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A VICTORIAN POLYMATH

AN ANALYSIS OF WILLIAM STANLEY JEVONS'S THOUGHT

Presentata da: Eleonora Buono

Coordinatore Dottorato — Daniela Giannetti

Supervisore — Giovanni Giorgini

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ABSTRACT

This work is a study of William Stanley Jevons's thought. My thesis is: Jevons's thought needs to be seen in the light of its *anthropological foundations* to enhance the understating of his works. Such study of the anthropological foundations puts emphasis on some aspects of his thought which have been neglected, such as his religious views. Particular stress is also devoted to historical contextualisation, enabling us to understand how a number of Jevons's concerns are rooted in his cultural background.

In the first chapter of my thesis, I focus on Jevons's epistemology and religious thought. Here I argue that his account of probability and natural laws had a theological foundation. I go on to further analyse Jevons's logic and ontology by comparing his work with the tradition of the *ars combinatoria*. In the second chapter, I present Jevons's moral and political thought. In the first part I again consider Jevons's religious beliefs, focusing on his allegiance to Unitarianism. I then consider Jevons's political thought in the light of a fundamental question: how could a society composed of selfish individuals be conceived? In the last part of the second chapter, I argue that Jevons appealed to Herbert Spencer's theory of evolution to reconcile individuals and society. In the third chapter I address Jevons's economic theory, arguing that it was strongly influenced by the other spheres of his thought. In the first part of the third chapter, I link Jevons's economic thought to his moral and political philosophy. In the second part of this chapter, I focus on the role of mathematics in Jevons's economic works. In the last part of the third chapter, I investigate Jevons's representation of the economic subject.

Those RULES of old discovered, not devised,
Are Nature still, but Nature methodized.

Alexander Pope, *An Essay on Criticism*

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INTRODUCTION

> I seem to have more clearly before me by degrees the position to which I would aspire. Accepting the progressive triumphs of physical science I would aid in the reform of abstract science and in the establishment of moral & political sciences. But I would also join science to morals & religion. I would try to show that they are not antagonistic (Jevons, 1972-1981, Vol. I, 203).

William Stanley Jevons (1835 – 1882) is first and foremost known as an economist. His revision of the theory of value and the definition of the principle of decreasing marginal utility gained Jevons a prominent position in the history of economic thought. Together with Léon Walras and Carl Menger, he is traditionally considered as one of the leading figures of the marginalist school – a theory which planted the seeds of contemporary economics.

Jevons became interested in political economy while he still was a young man working at Sydney's Mint. After coming back to England to pursue his studies, in 1866 he was appointed professor of Logic, Mental and Moral Philosophy at Owens College, in Manchester. He continued to teach political economy – which at that time was considered part of Mental and Moral Philosophy – until the year preceding his untimely death in 1882. The passage quoted above is drawn from Jevons's journal and is dated 11 March 1866. It was a moment of great significance for Jevons's career as an economist – which fact makes the passage quite bewildering. Here Jevons meditated on his endeavours, trying to estimate his prior achievements and the expectations he still nurtured for his work. He was determined to establish political economy as an autonomous, scientific subject matter, taking advantage of the method of the physical sciences. However, Jevons was far from being solely interested in economic theory. Indeed, alongside his concern for the scientific method of po-

litical economy, he mentioned another aspiration: combining science with morals and religion.

The above quoted passage of Jevons's journal buttresses the thesis I support in this dissertation. My thesis is: Jevons's thought needs to be seen in the light of its *anthropological foundations*. Such perspective would enhance the understating of Jevons's works and the meaning he attached to it. A study of the 'anthropological foundations' focuses on the description of the human being one's thought, whether such description is explicitly provided or only implied. Investigating the 'anthropological foundations' thus means stands here for the representation of the human subject involved in the most diverse spheres of thought treated by Jevons, such as his logic, epistemology, social policy, or economic theory.

The representation of the human nature is certainly of crucial importance in the domain of the social or human sciences, in which the human being is a specific object of investigation. However, every intellectual or practical inquiry entails an account of the human nature, if only *qua* representation of the subject elaborating a theory. Every time we pursue knowledge, we offer, either unwittingly or not, a representation of conditions which enable us to pursue such knowledge. The representation of the agent involved in the theoretical inquiry plays a foundational role for the inquiry itself, since the idea of ourselves in terms of subjects of knowing directs our investigations. Therefore, a study of the anthropological foundations is necessary for comprehending the bases on which any theoretical investigation is built.

Emphasising the anthropological foundations is all the more important in Jevons's case, given his interest in the social sciences. As I have already mentioned, the social sciences consider the human being and his behaviour as their specific object of study. Therefore, I will focus on those domains where the anthropological foundations are more evidently developed, such as the philosophy of morals and religious beliefs. These domains are strictly related to the anthropological foundations of Jevons's thought, entailing a representation of the human being in terms of the principles of his action or of his relationship with the Creator. Therefore, these aspects will be the main topic of my analy-

sis. I will also show the influence of those spheres of thought, and consequently of the anthropological foundations of Jevons's thought, on other domains, which at a first glance seem to be untouched by these kind of reflexions.

Moreover, this perspective puts emphasis on some aspects of his thought which have been neglected. This is the case with Jevons's religious views. This aspect of Jevons's thought has been considerably understudied, and it has often been considered to concern his private life alone. However, my focus on the anthropological foundations of Jevons's thought reveals the relevance of his theological reflections and religious beliefs for many of the topics which he treated. Taking this point of view also enabled me to see the link between topics which would not normally be thought to be related, such as Jevons's epistemology and religious beliefs. We shall see that the representation of the human mind as finite with respect to the infinite intellect of the Creator sheds light on Jevons's epistemology, as well as on his logical studies. This provides further proof of the importance of the studying the anthropological foundations of his thought.

In this dissertation, particular stress is put on the historical context in which Jevons lived. Such attention to historical contextualisation is connected to the inquiry of the anthropological foundations of Jevons's thought. Jevons's cultural background, the circles he was acquainted with, the places where he lived, couldn't but inform his thinking and his views of human nature. Hence, the study of the Victorian age enables us to understand how a number of Jevons's concerns are rooted in his cultural background, including his attempt at reconciling science and religion, and his ambitions for social reform.

Along with the inquiry into the religious character of Jevons's account, I pay particular attention to another, more general topic, that is, the relationship between 'is' and 'ought'. This topic is likely to attract much attention in a work concerned with the anthropological foundations of one's thought, since considering the philosophy of morals is of primary importance for such a study. Indeed the so-called 'is-ought question' has been the object of a lively debate

among moral philosophers[1]. This debate initially developed through reflections on David Hume's famous passage from the *Treatise on Human Nature* (1739). Here, Hume warned against the tendency of confusing 'is' and 'ought':

> In every system of morality, which I have hitherto met with, I have always remark'd, that the author proceeds for some time in the ordinary way of reasoning, and establishes the being of a God, or makes the observations concerning human affairs; when of a sudden I am surpriz'd to find, that instead of usual copulations of propositions, *is*, and *is not*, I meet with no proposition that is not connected with an *ought* or an *ought not*. This change is imperceptible; but is, however, of the last consequence. For as this *ought*, or *ought not*, expresses some new relation or affirmation, 'tis necessary that it should be observ'd and explain'd; and at the same time that a reason should be given, for what seems altogether inconceivable, how this new relation can be a deduction from others, which are entirely different from it (Hume, [1739] 1878, Vol. II, 245-246).

These two levels must be kept separate. Moreover, as Hume observed, no 'ought' can be derived from the 'is'. The level of 'ought' and 'is' being utterly distinct, every attempt to deduce the 'ought' from the 'is' is absurd and incorrect[2].

The realm of 'is' could be connected to the concept of *description*: when one is moving at the level of 'is', one is providing a description of the world as it is (or as one thinks it is). At the level of 'ought', instead, one is providing an account of how things *should* be (or how one thinks things should be). This is the realm of *prescription*, where we are not only describing the state of things, but expressing a judgement of value, presenting what in our mind would be the most desirable state of affairs. At the level of 'is', we are dealing with state-

[1] This topic has been discussed in several papers, which have been collected in Hudson, 1969.

[2] For further insight on this passage from Hume's *Treatise*, see the very influential paper from MacIntyre (see Hudson, 1969, 35-50).

ments of facts, while at the level of 'ought' with moral judgements, prescriptions, hypothetical imperatives[3].

Moreover, as I shall point out at several junctures, there are objects to which prescriptions simply do not apply. Therefore, speaking in terms of 'ought' is not always reasonable. If we are persuaded that some things could not happen any differently, such as a stone falling because of gravity, then it would be nonsensical to prescribe anything to such things. The stone has no choice: it would fall in any case. As I argue in the second chapter, prescriptions have solely a meaning for those subjects who can change themselves.

It is likely that Jevons knew the above passage from the *Treatise*, given the popularity of this text. Whether he knew it or not, though, Jevons did not give this problem the attention it deserved. My study reveals that the polarity between 'is' and 'ought' played a fundamental role in Jevons's work[4], but also shows the ambiguity with which this theme is treated by him. The tension between these two levels goes through every aspect of his thought, being found in his logic, as well as his moral philosophy and economic theory.

Furthermore, the 'is-ought problem' is deeply intertwined with my investigation of the anthropological foundations of Jevons's thought, and only in the light of this perspective reveals its pre-eminence. The entanglement between prescription and description, between what humans are and what they ought to be, is one of the most important topics emerging while Jevons depicts his conception of human nature. Studying Jevons's representation of the human being and the on the consequences of that representation on his thought requires a treatment of the 'is-ought question', which played such a relevant role in many of Jevons's investigations.

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[3] For a definition of 'is' and 'ought' in terms of statements of facts and normative judgements, see Hudson, 1969, 11-35.

[4] This issue had already been addressed, although it hasn't received the attention it deserves. In this regard, see: G. Robertson, 1876 (in Wood, 1988, Vol. I) 12, where Robertson has touched this topic with reference to Jevons's logic; Mazlish, 1986, 143; Maas, 2005, 116-117, 273-274; Mosselmans, 2007, 39-40.

In conclusion, this inquiry shows that a study of Jevons's thought from the point of view of its anthropological foundations enable us to shed light on the work of the Victorian polymath. This perspective clarifies not only his religious and moral thought, but also those fields which at first glance seem to be unrelated to this topic, such as logic or economic theory, depicting them under a different light. Indeed, the representation of the human being enters logic and economic theory *qua* subject of logical investigations or of the economic laws. Hence, a consideration of the anthropological foundations of Jevons's thought is of crucial importance to provide further understanding even of those fields which had been already studied at length.

William Stanley Jevons's life and works

William Stanley Jevons, called simply 'Stanley' by his family, was born on the 1st September 1835, in Liverpool[5]. Jevons's father, Thomas Jevons, was an iron merchant. Jevons's mother was Mary Anne Roscoe, daughter of William Roscoe. His maternal grandfather was an outstanding Liverpool citizen: he was a banker, an art collector, a poet, a historian, and he had been engaged in the struggle for the abolition of slavery. Both the Jevons and the Roscoes were wealthy and cultivated. Moreover, they were Dissenters, and specifically Unitarians. Jevons's family was well acquainted with the Unitarian circles in Liverpool, where the Unitarian community was flourishing[6].

Mary Anne Roscoe was a well-educated woman, whose interests encompassed botany, poetry, logic, chemistry, and political economy. It was she who gave the young Stanley, at the age of four, his first lesson in political economy, based on Richard Whately's textbook, *i.e. Easy Lessons on Money Matters for the Use of Young People*. Jevons attended the Mechanics Institution High

[5] For a detailed biography, see M. Könekamp, *Biographical Introduction* (Jevons, 1972-1981, Vol. I, 1-51). Another extensive biographical account can be found in Schabas, 1990.

[6] Concerning Unitarians and their influence in Liverpool, see the second chapter, first section.

School in Liverpool. He was thus given a technical education. His training in the hard and technical sciences, as some scholars have noticed, had a long-lasting influence on his scientific endeavours[7]. In January 1848, when Stanley was twelve, the firm of Jevons's father failed, due to the railway crisis of 1847. Its bankruptcy left Jevons's family in financial straits.

In 1851 Jevons left Liverpool and moved to London, to pursue his studies. He entered the Junior University College of London for the first time at the age of sixteen and became an undergraduate student there in June 1852. As a student at UCL, Jevons dedicated himself to the study of chemistry especially, taking advantage of the expertise of two exceptional teachers, Professors Graham and Williamson. Jevons also had the opportunity to study mathematics with Augustus De Morgan. One of the most eminent intellectuals of the Victorian age, De Morgan had a deep influence on Jevons's thought[8]. During these years, Jevons spent a considerable part of his leisure time walking through the streets of London. His walks were no mere diversions, but were rather prompted by a social interest. Jevons liked to wander in the poor and destitute districts of the city, "like Dickens before him and like Marshall a few years later" (Jevons, 1972-1981, Vol. I, 17), as his grandniece Margaret Könekamp has written. It isn't surprising that Jevons was an avid reader of Henry Mayhew, Charles Knight and, like many Victorians, of Charles Dickens, who had devoted themselves to describing and denouncing the condition of London's poor[9].

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[7] Some eminent economists and scholars, John Maynard Keynes for instance, have underlined that Jevons's early technical education informed his approach to political economy (see Keynes, [1936] 2010, Vol. X, 111; R. D. C. Black, 1972b, 369).

[8] Concerning Augustus De Morgan's influence on Jevons, see the first chapter.

[9] In 1851, Henry Mayhew published an influential book, namely *London Labour and the London Poor*, where the problem of working conditions in Victorian London was addressed. Charles Knight was the editor of another famous book in six volumes on London life, where the wretchedness of the poor's housing was discussed. As for Dickens's treatment of this issue, we think immediately of *Oliver Twist* and *The Bleak House*. It is probably no coincidence that Jevons visited Clerkenwell, a district known for being the headquarters of London's pickpockets, as Dickens wrote of in *Oliver*

Jevons did not then complete his education at UCL. Still a boy of seventeen, he was offered a position as Mint essayer in Sydney. Jevons arrived in Sydney on the 6th October 1854. It was the beginning of a very important period in Jevons's intellectual life[10]. While working at the Mint, he cultivated many old interests and developed new ones. He focused on meteorology: he published several papers on this subject matter, and from September 1856 to June 1858 he became Meteorological Observer for the *Empire*, an Australian newspaper. He also studied the geology, topography, and geography of the Australian territory. He visited some of the Australian goldfields.

Moreover, his interests in social issues had not faded during those years. He studied the city of Sydney both from the topographical and the sociological point of view, elaborating a survey[11]. During these years, Jevons started to take an interest in political economy. This interest was at first triggered by the issues arising from the introduction of a railway system in Australia. Jevons published his reflections in three letters in the *Empire* in 1857[12]. After contributing the first of these letters, Jevons began his studies of political economy. Among his readings we can find John Stuart Mill's *Principles of Political Economy*, Malthus and Whately's works, and Lardner's *Railway Economy*.

Twist. With regard to Jevons's walks in those districts, see the following journal entries: Jevons, 1972-1981, Vol. I, 67-68, 71-72, 90. On Jevons's interest in Mayhew's work, see Jevons, 1972-1981, Vol. I, 80-81.

[10] The relevance of Jevons's years in Australia has been underlined by LaNauze and Michael White in particular; see: La Nauze, 1941; M. White, 1982.

[11] In this regard, see La Nauze, 1941, 33-37.

[12] For the first letter, published on 10 February 1857, see Jevons, 1972-1981, Vol. II, 262-268. The second letter was published on 8 April 1857 (see Jevons, 1972-1981, Vol. II, 282-287). The third letter was published on 29 December 1857 (see Jevons, 1972-1981, Vol. VII, 8-11).

In the meanwhile, Jevons was pondering whether to keep his position or to leave Sydney[13]. His appointment at the Mint gave him and his family some economic stability, but he had a strong desire to complete his education and to take part in British intellectual life. The second option prevailed, and Jevons left Australia for good in 1859. In the same year he resumed his university studies at UCL. In that time, Jevons enhanced his knowledge of mathematics, which was still taught by De Morgan. He also continued to study political economy, philosophy and logic. While he was a student at UCL, Jevons pursued his personal studies as well, working on statistics, meteorology, and political economy. He completed his MA at UCL in June 1862.

With the end of his studies approaching, Jevons started to make the results of his prior efforts known. In June 1862 he published two diagrams, one concerning the Bank of England's account and the second the price of money funds, wheat, the number of bankruptcies and other data. These diagrams summed up the statistical work which Jevons had been doing in the previous years, being persuaded that "it is only [by] representing large masses of statistics in this manner that any sure foundation can be laid for Pol[l] Economical arguments" (Jevons, 1972-1981, Vol. II, 450).

In October 1862 Jevons read two papers before the British Association for the Advancement of Sciences. The papers were entitled "Notice of a General Mathematical Theory of Political Economy" and "On the Study of Periodic Commercial Fluctuations, with five diagrams". The first paper was relevant to the development of Jevons's economic theory, since it already contained all the basic principles which would later be the core of his major economic works. However, his presentation at the BAAS was quite disappointing: his theory did

[13] Concerning this decision, see Maas, 2016, where the author has analysed Jevons's account books, explaining his decision in the light of accounting practices and connecting it with the calculus of pleasures and pains.

not elicit any praise, and apparently barely any reaction, as Jevons bitterly noted in his journal (Jevons, 1972-1981, Vol. I, 188)[14].

The following year Jevons published a work which attracted more attention than the previous ones. It was a pamphlet entitled *A Serious Fall in the Value of Gold ascertained and its Social Effects set forth*. Jevons touched thus a relevant topic for his contemporaries, claiming that there had been a depreciation of gold and investigating its causes. At the end of 1863, Jevons produced another important work, *i.e. Pure Logic, or the Logic of Quality apart from Quantity*, which constituted a core part of his logical system. Moreover, in October of the same year Jevons moved from London to Manchester, where he started working as a tutor at Owens College. It was a humble position, but this turned out to be the beginning of a long and prestigious career. Jevons lived in Manchester thirteen years and became a high esteemed professor at the college.

However, the beginning of his career as a tutor was quite challenging. Jevons's resolution not to neglect his duties at Owens College while continuing to work on his projects led to a deterioration of his health. Despite his health issues, in the second half of 1864 Jevons finished a book which made his name. Its title was *A Coal Question: an Inquiry concerning the Progress of the Nation and the probable Exhaustion of the Coalmines*. The book was published in April 1865 and in the following year it gained the attention of two eminent figures: John Stuart Mill and William Gladstone, who was then Chancellor of the Exchequer. In the spring of 1866 Jevons was eventually appointed professor of Logic, Mental and Moral Philosophy at Owens College. This appointment gave Jevons enough economic stability to consider getting married. Indeed, on the 19th December 1867 he married Harriet Ann Taylor. She was the daughter of

[14] Here we read: "The year of which only five minutes have now to run [1862] seems to have been a long one. It has seen many of my hopes fulfilled, many frustrated. It has made me an M.A. It has seen my theory of Economy offered to a Learned Society (?) and received without a word of interest or belief".

John Edward Taylor, Unitarian and founder of the *Manchester Guardian* newspaper.

Those years in Manchester, after becoming professor at Owens College, were very productive for Jevons. It was then that he published his most important works: *The Theory of Political Economy* (1871) and *The Principles of Science* (1874). The latter was a long and complex book, and its composition took Jevons almost ten years[15]. Between 1875 and 1879, he published three papers concerning the commercial crises and their relation to sunspots. During the Manchester years Jevons became more and more interested in social policy: he produced many papers on some socially relevant issues – papers which would be then collected in the volume *Methods of Social Reform* (1883). Indeed, *The State in Relation to Labour* (1882), the last book Jevons wrote, was completely devoted to these issues.

Despite his productivity, Jevons's health continued to be fragile. It is likely that his health issues were at the basis of his choice to resign his post at Owens College. Thus, in 1876, he left Manchester and moved to London, where he accepted an appointment as professor of Political Economy at UCL. It was a less demanding position, since the teaching responsibilities were not as burdensome as they were at Owens College. This enabled Jevons to focus on his writings and on his health. Yet, his poor health forced him to resign his professorship at UCL as well.

Jevons's life abruptly ended in the summer of 1882. He was in Galley Hill for his holidays with his family. Jevons liked swimming: while in Australia, as he wrote in his letters, he took great pleasure in swimming in those clear waters (see for example Jevons, 1972-1981, Vol. II, 273). His doctor told him, though, that he should abstain from it, since bathing in the cold English waters was unsuited to his heart weakness. Yet, in the last day of the holidays, Jevons couldn't resist and took a swim. It is likely that his heart could not cope with the shock of the cold water, and Jevons drowned. He was only forty-six (see Jevons, 1886, 449-450).

[15] For this information, see the first chapter.

The reception of Jevons's work

Jevons has long been considered a figure of primary importance in the history of economic thought. Here I present the main contributions concerning Jevons's *oeuvre*, as well as provide evidence of how the present inquiry fills a gap in scholarly studies.

In 1936, John Maynard Keynes and Lionel Robbins each gave an appraisal of Jevons's importance as an economist (see Keynes, [1936] 2010, Vol. X; Robbins, 1936). In his biographical essay, Keynes focused on various aspects of Jevons's scientific works, such as his economic theory and statistical works, but also his discussion of policy measures. In Keynes's eyes, Jevons was an inductive scientist, "the first theoretical economist to survey his material with the prying eyes and fertile, controlled imagination of the natural scientist" (Keynes, [1936] 2010, Vol. X, 119). According to Keynes, Jevons's contribution to economics went even beyond his economic theory. Keynes underlined the relevance of Jevons's empirical work, pursued through the collection and scrutiny of data. Lionel Robbins's appraisal focused on Jevons's economic theory. Robbins stressed how ground-breaking his theory was. According to Robbins, Jevons's theory was indeed revolutionary: Jevons's new emphasis on the economic agent and the application of mathematics to political economy are changes of the utmost importance in the history of economic thought.

Nearly thirty years later, thanks to Robert Denis Collison Black, the eminent historian of economic thought, Jevons's work was given a renewed attention. While tracking back the correspondence between Cairnes and Jevons, in 1960 Black discovered that Jevons's granddaughter, Mrs. Könekamp, had many unpublished letters and journals of her grandfather. Black and Könekamp worked together for many years. Their partnership resulted in a seven-volume book, the *Papers and Correspondence of William Stanley Jevons*, published from 1972 to 1981.

Moreover, in August 1971, a Bellagio Conference about the marginal revolution was held[16]. In this conference, the question concerning the nature of this so-called marginal revolution was addressed. Was there a common core at the basis of the work of the three first marginalists, *i.e.* Léon Walras, Carl Menger and Williams Stanley Jevons? Although Schumpeter had argued that there was (see Schumpeter, [1954] 1987, 793 especially), not all the contributors to the Bellagio conference agreed with him. William Jaffé, who six years before had published Walras's correspondence in three volumes, argued that the three marginalists were far from having a unitary thought: instead, they had to be de-homogenized, as Jaffé suggested in his paper (see Jaffé, 1976)[17].

Mark Blaug, in turn, denied that the three founders of marginalism could be considered as such at all (see Blaug, 1972). In Blaug's eyes, it is a mere coincidence that Jevons's, Walras's and Menger's theories were published almost in the same year (see Blaug, 1972, 277). According to Blaug, there is no such thing as the marginal revolution. In contrast with this account, many lecturers stressed the ground-breaking character of Jevons's and the other marginalists' work with respect to prior economic theories (see R. D. C. Black, 1972b; Bowley, 1972; Coats, 1972; Hutchison, 1972; Donald Winch, 1972).

Between the 1980s and the 1990s several contributions appeared, touching different aspects of Jevons's scientific production. The 1990s, however, were a particularly flourishing decade for the study of Jevons's thought. Stephen Stigler, John Aldrich and Mary Morgan have focused on Jevons's statistical and econometric works (see S. M. Stigler, 1982; Aldrich, 1987; Morgan, 1990). The relationship between Jevons and the prior and subsequent economic theory has been much discussed (see Bostaph, Shieh 1986; Bostaph, 1989; Schabas, 1989; 1990; Kim, 1995; Peart, 1993; 1995a; 1995b; 1996; M. White,

[16] The papers presented at the Bellagio Conference have been collected in a volume edited by Black, A. W. Coats and Craufurd Goodwin (see R. D. C. Black, Coats, Goodwin, 1973).

[17] Jaffé's paper would later on trigger a discussion in the *American Journal of Economics and Sociology*; see: Peart, 1998; Hébert, 1998; Fontaine, 1998; Comim, 1998.

1989; 1991; 1994a; 1994d; 2004). The issue of Jevons's views concerning social policy and social reform has been addressed too (see Paul, 1979; Hutchison, 1982; Bowman, 1989; 1997; Peart, 1996; Richiardi, Sigot 2013).

Considerable attention has also been paid to Jevons's methodology, with respect to both his scientific and economic contributions. Wolfe Mays already tackled this issue in a paper published in 1962 (see Mays, 1962; see also MacLennan, 1972). Mays had argued that there is consistency between Jevons's epistemological account and the other subject matters he treated. According to Mays, Jevons's method is unitary, embracing his economic inquiries as well as his philosophy of science. Hence, Mays has the merit of showing the continuity between Jevons's philosophy of science and economic studies. However, Mays's paper was confined to these two main aspects of Jevons's thought, giving latitude for further inquiry.

The issue of Jevons's methodology was addressed years later by Philip Mirowski in *More Heat than Light* (see Mirowski, 1989). Mirowski highlighted the influences which thermodynamic theories had on the economic theory of the first marginalists, rooting Jevons's methodological account in physics. Margaret Schabas also elaborated this topic in her book *A World Ruled by Number*. Schabas stressed the role that logic played in Jevons's methodology. In Schabas's eyes, the core of Jevons's scientific methodology is to be found in the hypothetical deductive method. Michael White provided a further contribution to this topic in 2004. In this paper (White, 2004), White has argued that the reference to thermodynamic energy appeared quite late in Jevons's writings. Before relying on logical methods and energetic mechanisms, Jevons appealed to mechanical analogies. The same hypothesis has also been suggested by Harro Maas, who elaborated Jevons's use of mechanical analogies in a detailed monographic study (see Maas, 2005).

Jevons's thought has been examined in two other monographs: Sandra Peart's, *The Economics of William Stanley Jevons*, and Bert Mosselmans's, *William Stanley Jevons and the Cutting Edge of Economics* (see Peart, 1996; Mosselmans, 2007). The first work is an extensive investigation of Jevons's economic theory, with attention to his relationship with the classical school.

Moreover, Peart's book contains a remarkable treatment of Jevons's ideas on social policy. The second monograph, Mosselmans's, focuses on various topics. Mosselmans's most original contributions are to be found in his inquiry concerning Jevons's logic, music, and religious beliefs.

Mosselmans's study shows a praiseworthy inclination to take into account many aspects of Jevons's thought. He also has the merit of bringing to attention some topics which had been neglected, including Jevons's religious beliefs. However, despite touching many aspects of Jevons's work, Mosselmans did not develop a detailed analysis of some of them. For instance, Mosselmans's elaboration of Jevons's religious position lacks precise historical contextualisation. Mosselmans had another remarkable intuition when he argued that Spencer's philosophy was an important point of reference for Jevons. However, his analysis of Spencer's influence on Jevons could be further developed.

After Mosselmans's monograph, no other extensive study on Jevons has appeared. Some notable contributions have been published. Motohiro Okada elaborated a study of Jevons's theory of labour (Okada, 2012). In 2013, Richiardi and Sigot, as I have noted above, published their original investigation of Jevons's works on social policy (Richiardi, Sigot 2013). In the same year, another paper appeared, in which the author, Ivan Moscati, explores the problem of measurement in the three marginalists (Moscati, 2013). Harro Maas published two other papers, one co-authored with Hsiang-Ke Chao, on Jevons: the first one (Maas, 2016) considers Jevons's account books, analysing accounting practices in the Victorian age and relating them to Jevons's theory; the second is a study of diagrams and graphs in Jevons's and Marshall's work (Chao, Maas 2017).

Scholarly studies are far from being unconcerned with what I called the anthropological foundations of Jevons's thought. Contributions on the agent of Jevons's economic theory, on the depiction of human nature in the context of his philosophy of morals and utilitarianism, or on the role of character in his social policy indirectly address this topic (Higgings, 1935; Keynes, [1936] 2010; Mays, 1962; Paul, 1979; Hutchison, 1982; White, 1982, 1994a, 1994b; Mazlish, 1986; Bowman, 1989, 1997; Peart, 1996; Maas, 2005; Mosselmans,

2007; Richiardi, Sigot 2013). However, none of these contributions specifically focuses on this problem. This also explains why some of the aspects of Jevons's thought in which the issue of the anthropological foundations is more evident, like his religious views, have been neglected. My research thus aims at filling this gap in literature, both from a methodological and a thematical point of view. On the one hand, from the methodological point of view, I will put emphasis on this issue even in relation to these fields in which Jevons's representation of human nature has already been investigated. On the other hand, my research will focus on some of the most neglected aspects of Jevons's thought, showing their relevant for the study of the anthropological foundations of his inquiry and providing further understanding of his *œuvre*.

Outline of the dissertation

In the first chapter of my thesis, I focus on Jevons's epistemology and religious thought. Here I argue that his account of probability and natural laws had a theological foundation. I go on to further analyse Jevons's logic and ontology by comparing his work with the tradition of the *ars combinatoria*. According to this tradition, the world can be seen as a series of combinations, in which natural phenomena are constantly merging with each other. I paid particular attention to Jevons's link to the English context and to Leibniz's *characteristica universalis*.

In the second chapter, I present Jevons's moral and political thought. In the first part I again consider Jevons's religious beliefs, focusing on his allegiance to the Dissenting confession of Unitarianism. The purpose of the first part of this chapter is to provide a historical contextualisation to Jevons's religious thought. Therefore, I explain the developments of Unitarianism during the Victorian age and link Jevons's ideas to those of his contemporaries, with particular attention to William Gaskell and James Martineau.

I then consider Jevons's political thought in the light of a fundamental question: how could a society composed of selfish individuals be conceived? This question elicited a comparison between Jevons's response to this difficul-

ty and the solutions provided in the context of the utilitarian philosophy, which Jevons himself acknowledged as his own. I compare Jevons's position with two relevant utilitarian philosophers: Jeremy Bentham and John Stuart Mill. In the last part of the second chapter, I argue that Jevons appealed to Herbert Spencer's theory of evolution to reconcile individuals and society.

In the third chapter I address Jevons's economic theory, arguing that it was strongly influenced by the other spheres of his thought, and consequently by the anthropological foundations of his inquiry. In the first part of the third chapter, I link Jevons's economic thought to his moral and political philosophy. I explain how his moral individualism had a counterpart in his economic theory. In the second part of this chapter, I focus on the role of mathematics in Jevons's economic works, showing the entanglement of Jevons's mathematization of economics with both his epistemology and his theological ideas. In the last part of the third chapter, I investigate Jevons's representation of the economic subject. Continuing with the theme of the previous two chapters, I argue that Jevons's representation of the economic subject was influenced by his epistemology and religious views.

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CHAPTER 1

SEEING GOD'S MARKS IN NATURE

Jevons's religious beliefs and epistemology

1.1. The bridge between science and religion

In ancient Rome, the *pontifex maximus* was the highest religious office. '*Pontifex*' is a compound word, putting together the term '*pons*' (bridge) and the suffix '*fex*', from '*facio*' (make). Hence, the *pontifex maximus* was the supreme 'bridge-maker', as well as the head of other *pontifices*. He was in charge of constructing the bridge between humans and gods. Such a role shows at once their distance and proximity. Their distance, since they need a mediator to interact. Their proximity, because such an interaction is nonetheless possible. Moreover, this connection also strengthened the unity of society itself, unifying it around religion and tradition. Indeed, the bridges are not only needed in the heavens.

In nineteenth century England, both these celestial and earthly bridges seemed to fall apart[1]. Religious beliefs were apparently jeopardized by scientific discoveries and ideas. In *The Principles of Geology*, published between 1832 and 1833, Charles Lyell pointed out that the earth was much older than the account in Genesis supposed it to be. A further challenge came almost thirty years later with Darwin's *Origin of Species*, and then with his *Descent of Man*. Evolutionary theories put at risk the teleological view of religion and

[1] About the relationship between science and religion in nineteenth century's England see P. White, 2017, 41-52.

questioned human supremacy over all creatures[2]. As early as 1828, the Repeal of the Test Act suggested that the Church of England had lost its primacy[3]. While subscription to the Thirty-Nine Articles of the Anglican Church was still required to access the ancient universities, in 1826 a university was founded in London where students and professors were welcomed, regardless of faith. In such a context, science sometimes became a weapon in the hands of radicals and Dissenters[4].

On the one hand, these developments seemed to display an insurmountable distance between God and humans. On the other hand, many were persuaded that the precepts of Christianity demanded a rearrangement (see Cowling, 2001, XVI). Several Victorian scientists accepted thus the challenge of bridging the gap between science and religion. Many chose to use natural theology's conceptual framework. The most striking example of this tendency was the series of *Bridgewater Treatises*. The Earl of Bridgewater patronized eight highly influential scientists and philosophers, who revitalized the tradition of natural theology. Following William Paley, they strove to highlight the signs of God's design in His Creation[5]. This attempt had so strong an influence that Charles Babbage published autonomously a *Ninth Bridgewater Treatise* in 1837.

Another example of this bridge-making concern is the so-called Theological Declaration of Scientific Men (Jevons, 1972-1981, Vol. III, 60). On the 20th September 1864, *The Times* reported a debate under the title *Science and Scripture*. More than two hundred scientists had signed a declaration concerning the

[2] Some influential scholars held that the nineteenth century was the scene of growing secularization. According to them, "geology triumphed over Genesis, apes over angels" (see P. White, 2017, 41). In the following decades this interpretation was revised though. In fact, new scientific accounts called for a conciliation with religion, not for its abandonment.

[3] See Cowling, 1985, XVII, where the author focuses on the correlation between religious and political reform.

[4] See Desmond, 1989. Adrian Desmond's contraposition between radicals and elitists has been refined by Boyd Hilton (Hilton, 2000).

[5] On the *Bridgewater Treatises*, see Topham, 2010.

interpretation of the Holy Scriptures. According to them, science was not meant to cast doubt on the authenticity of the Scriptures: "we conceive that it is impossible for the Word of God, as written in the book of nature, and God's Word written in Holy Scriptures, to contradict one another, however much they may appear to differ" (VV. AA., 20th September 1864, *The Times*, 7). They continued accordingly:

> We believe that it is the duty of every scientific student to investigate nature simply for the purpose of elucidating truth, and that if he finds that some of his results appear to be in contradiction to the Written Word, or, rather, to his own interpretations of it, affirm that his own conclusions must be right, and the statements of the Scriptures wrong; rather leave the two side by side till it shall please God to allow us to see the manner in which they may be reconciled; and instead of insisting upon the seeming differences between science and the Scriptures, it would be as well to rest in faith upon the points in which they agree (VV. AA., 20th September 1864, *The Times*, 7).

The endorsers of this declaration considered that science must step back on religion's behalf. For them, the only way of reconstructing the bridge was to urge scientists to support religious beliefs.

The responses to the Declaration were not all encouraging. *The Times* published Sir John Herschel's refusal to sign, together with John Browning's. Herschel, who was one of the most eminent scientists of the time, considered that the call to subscribe to a religious *manifesto* was "an infringement of that social forbearance which guards the freedom of religious opinion in this country with especial sanctity" (VV. AA., 20th September 1864, *The Times*, 7). Furthermore, Herschel dissociated himself from any profession of atheism whatsoever. He considered this movement to be mischievous, "having a direct tendency […] to add a fresh element of discord to the already discordant relations of the Christian world" (VV. AA., 20th September 1864, *The Times*, 7).

Seven days later Jevons wrote a letter to Herschel and complimented him for his reply to the invitation to subscribe the Theological Declaration:

> Dear Sir,

> Permit me to express to you in a few words the extreme satisfaction with which I read your answer concerning the Theological Declaration of Scientific Men. Such an appropriate statement of the position of an inquirer in the present day strikes me as invaluable both to Science and True Religion. And I cannot sufficiently express my concurrence in your protest against a desire for freedom of inquiry being interpreted as a tendency to Irreligion. Is it worthy of Religion to assume that it must be discarded by all who freely seek after the Truth (Jevons, 1972-1981, Vol. III, 60)?

As a Dissenter, Jevons had first-hand acquaintance with the importance of free inquiry in religion. He studied at the new-born University College London[6], where many of his teachers were Dissenters as well. Some were luminaries, at the top of their fields, like the mathematician Augustus De Morgan[7]. Nevertheless, they had no place in Oxford or Cambridge, showing to the young Jevons that religious freedom still had a long way to go.

Moreover, there was a long-lasting connection between scientific inquiry and Non-Conformity[8]. Unitarianism was part of so-called rational Dissent, putting the accent on intellectual features of faith (see Hilton, 2006, 460). They had always favoured a liberal interpretation of the Holy Scriptures. The lack of references to the Trinity in the Bible pushed them indeed to deny its existence,

[6] More details on Jevons's education are to be found in: Jevons, 1972-1981, Vol. I, 13-18; R. D. C. Black, 1993, 163-166.

[7] For the relevance of De Morgan in Jevons's education, see R. D. C. Black, 1972a, 124 especially.

[8] In this regard, see P. Wood, 2004; as Paul Wood has explained in the introduction to this volume, there is a long historiographical tradition associating Dissent to interests in natural philosophy, mathematics and technology. According to this argument, in the eighteenth century, Oxford and Cambridge didn't provide an extensive education in mathematics and natural sciences, so that Dissenting academies started focusing on them. With respect to nineteenth century, scholars have highlighted the connection between educational interests and Unitarianism. Nonconformists had also an essential role in the foundation of University College London and of Owens College in Manchester, with the intention of providing a higher education in the natural sciences.

hence the name 'Unitarians'[9]. It is not surprising that Jevons argued in favour of a liberal reading of the Scriptures, since he came from this tradition.

His Unitarian background had certainly shown Jevons that science and faith were not opposed, nor necessarily in contradiction. He had further encouragement in this direction from his studies at University College London, from Augustus De Morgan especially. The relation between scientific inquiry and religion was of crucial importance in De Morgan's teaching (see R. D. C. Black, 1972a, 127) and works. De Morgan himself couldn't complete his degree at Cambridge because of his contempt for the subscription to the Thirty-Nine articles[10]. De Morgan was indeed a remarkable bridge-maker, willing to multiply the earthly bridges connecting different kind of believers. He supported the Catholic Emancipation Bill (see Cohen, 2005, 144) and referred to all subscriptions as a "deadly poison"[11]. In De Morgan's view, mathematics could be a powerful tool to unify the creeds. This idea was thus embodied in the *insignia* he drew for the London Mathematical Society. It was a triangle with at each side the Jewish, Christian and Muslim reference to the year of the Society's foundation (1865), according to each calendar. The figure was combined with the motto '*Vis unita fortior*' (a united force is stronger). Mathematics must create a "union of races and nations as well as of individuals"[12].

These connections, from Liverpool's Unitarians to De Morgan, had a strong effect on Jevons. He began to think that religion and science were not so

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[9] On the history of the term 'Unitarian', see Holt, 1938, 281; according to Raymond Holt, the term first appeared in England in Henry Hedworth's pamphlet (1672), but it was in use in Transylvania even before then.

[10] See Cohen, 2005, 139-158 and 143; this information is drawn from De Morgan's autobiographical sketch, London, British Library, MS 28509, f. 421. On this topic see also Cohen, 2007, chap. 4.

[11] For this quotation, see De Morgan to W. R. Hamilton, 27 July 1852, Dublin, Trinity College Library, Hamilton Papers, 1493/541, as quoted in Cohen, 2005, 143.

[12] For this description and references, see Cohen, 2007, 119. The quotation is drawn from Augustus De Morgan, Notebook, Ms Add. 69, De Morgan Papers, Special Collections, University College Library, University College, London.

distant. It was a question of fixing a bridge which had been damaged – perhaps even reconstructing it. The first part of the first chapter aims thus at investigating the relationship between Jevons's scientific reflections and religious beliefs. First, I focus on the last chapter of the *Principles of Science*, where the link with religion is particularly apparent. Here Jevons took part in scientific debates where a religious concern was involved, like the Uniformitarian and Catastrophist controversy or the attack on evolutionary theory. Thereafter I investigate the foundations of Jevons's epistemology, paying particular attention to the pre-eminence of logic and the psychologistic view of logic itself. Such an inquiry will raise a question concerning the nature of the laws of thought.

I then look at the religious foundations of Jevons's epistemology, showing that his notion of probability relies on a religious idea: the gulf between the finite mind of human being and the infinite intellect of the Creator. Such idea, even though it is not expressed in these terms by Jevons, is a direct consequence of his statements and has a deep influence on his thought, as I shall show. Finally, I argue that Jevons's probabilistic view of scientific knowledge coexisted with a firm belief in the order that God imprinted on nature, guaranteeing a sound basis for our scientific endeavours. Once again, we find that Jevons relied on religious beliefs in his understanding of science and scientific reasoning

A lifelong believer

The interest in religion and in its connection to scientific investigation was a lifelong one for Jevons[13]. During his youth he had been a keen student of religious matters. At the age of fifteen, he reported in his journal a plan to study the Gospels, analysing and arranging them chronologically. In fact he intended

[13] On Jevons's religious beliefs, see Mosselmans, 2007, chap. 6.

to write a "rigorrous history of Christ" (Jevons, 1972-1981, Vol. I, 99)[14], though he never completed the task. When he was young, he envisaged becoming a minister:

> It seemed so serious, & useful, a profession and I entered but little into the merits of religion, & the duties of a minister. Every one dissuaded me from the notion – & before I had arrived at any age to require a real decision science had claimed me (Jevons, 1972-1981, Vol. I, 99).

However, with the study of natural science Jevons developed a rational and critical perspective on religion. This intellectual penchant distinguished him from his sister Henrietta, who in his opinion had a warm and sentimental faith. In a journal entry dated 28th January 1857, Jevons illustrated this difference, explaining his doubts on this regard. He then explained his own conception of religion and of its relationship with the scientific account:

> Natural science was my chief study and I may say that I have become so impressed with the general character of natural laws of fact and have become so accustomed to habits of severe and exact thought, that I must have a solid foundation for my religion or I shall have none (Jevons, 1972-1981, Vol. I, 154).

At that time Jevons was in Australia. Those were years of intense religious reflection, as the correspondence with his sister Henrietta shows (Jevons, 1972-1981, Vol. II, the letters between 1856 and 1859).

Nonetheless these efforts were not confined to his youth. At the beginning of his academic career in Manchester, on the 11th March 1866, Jevons expressed a genuine bridge-making concern in his journal:

> Accepting the progressive triumphs of physical science I would aid in the reform of abstract science and in the establishment of moral & political sciences. But I would also join science to morals & religion. I would try to show that they are not antagonistic (Jevons, 1972-1981, Vol. I, 203).

[14] Here we read as follows: "the Gospels seemed worth more than reading – they were worth analysing & making into a rigorrous history of Christ. And this I actually undertook to do – while living in Chatham Street perhaps about the year 1850".

Even in his old age, his interest in this project did not let up. According to his wife, apparently he intended to write another *Bridgewater Treatise* in 1882 (see Jevons, 1886, 451). His sudden and premature death deprived us of this alleged *Tenth Bridgewater Treatise*, although his intention of writing one reveals how persistent these thoughts were for him.

Arrogant scientists: the concluding chapter of the Principles of Science

Religious and theological considerations played a considerable role in Jevons's *magnum opus*, namely *The Principles of Science* (1874). They are summarized in its concluding chapter, *Reflections on the Results and Limits of Scientific Method*. First of all, Jevons extensively underlined that he didn't want to be mistaken for a materialist. As he wrote, scientific progress seemed to hint at the possibility of reducing all phenomena to their material mechanisms. Matter and mind would be both reduced to a chain of causes and laws, human mind being nothing but various amounts of nitrogen and phosphorous (Jevons, [1874] 1877, 735-736). "Is science, then, essentially atheistic and materialistic?" (Jevons, [1874] 1877, 736). Jevons's answer was negative: "to assume […] that scientific method can take everything within its cold embrace of uniformity, is to imply that the Creator cannot outstrip the intelligence of his creatures" (Jevons, [1874] 1877, 739). Science is not equivalent to materialism, "as true science will not deny the existence of things because they cannot be weighed and measured" (Jevons, [1874] 1877, 768)[15].

Jevons never questioned God's existence. He briefly dealt with this in the *Preface* (Jevons, [1874] 1877, XXXI). He was more concerned with the problem of God's subordination to natural laws. Hence, Jevons's position is not understandable without reference to the debate between Uniformitarians and

[15] Here Jevons was addressing Comte's work and criticizing it for its materialism.

Catastrophists[16]. This debate first originated in geology, with the publication of Lyell's *Principles*. In that work Lyell held that the universe exhibited substantial uniformity (Lyell, [1832-1833] 2009, Vol. II, 157). Through the universe's life, natural causes had always been acting in the same way, and the quantity of energy of the universe had been the same too (see Cannon, 1960, 38; Rudwick, 1967, 272). From Hutton's point of view, "the present is the key to the past" (Geike, 1905, 486). Moreover, Lyell ruled out every reference to primary causes, that is, to the direct interference of God in the world. According to him, all developments were to be explained by means of secondary causes. The so-called Catastrophists, led by Adam Sedgwick and William Whewell, opposed this view. They also argued in favour of divine interference, even in the development of new species[17].

Jevons took part in this debate, which was largely concerned with the relationship between science and religion[18]. Science had described the natural laws as necessary and inexorable. Was then the scientist bound to question God's power? Jevons thought that this was not the case: "laws of nature are uniformities observed to exist in the action of certain material agents, but it is logically impossible to show that all other agents must behave as these do" (Jevons,

[16] The term 'Catastrophism' was introduced by William Whewell in 1832, in a review of Lyell's *Principles* (see Whewell, 1832, 126); for the opposition in Whewell's work, see Whewell, (1840) 1847, Vol. II, 420-421. With respect to this debate, see: Cannon, 1960; Rudwick, 1967; Day, 1975; Ruse, 1976; Rudwick, 2014. I would like to thank Andrew Hopkins for his precious suggestions concerning the scholarly debate on this topic.

[17] On Whewell's justification of divine intervention see: Cannon, 1960, 38-39; Ruse, 1976, 129.

[18] This debate certainly had theological implications. Rudwick, however, has warned against a simplistic interpretation of it in terms of opposing factions: "it would be wrong to conclude […] that the controversy was simply between, on the one hand, the proponents of providential design and providential activity, and, on the other, those who wished to eliminate all traces of providentialism from science" (Rudwick, 1967, 273).

[1874] 1877, 737). On the basis of these laws we could only assume that *similar* beings would be constrained by them. We had no right to extend the inference to those beings whose nature was unknown or presumably different. Therefore, we could not conclude that God would be restricted by the laws of His own creation. The Creator is different from his creatures: it follows that He could not be bound by the laws of nature. That is why the Uniformitarian position was in Jevons's eyes "superficial and erroneous", since they considered God "as being subject like a human legislator to the laws which he has himself enacted" (Jevons, [1874] 1877, 737).

Thus, Jevons assumed a Catastrophist position, clearly stating that "we cannot disprove the possibility of Divine Interference in the course of nature" (Jevons, [1874] 1877, 766). The habitual uniformity of nature did not imply that "extensive alterations or sudden catastrophes are impossible" (Jevons, [1874] 1877, 746). In fact Jevons used an argument of natural theology to endorse the Catastrophist account. He referred to Babbage's *Ninth Bridgewater Treatise*. According to Babbage, as Jevons explained, calculating engines were perfectly able to variate the laws regulating their mechanisms. Jevons therefore argued as follows, in a language peculiarly close to William Paley's:

> If such occurrences can be designed and foreseen by a human artist, it is surely within the capacity of the Divine Artist to provide for analogous changes of law in the mechanism of the atom, or the construction of the heavens (Jevons, [1874] 1877, 744).

The Uniformitarian position was not only logically inconsistent. Jevons even depicted it as a moral fault, an act of arrogance. In his view, "the too exclusive study of particular branches of physical science seems to generate an over-confident and dogmatic spirit" (Jevons, [1874] 1877, 737). Led by this spirit, the scientist would therefore deny the finiteness of his intellect and would assume that his method could disclose the mysteries of life itself (Jevons, [1874] 1877, 737). With an act of modern *hubris*, the scientist would eventually refuse all the alleged contradictory notions. For example, the attributes of all-power and all-benevolence would be inconsistent with one another,

as the existence of evil would prove him to be "either not perfectly benevolent, or not all-powerful" (Jevons, [1874] 1877, 768). However, this inconsistency was a result of our lack of understanding. As Jevons pointed out,

> we perpetually find ourselves in the position of finite minds attempting infinite problems, and can we be sure that where we see contradiction, an infinite intelligence might not discover perfect logical harmony (Jevons, [1874] 1877, 768)?

Many of these contradictions were only illusory. In Jevons's mind this was also the case of the supposed incompatibility between evolutionism and faith. According to him, Darwin's and Spencer's theories represented the origin of mental, moral and social phenomena in a revolutionary way. Their theories were indeed so extraordinary as to deserve a place beside Newton's *Principia*, among those works which utterly changed our beliefs. And yet they didn't jeopardize theology at all[19]. Darwin and Spencer only clarified what was the development of living beings following from their previous conditions. Nonetheless, they left aside the problem of determining what originally existed. As Jevons argued, "the origin of everything that exists is wrapped up in the past history of the universe" (Jevons, [1874] 1877, 764). Moreover, "by a different distribution of atoms in the primeval world a different series of living forms on this earth would have been produced" (Jevons, [1874] 1877, 763), so that the origin of the universe would still be a matter of theology. Eventually, evolutionism raised more questions than it answered.

[19] Bert Mosselmans has argued that Jevons was influenced by Spencer in showing that scientific and religious perspectives are not in conflict (see Mosselmans, 2007, 76-77). However, even if Jevons could surely have been influenced by Spencer's *First Principles*, as Mosselmans as argued, here I have shown that Jevons's conviction of the continuity of science and religion had much deeper roots, for instance the tradition of rational Dissent.

1.2. The task of knowing

As I have stated above, in this chapter I consider the relationship between Jevons's religious beliefs and his scientific reflections. Therefore, I focus on the book in which Jevons elucidated his views on epistemology and science at length, that is, *The Principles of Science*. In this section, I tackle the following problem: according to Jevons, what are the foundations of our knowledge? How could we secure the success of the task of knowing? As I shall explain, Jevons claimed that all the branches of knowledge came from a single source, *i.e.* logic. As we shall see, logic was, in turn, rooted in the powers of the human mind. Consequently, Jevons's position is an example of logical psychologism. Moreover, Jevons's choice to found logic in the human mind arises the question of the nature of logic itself. Thus, the 'is-ought question' is addressed, by means of the analysis of Jevons's view on logic.

The tyranny of specialism

Perhaps the most appropriate way to approach Jevons's *Principles of Science* is through its subtitle: *A Treatise on Logic and Scientific Method*. Its purpose was to settle the principles of the scientific method. In fact, in Jevons's opinion the material accomplishments of some sciences were not correlated with a proper reflection concerning their method. The result was an increasing specialization of knowledge at the expense of its unity and consistency (Jevons, [1874] 1877, XXVII-XXVIII). "We are in danger from the precipitancy and intellectual tyranny of specialism"(Jevons, 1972-1981, Vol. IV, 38)[20], wrote William Gladstone to Jevons, displaying a similar anxiety. Despite these developments towards an increasing specialization, Jevons saw knowledge as united[21]. As he wrote: "all the sciences meet somewhere upon common ground. No part

[20] In this letter, Gladstone expressed his appreciation of the *Principles*' conclusive chapter.

[21] Margaret Schabas attached Jevons's concern for the unity of knowledge to the cultural context of his time; see Schabas, 1984, 146.

of knowledge can stand wholly disconnected from other parts of the great universe of thought" (Jevons, [1874] 1877, 154).

The scientific method should encompass all branches of knowledge. After clarifying its foundations, this method would extend to all the branches of knowledge. Thus, from applying it to different domains, "we must sooner or later have strict sciences of those mental and social phenomena" (Jevons, [1874] 1877, XXVII). The social scientist could take as an example the physical sciences, due to their great record of success. Physical sciences could be the veritable "practice ground of the reasoning powers" (Jevons, [1874] 1877, XXVIII). It is not surprising, in the light of this, that Jevons suggested using the mathematical language in political economy (Jevons, 1871, 3)[22]. Indeed he had completed his *Theory of Political Economy* in 1871, while working on the *Principles of Science*. The idea of applying mathematics to moral and political sciences preceded his work on scientific method though, dating back to his days in Australia[23]. This continuity shows how cohesive his thought was[24]. From this point of view, the *Principles of Science* turns out to be a systematization of Jevons's methodological thoughts.

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[22] This topic will be further investigated in the last chapter.

[23] This idea was presented publicly for the first time in 1862, to the Section F of the British Association. The paper was then reprinted in 1866 (see Jevons, 1866). In fact this paper already displayed all the fundamental concepts which would be later expressed in the *Theory of Political Economy*. Apparently Jevons first conceived these thoughts in 1860, as it is shown in a letter of 1st June 1860, to his brother Herbert (Jevons, 1972-1981, Vol. II, 410). Moreover, according to La Nauze, Jevons was struck by this idea in February 1860 (see La Nauze, 1953). For a more extensive treatment of this issue, see the section "Mathematics and the world", in the third chapter.

[24] Several scholars pointed out the continuity of Jevons's methodological thought. In this regard, see: Mays, 1962; S. M. Stigler, 1982, for the application of statistics to the social sciences; Aldrich, 1987, for the role of probability in Jevons statistics and scientific thought, as well as for a criticism of Stigler; Schabas, 1990, concerning the priority of logic in Jevons's system.

Developing the psychological foundations of logic

All sciences must meet somewhere. In Jevons's account, they only met because they came from the same source. To him the common ground which bound all sciences together was *logic* (see Jevons, [1874] 1877, XXVII and 154-156). The foundation of every science and of thought itself rested in logic, the first and the simplest of the sciences (Jevons, [1874] 1877, 40). Jevons's position was evidently a criticism of the system of the logician and mathematician George Boole, which still inspired much admiration in him[25]. Boole was persuaded that mathematics was suited to provide a method for all sciences, since "the ultimate laws of Logic are mathematical in their form" (Boole, 1854, 11). In Jevons's view, logic had theoretical primacy over mathematics, as qualitative reasoning was prior to quantitative reasoning[26]. Jevons held that, "if numbers rule the world, it is the laws of logic which rule number" (Jevons, [1874] 1877, 154)[27].

We could nonetheless ask: what rules the laws of logic? Logic is a formal science, containing a set of rules. Where do these rules originate? As Jevons stated in the *Introduction* to the *Principles of Science*, "at the bases of all thought and science must lie the laws which express the very nature and conditions of the discriminating and identifying *powers of mind*" (Jevons, [1874] 1877, 5, emphasis added). Therefore logic could claim such a priority thanks to its foundation in the structure of human mind. Thus Jevons perspective on logic and its laws was psychological[28]. In this regard, Jevons had much in com-

[25] On Jevons and Boole, see: G. Robertson, 1876 (in Wood, 1988, Vol. I), 12; Mays, 1962, 236; Strong, 1976, with regard to probability; Schabas, 1990, 60-65 especially; Maas, 2005, 112-117 and 137, concerning the laws of thought.

[26] On this topic, see Jevons, 1890; see also Jevons, (1874) 1877, chap. 8 especially.

[27] Margaret Schabas made an extensive treatment of this subject matter (see Schabas, 1990, chap. 4).

[28] On this topic, see Higgings, 1935 (in Wood, 1988, Vol. I), 50. Here Higgins affirms that "there can be little doubt as to the distinctly psychological nature of [Jevons's]

mon with George Boole. In *An Investigation on the Laws of Thought* (1854) Boole had already stressed that an investigation in logic was in fact an inquiry into mental powers (Boole, 1854, 1-2). Jevons was aware of his debt to Boole and gladly accepted this position[29].

Established as this position may seem in *The Principles*, it went through different formulations in Jevons's works. One can reconstruct these changes from preceding publications. In this regard, *Pure Logic* (1864) is of particular interest. The full title is *Pure Logic, or the Logic of Quality Apart from Quantity, with Remarks on Boole's System and on the Relation of Logic and Mathematics*[30], its purpose being to outline a specific domain for qualitative logical reasoning. Hence, Jevons attempted to articulate the laws regulating logic. The first one was the law of sameness. Just after formulating it, he tried to clarify the meaning of a logical law *per se*:

> Logic proceeds by laws, and is bound by them. For logic must treat names as thought treats things. And the laws of logic state certain *samenesses* or uniformities in our ways of thinking, and are of self-evident truth (Jevons, 1890, 12).

The passage is difficult and the whole text is characterized by a great ambiguity on this subject matter. From this point of view, logic and thinking were separate and parallel things. Logic was only concerned with names, while thought with objects. However, logic was still connected with thinking by the means of its laws since these laws described some uniformities in thought.

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starting point. […] Not that he identified himself with any particular system of psychology". See also Schabas, 1990. 58. If Higgins's stated that Jevons did not fit in any psychological account in particular, this idea will be criticized by Harro Maas (Maas, 2005, 171-180). According to him, Jevons's is strongly influenced by physiology. In this regard, see also M. White, 1994a, where Michael White identified Jennings's physiology as Jevons's source.

[29] Jevons stated that he was indebted to Boole several times. See, for instance, Jevons, 1890, 4-5.

[30] The text was then reprinted in *Pure Logic* (see Jevons, 1890).

Moreover, Jevons suggested that *every* logical law stated some uniformities in the reasoning process. The first one, the law of sameness, would have been a principle underlying any kind of reasoning[31].

Yet the text did not tackle the problem of the connection between names and things. They remained two separate spheres, albeit concealing an unclarified affinity[32]. In *Pure Logic* Jevons chose to introduce every law of thought by the very same expression, namely "it is in the nature of thought and things, that" (Jevons, 1890, 12, 16, 21, 25, 28, 31 and 34)[33]. Through this formulation he described thought and things as separated, holding though that the laws of logic applied to both. That ambiguity was even more apparent in a further passage, where the laws of logic were enumerated. Jevons at first presented these laws as the laws or conditions of logic, except then arguing as follows: "it seems likely that these are the primary and sufficient laws of *thought*" (Jevons, 1890, 39, emphasis added).

Thus, the laws of logic and laws of thought overlapped throughout *Pure Logic*. Eventually, their identity was expressed in the opening page of a text published in 1869, *The Substitution of Similars*[34]. In Jevons's own words:

> Logic is the science of the laws of thought itself, and there is no sphere of observation and reflection which is more peculiarly open to any inquirer, than the inquirer's own mind as involved in the process of reasoning (Jevons, 1890, 81).

Once logic had been defined accordingly, it also acquired a new feature: self-evidence. Jevons held that mental processes were primarily disclosed to the in-

[31] In *Pure Logic* the formulation of the so-called law of sameness preceded the enunciation of the substitution principle (see Jevons, 1890, 18). In any case, Jevons explicitly stated that the law of sameness occupied a fundamental place among the laws of reasoning (see Jevons, 1890, 39).

[32] As we shall see, Jevons addressed this same topic in *The Principles of Science*, ten years later.

[33] This expression occurred every time a law of logic is formulated.

[34] This paper is also included in *Pure Logic* (see Jevons, 1890).

quirer investigating his own mind. The mind was evident to itself. Therefore logic was endowed with the character of self-evidence as well. In such a way Jevons completed the statement of *Pure Logic*, where it was written that logical laws had a self-evident truth. After reducing logic to the process of reasoning, Jevons secured its evidence. Moreover, Jevons's argument was buttressed by George Boole. According to the latter, the laws of thought were endowed with evidence as well. They were made apparent in the very moment of their manifestation. We had thus an immediate knowledge of our own mind's functioning (Boole, 1854, 4).

In *The Substitution of Similars* (1869) the laws of thought were considerably simplified. If they were six in *Pure Logic*[35], in *The Substitution of Similars* they were reduced to three: law of identity, law of non-contradiction, law of duality (Jevons, 1890, 111). These are nothing but the fundamental precepts of Aristotelian logic, since the law of duality is the law of the excluded middle. Jevons certainly was a harsh critic of Aristotelian logic[36]. Oddly enough, though, he relied on Aristotle for the definition of his fundamental logical and mental laws. Jevons took these norms from the field of logic and made them enter the mental sphere.

Logical psychologism in the Principles of Science

The texts here analysed were completed while Jevons was writing the *Principles*[37]. They account for a development which took place during the

[35] In order: law of sameness, law of simplicity, law of same parts and wholes, law of unity, law of contradiction, law of duality (see Jevons, 1890, 39).

[36] George Robertson insisted on this feature in his review of the *Principles* (see G. Robertson, 1876 [in Wood, 1988, Vol. I] 12-13).

[37] The journals and letters of Jevons cast a considerable light on the composition of the *Principles*, corroborating this statement. On 4th December 1866 he wrote in his journal that he intended to collect his thought about logic in a comprehensive work (see Jevons, 1972-1981, Vol. I, 208-209). *Pure Logic* was composed some years before, since Jevons wrote to his brother that he had already finished it in 1863 (see Jevons, 1972-

composition of Jevons's great work. The psychological foundations of the laws of thought and logic were no longer questioned in the *Principles*. In that work, Jevons was also more explicit concerning the psychological features of logical reasoning. He analysed the mental powers involved in the acquisition of knowledge *before* focusing on the logical laws. Such laws were then deduced from these powers. Certainly this change of order in his argument could derive from the subject matter of the *Principles*. The work was concerned with the whole of scientific knowledge, rather than logic alone. A larger inquiry on the possibilities of mind could have seemed more appropriate. Nonetheless, the fact that science and logic were there explicitly derived from mental powers is revealing of Jevons's psychologistic standpoint.

In the *Principles*, Jevons only focused on those powers which were involved in the acquisition of scientific knowledge. In order to identify them, he relied on Alexander Bain's theory (Jevons, [1874] 1877, 4). According to Bain, there were three laws of that sort: the power of discrimination, the power of detecting identity, the power of retention. In this account, the power of discrimination was at the basis of every sensory perception. There would be no sensation without the capacity of discriminating an object from the context in which it is situated.

However, Jevons was very clear in attributing such a power to the lowest level of knowledge. As he stated, "we are always engaged in discrimination; and the rudiment of thought which exists in the lower animals probably consists in their power of feeling difference and being agitated by it" (Jevons, [1874] 1877, 4). This power was shared by human beings as well as by other

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1981, Vol. III, 48). He was very engaged in logical studies during his first years in Manchester, as his works on the logical machine showed (see the letter the Herbert, 23rd June 1868, in Jevons, 1972-1981, Vol. III, 185). He then explained to Alexander Macmillan his plan for the publication of the *Principles*, on 13th September 1872, adding that he had more than three hundred pages ready for press (Jevons, 1972-1981, Vol. III, 249). Given this background, it is possible to argue that the composition of the *Principles* took nearly ten years, notwithstanding the uncertainty of its precise starting point.

animals. But science was no matter of simple discrimination. Science wouldn't be born without the power of identification, namely of detecting the similarities where no similarity was at first seen. In Jevons's view, identification was the main feature of the *intellect*. The very term 'intellect' was related, explained Jevons, with the Latin *intelligo*, or the Greek *legein*, both meaning 'gathering together' (Jevons, [1874] 1877, 5). The three fundamental laws of logic were expressions of these mental powers, completing the foundation of logic on psychology (Jevons, [1874] 1877, 5). Although these arguments had already been made in 1869, in the *Principles* some interesting details were added. Jevons was strongly drawn towards Herbert Spencer's thought. He accepted Spencer's depiction of logic as an objective science (Jevons, [1874] 1877, 4 and 7) – a science emerging in the course of evolution. Spencer's views well-suited Jevons's perspective, as I shall argue in the next chapter. Spencer's evolutionism provided Jevons with a tool for explaining the development of science and logic. In Jevons's account, a high power of discrimination was a mark of *superior* creatures alone. What he called the 'lower animals' were lost among sensory impressions, incapable of discerning their similarities. From this point of view, the intellect is the result of a higher stage of evolution.

Such an idea was also mirrored in another passage of the *Principles*, where Jevons defined logical terms. In his own words, "the simplest and most palpable meaning which can belong to a term consists of some single material object, such as Westminster Abbey, Stonehenge, the Sun, Sirius, &c." (Jevons, [1874] 1877, 24). This definition was considered to be consistent with the powers of the mind. Concrete and simple things must be the first objects of human mind, in its early stages of development. Moreover, at those stages, humans were comparable to other animals, since Jevons argued as follows:

> The dog can recognise his master among a hundred other persons, and animals of much lower intelligence know and discriminate their haunts. In all such acts there is judgment concerning the likeness of physical objects, but there is little or no power of analysing each object and regarding it as a group of qualities (Jevons, [1874] 1877, 24).

Human beings were certainly not confined to the same stage as animals of so-called lower intelligence. Growing up, they entered "the dignity of intellect" (Jevons, [1874] 1877, 24). They acquired the power of logic discrimination and abstraction (see Jevons, [1874] 1877, 24-25). Hence, Jevons did not only consider the laws of logic as founded in the mental powers. He also depicted those powers as embedded in an evolutionary process, in accordance with Spencer's view (Jevons, [1874] 1877, 7).

A simple, natural logic, and its opponents

In Jevons's view, logic proceeded from the laws of thought. However, it was distinct from them. Logic had its own laws, like the principle of substitution (Jevons, [1874] 1877, 17)[38] or the rules of symbolic expression (Jevons, [1874] 1877, 32-35). Logic had a peculiar role in Jevons's eyes. While it was founded in the laws of thought, it involved some additional principles, which guaranteed the rigour of its assertions. Owing to these features, logic had the task of *correcting* the ordinary reasoning processes. Therefore its simplicity was essential. In this regard, Jevons strongly criticized Boole's system, which in his opinion was anything but simple and natural (see Jevons, 1890, 66-68, 76-77, 147-148). Such a task was very clearly expressed in *The Substitution of Similars* (Jevons, 1890, 109-110).

As Jevons explained there, a logical system had to be simple, so that a student could learn a few simple rules, and easily apply them to a multitude of cases:

> The logical student need only acquire a thorough comprehension of the principle of substitution and the very primary laws of thought, in order to be able to analyse any argument and develop any form of reasoning which is possible (Jevons, 1890, 109)[39].

[38] According to this principle, two similar elements can be substituted in a logical inference without changing the meaning of the inference itself.

[39] This sentence was meant to criticize the complexity of Aristotle's syllogism.

Logical rules had to be few in number, and simple in character in order to be internalised and applied (Jevons, 1890, 109-110)[40].

Logic should not be confined to school desks. "The most unfortunate feature of the long history of our present traditional logic has been the divorce existing between the logic of the schools and the logic of common life" (Jevons, 1890, 120), argued Jevons. This separation had engendered the view that logic was of no help in discovering new truths. In this case, as well as in many others, the object of Jevons's criticism was John Stuart Mill. According to Mill, our knowledge came entirely from experience (see, for instance, Mill, [1840] 1969, 125)[41]. Therefore, every general truth had been previously derived by observation: "a general truth is but an aggregate of particular truths; a comprehensive expression, by which an indefinite number of individual facts are affirmed or denied at once" (Mill, [1843] 1974, Vol. VII, 186). General propositions were nothing but a mere *compendium*, an aid to memory (see Mill, [1843] 1974, Vol. VII, 186). For Mill the reasoning from general to particular, namely deduction, was subordinate with respect to induction (see Mill, [1843] 1974, Vol. VII, 162-163). Instead, "all inference is from particular to particular" (Mill, [1843] 1974, Vol. VII, 193).

Although Jevons agreed with Mill concerning the empirical nature of knowledge[42], he could not accept Mill's lessening of deduction. Stating the

[40] Here we read: "once we lay down the primary laws of thought, and employ them by means of the principle of substitution, we find that an unlimited system of forms of indirect reasoning develops itself spontaneously".

[41] Here we read: "There is no knowledge *a priori*; no truths cognizable by the mind's inward light, and grounded on intuitive evidence. Sensation, and the mind's consciousness of its own acts, are not only the exclusive sources, but the sole materials of our knowledge". On this topic, see Macleod, Miller 2017, chap. 12.

[42] Jevons stated that neither deduction nor induction could add something fresh to our knowledge. They only unfold our previous notions (see Jevons, [1874] 1877, 118; a similar thought is expressed in Jevons, [1874] 1877, 12, where Jevons argued that all knowledge was inductive because it originated from experience, even if deduction was required for reasoning to be fully developed.

primacy of induction over deduction, Mill incurred two errors in Jevons's opinion. First, Mill's position was inconsistent. He argued that, when we reason, we move from particular to particular, unless that he didn't elucidate *how* the passage from particular to particular took place (Jevons, [1874] 1877, 227). As a matter of fact, this lack of explanation was due to the inconsistency of his thesis, for, as George Boole had already argued in *The Laws of Thought*, inductive reasoning involved the use of general truths (Boole, 1854, 403-404). Second, the primacy of induction implied that deduction had no place in the natural reasoning, creating a gulf between logic and ordinary thought. In Jevons's view this was unacceptable. Logic was founded in the laws of thought: how could it be unnatural? Hence, "a prime object of any logical reform should be to reconcile the strict doctrine with the looser forms of ordinary thought" (Jevons, 1890, 121).

A logic caught between 'is' and 'ought'

Logic was meant to correct the imprecisions of common reasoning, and it was able to do this only because it was natural itself. And yet in what sense was it *natural*? Had Jevons's logic a *descriptive* or a *prescriptive* nature? Thus, Jevons put us in front of a dilemma which was deeply rooted in his thought: the tension between *is* and *ought*, or description and prescription. Indeed its foundation in mental processes suggested that logic provided a description of some mental mechanisms. From this point of view, the laws of thought could be included among the *laws of nature*. They governed human thought – and human beings are a part of nature after all. In Jevons's own words:

> The Laws of Thought are the first and most important of all the laws which govern the combinations of phenomena, and, though they be binding on the mind, they may also be regarded as verified in the external world (Jevons, [1874] 1877, 173).

Language, thought and things were three separate, but still analogous series (see Jevons, [1874] 1877, 8-9)[43]. The laws of thought were both laws of thought *and* of things (Jevons, [1874] 1877, 8)[44]. However, if the laws of logic and of thought were the same thing, logic could only describe the natural chain of reasoning. The laws of thought would be natural laws, so that they wouldn't be true nor false: they would simply *be*. The matter was more complex though, because this was only one side of the coin. Jevons explicitly addressed this problem in *The Principles of Science*, writing as follows:

> Logicians, indeed, appear to me to have paid insufficient attention to the fact that mistakes in reasoning are always possible, and of not unfrequent occurrence. The Laws of Thought are often called necessary laws, that is, laws which cannot but be obeyed. Yet as a matter of fact, who is there that does not often fail to obey them? They are the laws which the mind ought to obey rather than what it always does obey (Jevons, [1874] 1877, 7).

A similar problem had already been addressed by John Stuart Mill in the *Introduction* to his *System of Logic* (1843). Despite Jevons's dislike of Mill, their position concerning the nature of the laws of logic were very similar. In his *Logic* Mill supported bishop Whately's assertion, according to which logic was the science as well as the art of reasoning: "meaning by the former term, the analysis of the mental process which takes place whenever we reason, and by the latter, the rules, grounded on that analysis, for conducting the process correctly" (Mill, [1843] 1974, Vol. VII, 4). Mill provided a further explanation in *An Examination of Sir William Hamilton's Philosophy*:

> Logic is not the theory of Thought as Thought, but of valid Thought; not of thinking, but of correct thinking. It is not a Science distinct from,

[43] This passage had been briefly discussed by Bert Mosselmans (Mosselmans, 2007, 39-40). I shall further analyse this passage while treating the topic of Jevons's art of combinations, as well as in the last chapter.

[44] It is worth mentioning that, with this statement, Jevons provided an answer to the problem exposed in *Pure Logic*, namely the problem of the relation between things and names, thought and logic.

> and coordinate with, Psychology. So far as it is a science at all, it is a part, or branch, of Psychology; differing from it, on the one hand as a part differs from the whole, and on the other, as an Art differs from a Science (Mill, [1865] 1979, Vol. IX, 359).

Jevons endorsed this position: indeed, he considered logic as a branch of psychology as well as a set of rules for correct reasoning. However, Jevons's own theory hid a relevant ambiguity. He stated that the laws of thought – the law of identity, contradiction and duality – were laws of thought as well as of things. As such, they were laws of nature, regulating the order of phenomena. These laws, inasmuch as they were natural laws, must be *necessary*. Yet they *are* violated, as we are often mistaken in our reasonings[45]. How then could the laws of thought be natural laws?

Furthermore, this problem couldn't be solved by Mill's distinction between the science and the art of reasoning. On the contrary, such a distinction only worsens it. Jevons stated that the laws of identity, contradiction and duality were both laws of thought and laws of logic. Thus, Jevons implied that the same laws at once could and could not be violated. On the one hand, *qua* laws of thought, they were natural and therefore necessary. On the other, *qua* laws of logic, they were prescriptive rules and therefore may or may not be followed. After identifying the laws of thought and the logical principles, Jevons could not account for reasoning errors anymore[46]. How could these errors

[45] George Boole was far more sensitive to this problem than Jevons. See. for example, Boole, 1854, 22-23 and 408-410.

[46] Bert Mosselmans had the merit of highlighting this topic in Jevons's logic. However, he didn't focus on the tension between description and prescription. In fact, he noticed that "Jevons seems to defend Descartes' (1637) view that everyone possesses the same faculty of reasoning, but not everyone always makes proper use of it" (Mosselmans, 2007, 40). The impossibility of accounting for these errors persisted though, being shared by Descartes. Afterwards, Mosselmans argued as follows: "as mistakes in reasoning are always possible, our thoughts cannot be the criterion of truth, and the laws of thought govern the 'events of objective nature'". Nonetheless, he didn't address the problem of how these mistakes could be possible. Moreover, if the

emerge if the laws of thought were necessary? Moreover, how could these mistakes be acknowledged, if the laws which stated them and the laws which should correct them were the same? Thus, these ambiguities were unavoidable, since in Jevons's theory these laws were at once descriptive and prescriptive.

Similar positions would be criticized by the antipsychologists, such as Frege and Husserl[47]. However, the psychological foundation of Jevons's logic could not be reduced to a simple inconsistency. It had a relevant role in his thought. As argued above, logic gained its evidence thanks to its relationship with the laws of thought. Logic also enabled to correct ordinary reasoning, since it was a natural habit. Consequently, logic could become the common ground where every branch of knowledge meets – providing for the unity of knowledge. The alleged evidence of mental process was Jevons's way to safeguard the task of knowing.

1.3. As in a mirror

In Jevons's eyes, the edifice of knowledge had its foundation in the laws of thought and logic. He was confident of the progress of science. Notwithstanding this, he was also aware of its limits. In the following section, I explore the limitations of human intellect in relation to the ontological difference between the human and the divine mind. Such inquiry casts new light on Jevons's conception of the theory of probability.

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laws of thought govern nature, they *must be* a criterion of truth, having thus a prescriptive nature. Therefore, the topic could not be treated without consideration of the relation between prescription and description.

[47] For those critics, see Centrone, 2013. I am indebted to Davide E. Quadrellaro for this reference as well as for his help in thinking through the problem of logical psychologism.

A finite intellect in an infinite universe

Throughout the *Principles of Science*, he constantly highlighted the limitations of scientific knowledge, focusing on this topic both in the preface and in the conclusion. As we read in the *Preface to the First Edition*:

> The value of science is of course very high, while the conclusions are kept well within the limits of the data on which they are founded, but it is pointed out that our experience is of the most limited character compared with what there is to learn, while our mental powers seem to fall infinitely short of the task of comprehending and explaining fully the nature of any one object (Jevons, [1874] 1877, XXXI-XXXII).

The human mind was finite, limited. But if human knowledge was finite, the universe was infinite. Consequently, human knowledge would never have a complete grasp on the universe. That was why Jevons wrote that "all sciences are and will ever remain in their infancy, relatively to the extent and complexity of the universe which they undertake to investigate" (Jevons, [1874] 1877, 238).

Because of these limitations, our statements concerning nature were – and were always meant to be – only probable[48]. Although this point has already attracted the attention of many scholars (see Hutchison, 1982, 374-376; MacLennan, 1972, 61 especially; Aldrich, 1987, 235-236; Schabas, 1984, 136), I would like to stress its *religious* character. In Jevons's opinion, humans were finite beings in an infinite universe. However, an infinite universe could not be the creation of a finite being. Its creator must therefore have an infinite intellect. As stated above, Jevons had no intention of questioning the existence of such a creator. On the contrary, he struggled to bridge the gap between religion and science. Hence, to him, the finiteness of the human intellect had a religious meaning, not only an epistemological one. Humans, *qua* creatures, had a finite intellect; God, *qua* Creator, had an infinite one. This ontological gulf between

[48] This statement recurs in the *Principles*. For a clear expression of it, see Jevons, [1874] 1877, 235.

the creature and the Creator, between finite and infinite, set some boundaries to scientific investigation.

In the concluding chapter of the *Principles*, Jevons referred to this infinite intellect and His peculiar ways of knowing. Such infinite understanding contrasted the finite one of humans. In this account, humans were only able to make inferences as far as they had enough information about the past. Their inferences also had to assume a continuity through the course of nature. However, since intervention from unknown variables was always possible, every conclusion was only hypothetical. By contrast, "to the view of perfect intelligence nothing is uncertain" (Jevons, [1874] 1877, 739). Our efforts in scientific inquiry approached this perfect power of understanding, but, "nevertheless, as Laplace with profound wisdom adds, we must ever remain at an infinite distance from the goal of our aspirations" (Jevons, [1874] 1877, 739). Thus, the tension between finite and infinite was necessary, as it depended on an ontological determination of human beings.

Humans would never see nature clearly; they would never grasp it all at once in all respects. They would always see it "as in a mirror", in Paul's words (Corinthians 1, 13:12). Such a limitation had already been noted by John Herschel, a scientist whom Jevons admired. In *A Preliminary Discourse on the Study of Natural Philosophy* Herschel had depicted the human being as "*a being darkly wise*" (Herschel, [1830] 2009, 6). This expression was drawn from Alexander Pope (Pope, [1733-1734] 2006, Epistle II, 281), echoing at the same time Paul's first letter to the Corinthians. By means of it, Herschel stressed our limited powers in scientific inquiry as well as our strengths. Human intellect might be dimmed, but it was nonetheless wise.

An unexpected Butlerian

Herschel's exposition could certainly have had an influence on Jevons. Moreover, Jevons's account displayed a strong affinity with a famous treatise of Bishop Butler, *The Analogy of Religion to the Constitution and Course of Nature*. The purpose of Butler's work was to compare nature with the Scrip-

tures and to highlight their similarities. Consequently, the analogies between the two of them were for Butler a sign that they had the same maker, proving thus the divine authorship of the Scriptures (Butler, [1736] 1867, XXVII). In Butler's account, analogical reasoning depended on our past experience, since observed instances were the basis for conclusions of a more general character. Thus, we extend our conclusions from some cases to other similar cases. However, our conclusions could always be contradicted by future observations. That is why for Butler our reasoning wasn't certain, but only probable:

> Probable evidence, in its very nature, affords but an imperfect kind of information, and is to be considered as relative only to beings of limited capacities. For nothing which is the possible object of knowledge, whether past, present, or future, can be probable to an infinite Intelligence; since it cannot but be discerned absolutely as it is in itself, certainly true, or certainly false. But to us, probability is the very guide of life (Butler, [1736] 1867, XXVI).

The similarity with Jevons's account is remarkable. Indeed, Jevons himself referred to the last sentence of this quotation (see Jevons, [1874] 1877, 197). Butler's argument pointed to the difference between a finite and an infinite intellect. Jevons also held that the probability was a meaningful concept only for a finite mind. He argued thus as follows:

> It is impossible to expound the methods of induction in a sound manner, without resting them upon the theory of probability. Perfect knowledge alone can give certainty, and in nature perfect knowledge would be infinite knowledge, which is clearly beyond our capacities (Jevons, [1874] 1877, 197).

Finite knowledge "admits of degrees", as Butler wrote (Butler, [1736] 1867, XXIV). In the same way, probability was to Jevons the way of estimating the degree of our knowledge, that is, measuring the quantity of knowledge that we possessed (Jevons, [1874] 1877, 198-199).

Jevons's ideas on probability were certainly not exclusively indebted to Butler, as the references to many other authors prove. Yet Jevons's stress on the limitations of the human mind must have brought to a reader's mind the

theses of Butler. Jevons's closeness to Butler was in fact highlighted by Gladstone in the above mentioned letter concerning the conclusions of the *Principles*: "I hope you will not be shocked if I designate it by an epithet which to my mind conveys the highest commendation: it seems to me eminently *Butlerian*" (Jevons, 1972-1981, Vol. IV, 38)[49].

To Jevons this adjective could have sounded bizarre indeed. Butler was highly renowned in the nineteenth century, but mostly in the first part of the century – and mostly among Evangelicals. Evangelicals were attracted by Butler's theory of reward and punishment, by his doctrine of atonement, by his view of human baseness. For the very same reasons Unitarians were unwilling to attach the epithet of 'Butlerian' to themselves (see Hilton, 1988, 174-189). That is probably why Gladstone thought that such an epithet would have astonished Jevons. Given this background, the quotations from Butler in the *Principles* turn out to be even more interesting. By referring to the Butlerian conception of probability, Jevons recalled an author whose popularity was steadily declining in the second half of the nineteenth century. But his appreciation of Butler was even more peculiar, considering his Unitarian background.

The method of inverse probability

Jevons stressed the wisdom as well as the darkness of the human intellect. For example, he noticed that it couldn't help considering objects in temporal succession:

> The limited power of our minds prevents our grasping many ideas at once […]. All life proceeds in the succession of time, and we are obliged to write, speak, or even think of things and their qualities one after the other (Jevons, [1874] 1877, 33).

On the contrary, a perfect understanding would grasp things as they are, *simultaneously* (Jevons, [1874] 1877, 34). Moreover, in Jevons's opinion our intel-

[49] Gladstone admired Butler's work, so much so that Boyd Hilton called him "the last Butlerian"; see Hilton, 1988.

lect was directed towards this perfection, since "compared with the brutes we do possess some slight approximation to such power" (Jevons, [1874] 1877, 34). Jevons thus expressed his commitment to Spencer's evolutionism, according to which intellectual faculties resulted from the evolutionary process, as I shall explain in the next chapter.

Notwithstanding this increasing perfection of human intellect, in Jevons's eyes human beings were still deficient in many ways. For instance, they tended to simplify observed natural phenomena. As he stated, "simplicity is naturally agreeable to a mind of limited powers, but to an infinite mind all things are simple" (Jevons, [1874] 1877, 625). These limitations were particularly relevant while undertaking an *inductive* study. According to Jevons's definition, induction was nothing but the inverse of deduction (Jevons, [1874] 1877, 12, 121-122, and chap. 7). Deduction drew the consequences from some premises, whereas induction had to infer the premises from the consequences.

Induction was founded in a religious perspective, since it was described as an investigation of God's hand in nature: "given events obeying certain unknown laws, we have to discover the laws obeyed. […] We have to interpret the will by which the conditions of creation were laid down" (Jevons, [1874] 1877, 122). Thus, trying to outline the laws of nature, the scientist was really determining the conditions that God had impressed on the world. In Jevons's own words, "the laws of nature are the invaluable secrets which God has hidden, and it is the kingly prerogative of the philosopher to search them out by industry and sagacity" (Jevons, [1874] 1877, 126).

As for the method to use in such an investigation, Jevons relied on Laplace and De Morgan, that is, on the so-called method of the inverse probability[50]. The direct method of probability stated that it was possible to calculate the probability that an event would happen from the probabilities of a given set of premises. But according to these authors the contrary was also possible. The

[50] For an analysis of Jevons's formulation of inverse probability see: Strong, 1976, where the topic is exposed in close relation to De Morgan and Boole; Aldrich, 1987, 236-238.

method of inverse probability was an attempt to calculate the probability that a given event would have been the result of one cause or another (see De Morgan, [1838] 1841, V-VI). De Morgan expressed the problem of inverse probability as follows: "an event has happened, such as might have arisen from different causes: what is the probability that any one specified cause did produce the event, to the exclusion of the other causes?" (De Morgan, [1838] 1841, 53). As Jevons explained, Laplace thought that the probability of an event being triggered by a certain cause was proportional to the probability that the cause had to produce this event. "In other words", continued Jevons, "the most probable cause of an event which has happened is that which would most probably lead to the event supposing the cause to exist" (Jevons, [1874] 1877, 243).

The problem with the method of the inverse probability was that one had to take into account every possible cause of the given event. For instance, let us suppose that we want to find out the cause of an event and there are only three possible causes, C_1, C_2 and C_3. Each would have a certain probability of being the actual cause. Let us then attach the probability p_1, p_2 and p_3 respectively to C_1, C_2 and C_3. Thus, the probability of C_1 being the cause of the observed event would be:

$$\frac{p_1}{p_1 + p_2 + p_3}$$

According to the formula, the probability of a cause being the actual one could be found by dividing its own probability by the sum of the probabilities of all the possible causes. In Jevons's view this system was essential to a correct understanding of induction. As such, for him the theory of probability was a guide to life indeed – the noblest product of the intellect, so that "to eulogise the theory ought to be as needless as to eulogise reason itself" (Jevons, [1874] 1877, 200)[51].

[51] The sentence also involved a criticism of Mill's method and his lack of interest for probability; on this subject matter, see Strong, 1976, especially 199-200 and 204.

In illustrating the application of this method, Jevons recalled Poisson's example of the ballot-box. According to this example, each possible cause of one event was represented by a ballot-box, containing an equal number of black and white balls (Jevons, [1874] 1877, 244). This was a quite popular image. It was used extensively by De Morgan in his *Essay on Probabilities* (see De Morgan, [1838] 1841, chap. 3). However, De Morgan's use of the urn example and Jevons's differed with respect to a substantial point. De Morgan only used it to exemplify practical instances. Jevons, by contrast, followed Laplace in comparing the universe itself to an infinite ballot-box. As we read in the *Principles*:

> In order that our solution may apply to natural phenomena, we must render our hypotheses as little arbitrary as possible. Having no *à priori* knowledge of the conditions of the phenomena in question, there is no limit to the variety of hypotheses which might be suggested. Mathematicians have therefore had recourse to the most extensive suppositions which can be made, namely, that the ballot-box contains an infinite number of balls (Jevons, [1874] 1877, 255).

In Jevons's account, De Morgan's example became a metaphor for the world.

As Strong has pointed out in his paper on inverse probability, Laplace was forced to assume that the urn contained an infinite number of balls. This assumption prevented him from sketching an exhaustive list of every possible cause of a given event. Such a list would simply be inconceivable. Consequently, "instead of trying to eliminate all but a finite number of candidates at the outset […], we incorporate all the possibilities, assuming *a priori* that each is equiprobable", as Strong has explained (Strong, 1976, 204)[52]. George Boole had not failed to notice the fallacy in this reasoning: in a condition of ignorance, we had no possible basis in attributing an equal probability to each possible cause (see Boole, 1854, 201-205). Jevons was familiar with Boole's criticism but nonetheless rejected it. In his opinion, Laplace's model was in some degree arbitrary, but still more appropriate than any other (Jevons, [1874] 1877, 256-257).

[52] For this argument in Boole's text, see Boole, 1854, 368-375.

Jevons had a particular interest in preserving Laplace's suggestion. Both Jevons and De Morgan recognized some potential in this kind of scientific investigation, and, according to Strong, they opened the way for future research (see Strong, 1976, 205-206). Additionally, Laplace's metaphor was perfect to represent the condition of a darkly wise being. As stated above, the human being was a finite creature facing an infinite universe. Accordingly, in the ballot-box's image the number of balls had to be infinite. This would account for the darkness surrounding human understanding. Notwithstanding their limitations, humans could find a guiding light in their reasoning powers, for example in the theory of probability.

For the most part, inductive reasoning would deal with an infinite number of objects. That was what Jevons called "imperfect induction", in opposition to the perfect induction (see Jevons, [1874] 1877, 146). Jevons was very attentive to this distinction and to the limitation it implies:

> There is no fact which I shall more constantly keep before the reader's mind in the following pages than that the results of imperfect induction, however well authenticated and verified, are never more than probable. We never can be sure that the future will be as the present. We hang ever upon the will of the Creator: and it is only so far as He has created two things alike, or maintains the framework of the world unchanged from moment to moment, that our most careful inferences can be fulfilled (Jevons, [1874] 1877, 149).

We remained at the mercy of God, as Jevons remarked, consistent with his Catastrophist allegiance. And even supposing that the universe would remain unchanged, our inferences would always be uncertain because we were ignorant of the universe as a whole (see Jevons, [1874] 1877, 150).

It was while addressing the problem of imperfect induction that Jevons first introduced the ballot-box's metaphor:

> Nature is to us like an infinite ballot-box, the contents of which are being continually drawn, ball after ball, and exhibited to us. Science is but the careful observation of the succession in which balls of various character present themselves (Jevons, [1874] 1877, 150).

The drawn balls stood thus for the past events. Our predictions had to rely on the observed combinations of phenomena. Jevons seemed then to suggest that we only had knowledge of the actual observed cases – *i.e.* the drawn balls:

> No finite number of casual drawings can give us sure knowledge of the contents of the box, so that, even in the absence of all disturbance, our inferences are merely the best which can be made, and do not approach to infallibility (Jevons, [1874] 1877, 765).

The ballot-box itself remained unfathomable. Human beings would always see nature as in mirror, and never clearly.

1.4. The laws of nature

Jevons struggled to show that human knowledge was probabilistic. Sometimes the probability of a hypothesis is so high that the hypothesis's truth seems to be any reasonable doubt (see Jevons, [1874] 1877, 251). Yet, our inquiry concerning the laws of nature would never reach absolute certainty. However, Jevons's account arises a question: how can we be sure of the *very existence* of these laws? If we are ignorant of the ballot-box's inner structure, *a priori* we would not be allowed to assert the existence of any law at all. We could not draw such a conclusion on the basis of actual observed events exclusively. In this section I will analyse Jevons's conception of the laws of nature and show its relationship with Jevons's religious beliefs, paying particular attention to the connections with the tradition of natural theology.

Empirical laws

In his study of Jevons's conception of economic laws, Michael White has pointed out that Jevons depicted the laws of nature as "a set of observation statements or propositions devoid of theoretical content in that they identified

factual sequences of events" (White, 1989, 428)[53]. To a certain extent Jevons did consider the laws of nature as inessential connections of facts, namely recurrences merely connecting the drawn balls. He could infer this as he identified the notions of causality and correlation[54]. However, Jevons's arguments suggested that the laws of nature were not mere inessential connections of facts, but had a strong causal meaning. For example, while considering combinations of phenomena, he wrote as follows:

> The most superficial observation shows that some things are constantly associated with other things. The more mature our examination, then more we become convinced that each event depends upon the prior occurrence of some other series of events. Action and reaction are gradually discovered to underlie the whole scene, and an independent or casual occurrence does not exist except in appearance. Even dice as they fall are surely determined in their course by prior conditions and fixed laws (Jevons, [1874] 1877, 174).

Jevons had a deterministic view of the universe. In his mind, even those happenings which most certainly looked fortuitous were in fact regulated by laws.

In several cases Jevons warned the reader against the temptation of attributing any flaws to these laws. Chance had no place in his conception of nature, and the laws of nature did not admit exceptions. He suggested that when confronted by any allegedly chance event, "everyone sees, after a little reflection, that it is in our knowledge the deficiency lies, not in the certainty of nature's laws" (Jevons, [1874] 1877, 198). Accordingly, on Jevons's account, probability measured the quantity of *our subjective* knowledge, as De Morgan and others held (see Jevons, [1874] 1877, 198-199)[55]. In the laws of nature there was no flaw: they were exact. On this Jevons was positive. For example, he took

[53] For Jevons's depiction of the natural laws as mere sequences of facts, see notably the first section of White's paper (White, 1989, 426-431).

[54] On this subject matter, see: MacLennan, 1972, 60, for a criticism; Peart, 1996, 209, where the author defended Jevons from the criticism on this point.

[55] In these pages Jevons referred to many authors who held the idea that probability measured the quantity of our knowledge. However, his main point of reference in this regard must have been De Morgan, given their personal acquaintance.

correlations of natural phenomena to be mathematically expressable. The scientist's purpose was then to "discover the mathematical equation or law connecting a quantitative cause with its quantitative effect" (Jevons, [1874] 1877, 335)[56]. As we know, however precise our measurements may be, we could never be certain of our conclusions. And still, as he stated, "it would be a great mistake to suppose that there is any inexactness in the laws of nature" (Jevons, [1874] 1877, 462).

Before developing this argument, a clarification is needed. By saying that Jevons envisioned the existence of exact natural laws, I do not mean to discard his probabilistic view. Even the most established of our laws were only probable: "the law of gravitation itself is only probably true" (Jevons, [1874] 1877, 259), as Jevons stated. The point is that Jevons was convinced of the existence of natural laws themselves – a belief which he wasn't willing to consider as merely probable. He was sure that nature was regulated by necessary laws. The laws of nature really existed, but they belonged in the box: if the scientist could not grasp them, it was because of human deficiency. In Jevons's own words, "there is no infallible mode of arriving at the absolute truth, which lies beyond the reach of human intellect, and can only be the distant object of our long-continued and painful approximations" (Jevons, [1874] 1877, 358).

On the one hand, White was certainly right in stating that Jevons considered laws as mere correlations of events. On the other hand, Jevons's deterministic view of nature entailed a stronger account of causality. Eventually, in his opinion the known scientific laws were factual statements *because of human's finiteness*. Had we an infinite understanding, we could discover the true laws of nature. It means that the laws of nature could be seen from two different points of view: in themselves, they were exact and flawless, binding natural phenomena in a necessary causal chain; from the perspective of scientific inquiry,

[56] For other instances of this assumption, see Jevons, (1874) 1877, 483 and 625.

though, they were mere correlations of observed events, since this was as far as the human intellect could go[57].

This idea was apparent in some passages of the *Principles*. Above all, this is the case of the section on quantitative induction, especially in relation to the concept of empirical law (Jevons, [1874] 1877, 483-503). An empirical law or formula was in Jevons's account a mathematical equation consistent with our data (Jevons, [1874] 1877, 487). Given a table displaying the values according to the variant and the variable, we could formulate a mathematical relation yielding numbers in agreement with the table. The mentioned mathematical function would be of this type, being thus a parabola:

$$y = \mathrm{A} + \mathrm{B}x + \mathrm{C}x^2$$

We can use several methods to find these formulas, like interpolation and extrapolation (Jevons, [1874] 1877, 495-499). By means of these techniques, we can find the formula best suited to the data.

However, these empirical laws did not correspond with the actual laws of nature. They had a practical validity and were exclusively related to the data of the given table. According to Jevons's own account, our knowledge was restricted to observed events, or the drawn balls. Consequently, *every* law we state should be an empirical one. As Jevons wrote, "these empirical formulae do not coincide with natural laws. They are only *approximations* to the results of natural laws" (Jevons, [1874] 1877, 489, emphasis added). Jevons implied thus that there were objective laws to which we can increasingly approach, but never grasp. We might even have guessed what the true law of nature was, except that we would never be sure that *it really was* the true law. Some empirical

[57] Consequently, I have no intention of discarding White's view on this subject matter. I think, however, that it is incomplete. As a matter of fact, in the mentioned paper (M. White, 1989) White has only considered what Jevons stated concerning our way of depicting natural laws. White has not taken into account Jevons's descriptions of nature *per se*, independently of the human possibility of knowing it.

laws provide exceedingly precise results, so that "there is a presumption in favour of its being the true function, although there is no certainty whatever in the matter" (Jevons, [1874] 1877, 490). Since we could only state probable laws, no function could be called 'true'. Hence, Jevons expressed himself as if in nature itself there were mathematical laws regulating phenomena but never disclosing themselves to our gaze.

This idea was also suggested in the section concerning the mathematical principles of approximation (Jevons, [1874] 1877, 471-475). Jevons argued there that the mathematical expressions of physical laws were in a state of progressive approximation. As he explained, "it is a general rule in quantitative investigation that we commence by discovering linear, and afterwards proceed to elliptic or more complicated laws of variation" (Jevons, [1874] 1877, 474). At first a mathematical formula expressing a physical law would be of this type:

$$y = \mathrm{A} + \mathrm{B}x$$

This is the formula of a straight line. In Jevons's opinion our quantitative investigations supposed at first a uniform, linear movement. But then, using more sophisticated tools of measurement, "it will probably be found that this uniformity of motion is only apparent, and that there exists some acceleration or retardation" (Jevons, [1874] 1877, 473). Consequently, the mentioned formula would admit other terms, like $\mathrm{C}x^2$, $\mathrm{D}x^3$ and so on. Thus, we proceeded then from a linear relation to a curve, and to a curve of higher degree. This was a process of approximation. And yet, approximation *to what*? Jevons seemed to suggest that this formula would be increasingly approaching the true natural relation. Even the use of the term 'discover' prompts this interpretation: had we an infinite mind, we would *discover* the true law.

God as a guarantor

What gave Jevons the certainty that such laws existed? What justified him in excluding the assertion concerning the very existence of these laws from the realm of probability? A contemporary scientist might accept their existence as an axiom, because without this assumption no scientific inquiry would be possible. I argue nonetheless that Jevons's case was different. In order to understand his commitment to the existence of natural laws, we must recall the bridge between religion and science.

Jevons found a justification for the existence of natural laws in God. As we read in the *Preface* to the *Principles*:

> Were this indeed a Chaotic Universe, the powers of mind employed in science would be useless to us. […] Happily the Universe in which we dwell is not the result of chance, and where chance seems to work it is our own deficient faculties which prevent us from recognising the operation of Law and of Design (Jevons, [1874] 1877, 2).

Humans may not acknowledge the signs of order provided by the natural laws, but this did not mean that there weren't any. The laws of nature had been impressed on matter in the moment of its creation (Jevons, [1874] 1877, 173)[58]. Consequently, by induction "we have to interpret the *will* by which the conditions of creation were laid down" (Jevons, [1874] 1877, 122, emphasis added). The universe was created by God, so in Jevons's eye it was certainly regulated by laws. Therefore, the universe concealed, but still revealing it by some marks, the Creator's will. And the will of God could not be to create a chaotic universe, not to mention that the universe displayed the marks of design.

The language that Jevons used was hardly a neutral one. It rather recalled the arguments of natural theology. William Paley had argued that the universe showed the hand of an intelligent Creator (see Paley, [1802] 2009, 19). In Paley's view, God was the supreme Contriver of the world. This Contriver had

[58] Here it is stated that "patient and skilful examination of the records may […] disclose the laws imposed on matter at its creation".

created the universe according to a design, which showed through in nature by numerous instances[59]. As Paley had concluded,

> whenever we find a general plan pursued, yet with such variations in it, as are, in each case, required by the particular exigency of the subject to which it is applied, we possess, in such plan and such adaptation, the strongest evidence, that can be afforded, of intelligence and design (Paley, [1802] 2009, 227).

Jevons, as a Unitarian, could certainly have been inclined towards natural theology[60]. And indeed he relied on a *Dieu horloger* as a guarantor of nature's order.

However, God's design wasn't the only source of certainty for Jevons. In his own words:

> we can never recur too often to the truth that our knowledge of the laws and future events of the external world is only probable. The mind itself is quite capable of possessing certain knowledge (Jevons, [1874] 1877, 235).

In this view, if the laws of nature were beyond our reach, we nonetheless had a privileged access to our minds. Human sight may be obfuscated when enquiring nature, but it was clear when looking into the observer's own mind. Hence, we could be sure that "the fundamental laws of thought, and the rule of substitution […], are certainly true" (Jevons, [1874] 1877, 236). As stated above, for Jevons the inquirer's mind was transparent to his own scrutiny.

God guaranteed the existence and necessity of the natural laws and the laws of thought provided a foundation for human knowledge. In the array of

[59] For an example, see Paley, (1802) 2009, 20, where the author puts forward the case of fish's eye. The different shape of crystalline lenses in the eye of terrestrial animals and fish. The fish have rounder lenses than other animals, to fit the different way in which light is refracted in the water.

[60] See for example the positions of Whately or Southwood Smith, in Hilton, 1988, 53-54, 76-79; Jevons considerably appreciated Whately, as Hilton recalled (Hilton, 1988, 53).

probable statements, the laws of thought and logic were certain. Humans were darkly wise beings indeed. Jevons put forward thus a highly original synthesis of Butler and Paley[61]. On the one hand, Jevons took from Butler the probabilistic character of human knowledge. Accordingly, human understanding was darkened. On the other hand, Paley's conceptual framework secured the rationality of the universe. Humans were also wise. Jevons's position couldn't be understood without referring to the certainty as well as the uncertainty of human knowledge.

1.5. Ars combinatoria

As stated above, Jevons depicted the universe in the terms of a ballot-box. The balls would be extracted one after the other from this infinite urn, according to the laws of nature. Consequently, induction consisted in discovering the laws obeyed by natural phenomena. Induction was thus the inverse operation of deduction, and was far more complicated than the latter:

> Instead of the comparatively easy task of finding what effects will follow from a given law, the effects are now given and the law is required. We have to interpret the will by which the conditions of creation were laid down (Jevons [1874] 1877, 122).

Induction was an analytical process separating "the complex *combinations* in which natural phenomena are presented to us" (Jevons [1874] 1877, 122, emphasis added).

The ballot-box metaphor echoed thus the tradition of the *ars combinatoria*, since it suggested that nature was a series of combinations and permutations. Such a link had already been noticed by Strong, who argued that "what for Bernoulli was little more than an illustration, comes to embody the illusive vision, reaching back beyond Leibniz to Lull and Ramus, of science as *ars combinatoria*" (Strong, 1976, 206). Indeed Jevons devoted a chapter of the *Principles* to elucidating the rules of combinatorial calculus. In his turn, Jevons him-

[61] For the opposition between Butler and Paley, see Hilton, 1988, 4, 79 and 177.

self didn't fail to note the connection, quoting Leibniz and Bernoulli as sources of his own investigation. The art of combinations and permutations was then a method which enabled the scientist to orient himself among the seeming chaos of nature. As such, its scope wasn't only logical, but also ontological.

The ontological sense of Jevons's combinatorial calculus has already been noted by some scholars, notably by Strong, in the paper mentioned above, and by Mays and Henry. However, none of them has ever attempted to clarify Jevons's link with this tradition. The purpose of this section shall be therefore to compare Jevons's position with some theorists of the *ars combinatoria*. The illustration of Jevons's theory as well as the comparison with the thinkers of this tradition will show that he can be numbered among them.

I will focus on the following expositors of the *ars combinatoria*: the Kabbalist Abraham Abulafia, Ramon Llull, Francis Bacon, Giulio Camillo, John Wilkins, Gottfried Leibniz. The choice is justified, in some cases, by the fundamental role these authors had for the art's development: this is notably the case of Abulafia and Llull, without whom the very birth of an *ars combinatoria* wouldn't have been possible. Some others, like Wilkins and Bacon, took roots in the English philosophy. Their choice is motivated thus by the fact that they were important references in Jevons's education. However, Jevons was influenced by this tradition of thought much more than he himself was aware of. Consequently, the comparison is sometimes inspired by these unintentional proximities, like in the case of Giulio Camillo.

I shall first take into account two metaphors which Jevons attached to the study of combinations among natural phenomena. The first metaphor was that nature was a secret language, waiting to be deciphered. This view will be compared to the Kabbalah's account, paying a particular attention to a pre-Kabbalistic text, the *Sepher Yetzirah* (*Book of Creation*) and then to the Kabbalist Abraham Abulafia. I will then briefly examine Ramon Llull's *ars magna*. According to Jevons's second metaphor, the world was instead a labyrinth through which the scientist had to find his way. This image shall be related to Bacon's depiction of the world as a labyrinth and a forest. After that I will focus on Jevons's theory of combinations, connecting it with his logic. Then Jev-

ons's combinatorial calculus will be considered in its relations to his machines. Analysing Jevons's Logical Alphabet and Machine shall prompt a comparison with Giulio Camillo's *Idea del theatro*. Thereafter I will focus on Jevons's view of language and of signs. This topic will require a parallel with Francis Bacon's philosophy of language and John Wilkins's project of a philosophical language. Thanks to the examination of Jevons's account concerning the relation between words and things, it will be made clear the proximity of his view to Leibniz's ones.

The conclusions I have drawn from these studies are as follows. Jevons could be rightly numbered among those thinkers who contrived an *ars combinatoria*. However, Jevons's position was different from many other examples of *ars combinatoria* because he didn't believe that language had an immediate grasp on reality. The core of his art was the *order* of combinations rather than the terms involved. Therefore, the relevant aspect of his combinatorial art turned out to be its syntax. From this point of view, his theoretical construction displayed a most striking similarity with Leibniz's *characteristica*.

Additionally, the interest of pursuing such a study rests in the widening the current interpretations of Jevons's logic, following a path at which scholars have only hinted but not developed[62]. Indeed none of this work has considered Jevons's logic and philosophy of science in the light of the *ars combinatoria*. This path shows how Jevons logic could be interpreted as an ontology which was articulated as an art of combinations: the combinatorial structure of the Logical Alphabet corresponded to natural phenomena in Jevons's mind, bringing thus his logic closer to the traditional philosophical accounts of *ars combinatoria* here presented.

[62] This path has been suggested in Strong, 1976, as I have highlighted, but also Mays, Henry, 1953, especially 488. For other works concerning Jevons's logic, see: MacLennan, 1972; Schabas, 1984; 1990; Mosselmans, 2007, chap. 4. On Jevons's logic in relation to his machine, see Maas, 2005.

The hidden meaning and the labyrinth

In the *Principles* Jevons argued that

> induction is the decyphering of the hidden meaning of natural phenomena. Given the events which happen in certain definite combinations, we are required to point out the laws which govern those combinations ((Jevons [1874] 1877, 124-125).

This parallel showed that induction was a difficult task: "anyone can invent a secret language […]. But to decipher the letter, having no key to the signs adopted, is a wholly different matter" (Jevons [1874] 1877, 124). As we shall see, Jevons represented reality's structure by the means of what he called the "Logical Alphabet". In Jevons's logic the objects could be denoted by letters, and the structure of their combinations mirrored the world's own structure.

In Jevons's account, the letters of the Logical Alphabet could correspond to the events of the world, or to their qualities, as we shall see. However, the idea that we had to decipher the universe's language was ancient. Moreover, it had a long-lasting association with understanding reality as a series of combinations. This view was notably typical of the Kabbalah, according to which creation itself had been a linguistic process. The Kabbalah consisted first of all in interpreting the Scriptures. However, the Kabbalist went beyond the letter of the texts. He struggled to find, in the warp and weft of the Scriptures, the Torah preceding the creation itself. Indeed, before the writing of the sacred text, the eternal Torah conceived by God was nothing but a disordered series of letters. That was why the combinatorial art was fundamental to the Kabbalist (Eco, 1993, 30-31). The *temurah*, one of the Kabbalist techniques, is of particular interest in this regard[63]. It was the art of producing anagrams basing on the

[63] The theologian and Semitist Gershom Scholem have explained that *temurah* wasn't originally a Kabbalist technique, as it had developed in the context of German Hassidism. However, the Kabbalistic practices have been popularly attached to the following *temurah* technique, on account of their similarity; see Scholem, 1941, 99.

Names of God. The new words thus obtained displayed some of the text's hidden senses.

Abraham Abulafia, a Jewish Kabbalist and mystic born in Saragossa in 1240, developed this procedure considerably (see Idel, 1988, 19). Abulafia tried to anatomize the name of God, combining it with different letters and vocalizing it differently. This practice had mystical purposes and it was related to an ecstatic process, involving some techniques of reciting the divine names (Idel, 1988, 25-30). In Abulafia's own words: "in the thoughts of your mind combine and be purified" (Abulafia, Sitre Torah, MS. Paris, fol. 157b, as quoted in Idel, 1988, 19). The combinational procedures were described by Abulafia as follows:

> And begin by combining this name, namely, YHWH, at the beginning alone, and examine all its combinations and move it and turn it about like a wheel returning around, front and back, like a scroll, and do not let it rest, but when you see its matter strengthened because of the great motion, because of the fear of confusion of your imagination and the rolling about of your thoughts, and when you let it rest, return to it and ask [it] until there shall come to your hand a word of wisdom from it, do not abandon it (Abulafia, MS. München 408, fols. 65a-65b, also published in Sefer ha- Peli'ah, fol. 35b, as quoted in Idel, 1988, 21).

As the great Abulafia's commentator Moshe Idel has pointed out, for the Kabbalist the name of God enabled one to read the world's structure, providing him with a scientific knowledge as well as a magical power (see Idel, 1988, 19).

The linguistic character of the world was the basis of the Kabbalistic legacy. Its clearest expression is to be found in the *Sepher Yetzirah*, or *The Book of Formation*. The *Sepher Yetzirah* is a short cosmological treatise, whose conception is still uncertain but dated between the fifth and the ninth century C.E. (see Segol, 2012, 25-28). As a matter of fact, the *Sepher Yetzirah* wasn't *stricto sensu* a Kabbalistic text, as it preceded the birth of that tradition in the twelfth century southern Europe. Nevertheless, the treatise was very relevant for the

development of the Kabbalistic studies, becoming an integral part of them (see Dan, 2005, 4)[64].

According to this treatise, God created the world by the means of the ten *Sephiroth* and the twenty letters of Jewish alphabet. As we can read in the first chapter, "ten are the ineffable Sephiroth. Twenty-two are the Letters, the Foundation of all things" (Ben Joseph, 1996, 17 [I, 2])[65]. The letters were then divided in three categories to explain the creation of the elements, the planets, the months, Zodiac signs and human organs:

> The twenty-two sounds and letters are the Foundation of all things. Three mothers, seven doubles and twelve simples. The Three Mothers are Aleph, Mem and Shin, they are Air, Water and Fire. […] He hath formed, weighed, and composed with these twenty-two letters every created thing, and the form of everything which shall hereafter be (Jospeh, 1996, 18 [II, 1-2]).

Their pronunciation was then the primal cosmogonical act (Ben Joseph, 1996, 18 [II, 3])[66].

Moreover, God Himself had engaged in a combinatorial process, by pairing the letters one after the other:

> For He shewed the combination of these letters, each with the other; Aleph with all, and all with Aleph; Beth with all, and all with Beth. Thus in combining all together in pairs are produced the two hundred and thirty-one gates of knowledge (Ben Joseph, 1996, 18-19 [II, 5]).

The world itself was *alphabetical*. As the semiologist Umberto Eco has remarked, this view annihilated the distance between signifier and meaning (Eco, 1993, 37-38). In the *Sepher Yetzirah* the letters weren't the means of denoting

[64] On the *Sepher Yetzirah*, see also Dan, 2005, 15-18.

[65] The mentioned author was the alleged transcriber of the treatise, as related in Ben Joseph, 1996, 7. The notation in the parenthesis indicates the corresponding passage of the treatise, according to the chapter and verse.

[66] As we read here: "these twenty-two sounds or letters are formed by the voice, impressed on the air, and audibly modified in five places; in the throat, in the mouth, by the tongue, through the teeth, and by the lips".

the natural objects, but were themselves those objects. Hence the privileged access of the Kabbalist to reality: he was able to express the world because his language was formed by the primal constituents of reality.

The entanglement between the theory of combinations and ontology, as well as its linguistic character, was also apparent in Ramon Llull's works. Llull's defined accordingly his *ars magna* in the introduction to the *Introductoria artis demonstrativae*: "*ista ars est et logica et metaphysica*" (Llull, 1721-1742, Vol. III, 1, as quoted in Rossi, 1960, 45), namely "this art is at once logic and metaphysical". His *ars combinatoria* had thus ontological implications. In the *Libre de contemplació en Déu* (1273-1274) (*Book of God's Contemplation*) Llull explained that we could understand our material world in the light of the spiritual one, by connecting the worldly objects' qualities to God's attributes. For example, the goodness of human beings was caused by the goodness of the Creator. Thus the divine qualities were the first constituents of reality[67].

The *Book of God's Contemplation* had a great importance in Llull's elaboration of the art[68]. Here Llull found the first principles of his art in the divine attributes, which would be later called *Dignitates*. The divine Dignities were the basis of Llull's art of combinations. But these principles had to be ordered and listed for an art of combinations to be born. Llull first ordered them into multiples of four, during the so-called "Quaternary Phase", and then into multiples of three, during the "Ternary Phase", according to the distinction Anthony Bonner has marked in his edition of Llull's writings (Llull, 1985, Vol. I, 56-57). In the *Ars brevis* (1308), which was the most influential work of the Ternary Phase with the *Ars generalis ultima* (1305-1308), the divine Dignities

[67] On this topic see Rubio, 2018, 88. See also Yates, 1954, 27, where it has been shown how the worldly and celestial phenomena have been compared to elemental processes in Llull's works. See also Yates, 1982.

[68] As explained by Anthony Bonner, who edited the *Selected Works of Ramon Llull* for Princeton University Press, the *Libre de contemplació* pertained to the "Pre-Art phase" (Llull, 1985, Vol. I, 56); see also Rubio, 2018, 86.

were nine[69]. Here, in his first figure (Llull, 1986, Vol. XII, 197)[70], Llull associated nine letters, from B to K[71], to the nine divine *Dignitates*, whereas the same letters were related to nine principles in the second figure[72]. Therefore in the Ternary Phase the principles of Llull's art were eighteen. Moreover, these letters were associated to a question, a subject, a virtue, a vice (see Llull, 1985, 580-581).

Everything could be reduced to these eighteen principles. As Llull wrote while elucidating the first figure, "everything that exists is implicit in the principles of this figure, for everything is either good or great, etc. […] Therefore, whatever exists is reducible to the above-mentioned principles" (Llull, 1985, 583). If the first figure showed that everything was connected to the Dignities, the second concerned the worldly objects. It was composed of three triangles. Each triangle was connected to three principles. For example, the first one subsumed the categories of difference, concordance and contrariety. In their turn, these categories were articulated in three species. Now, putting together these categories and species one could classify every object, material or immaterial as it may be[73]. Moreover, these principles were also required to define the Dignities. As Llull wrote, "the Figure T [the second figure] serves the First Figure, for through difference one can distinguish between goodness and goodness, between goodness and greatness, etc." (see Llull, 1985, 585).

Llull's figures were deductive instruments, displaying how the combinatorial artist could represent the world through his logical language. The first figure for instance "is circular to show that any subject can become a predicate and vice versa, as when one says, 'goodness is great', 'greatness is good', and

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[69] *Bonitas*, *Magnitudo*, *Eternitas*, *Potentia*, *Sapientia*, *Voluntas*, *Virtus*, *Veritas*, *Gloria*; see Llull, 1986, Vol. XII, 197.

[70] The first figure was denoted by the letter A.

[71] The letters were nine because J was excluded.

[72] *Differentia*, *Concordantia*, *Contrarietas*, *Principium*, *Medium*, *Finis*, *Maioritas*, *Aequalitatis*, *Minoritas*; see Llull, 1986, Vol. XII, 200. The second figure was denoted by the letter T.

[73] For the explanation of the second figure, see Llull, 1985, 583-585.

so on" (Llull, 1985, 582). Several syllogisms could be formed by combining the Dignities in the form of subject or predicate. The artist could investigate thus the relations between subjects and predicates and define the terms according to their nature (see Llull, 1985, 582)[74]. The combinatorial character was considerably apparent in the third and fourth figures. As we can see, the third figures paired the letters of Llull's alphabet, so that various sentences could spring from their association, according to the letter's different meanings. The fourth figure was composed by three concentric circles, "the outermost of which is fixed and the two inside ones of which are mobile" (Llull, 1985, 587). By moving the circles, the artist could explore the associations among the letters in groups of three: in Llull's own words, "one may seek out necessary conclusions and find them" (Llull, 1985, 587).

These were some of the means through which Llull's *ars* calculated the combinations of the nine letters. However, the guarantee that these combinations had an ontological soundness were the causal influence of the Dignities. They were the pillars of the world and not by chance Moshe Idel connected them to the *Sephiroths* (see Idel, 1996)[75]. Nicholas of Cusa, medieval philosopher and mathematician, didn't fail to notice this feature of the *ars magna*: "*primum fundamentum artis est quod omnia, quae Deus creavit et fecit, creavit et fecit ad similitudinem suarum dignitatum*" (Nicholas of Cusa, Cod. Cus. 85, f. 55v., as quoted in Rossi, 1960, 49)[76]. As the historian of philosophy Paolo Rossi has stated, this metaphysical theory, *i.e.* the exemplarism, was in fact a guarantee that Llull's logic primarily pertained to reality rather than only human discourse, because it enabled one to find the similarities between the Dignities and the world (see Rossi, 1960, 49).

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[74] Here we read: "In this figure, moreover, the artist seeks the natural conjunction between subject and predicate, as well as their relative disposition and proportion, so that he can find the middle term and thus reach a conclusion".

[75] For a discussion of this topic and a comparison between Llull and the Kabbalah, see Hames, 2000, chap. 3.

[76] "The primal foundation of the art is that everything which God has created and done was created by him and done in accordance with his dignities" (my translation).

For his part, Jevons was at the same time distant and close to these views. On the one hand, the importance of studying natural phenomena in terms of combinations had for him too a theological foundation. As quoted above, "the laws of nature are the invaluable secrets which God has hidden, and it is the kingly prerogative of the philosopher to search them out by industry and sagacity" (Jevons, [1874] 1877, 126). Furthermore, both Jevons and Llull constructed their combinatorial logic on the basis of an alphabet. They associated letters with qualities or objects and then combined them in sentences. These letters were evidently conventional, since they did not display any similarity with the thing denoted. This feature distinguished Jevons and Llull from the Kabbalah, where the letters themselves had an ontological value. On the other hand, Jevons's version of the *ars combinatoria* could not really be considered linguistic. It certainly was an analytical process, and as such it could be described as an act of deciphering. But we shall see that in Jevons's eyes our words put things at distance, never expressing them exactly.

In Jevons's view the combinatorial calculus enabled to cope with the complexity of reality. While describing the process of induction as inverse operation, he notably used the example of the labyrinth: "a person may walk into the most complicated labyrinth or the most extensive catacombs, and turn hither and thither at his will; it is when he wishes to return that doubt and difficulty commence" (Jevons, [1874] 1877, 122). To leave the labyrinth the adventurer would have either to return by the path he made at first – challenging thus his memory – or to try every possible way. And nature was certainly similar to a labyrinth in this respect. The scientist could be lost among the multitude of phenomena, in which "we seldom observe any law in uninterrupted and undisguised operation" (Jevons, [1874] 1877, 126). To the negligent observer, nature didn't show any regularity at all, since "the laws may be simple, but their combined effects are not simple, and we have no clue to guide us through their intricacies" (Jevons, [1874] 1877, 126).

Depicting nature as a labyrinth of intricacies Jevons came near the *ars combinatoria* again. In the sixteenth century this tradition merged in fact with the new-born interest for the development of a scientific method. The *ars*

memorativa, which had long been related to the combinatory, found a new place in Ramus's logical system[77]. In the *Principles* Jevons quoted Ramus's dialectical method as a forerunner of his Logical Alphabet (Jevons, [1874] 1877, 703-704). Moreover, Jevons's description of nature displayed a remarkable similarity to Francis Bacon's account. For the latter, nature had indeed a maze-like appearance, being akin to a forest or a labyrinth (Bacon, [1620] 1857-1874, Vol. I, 129): its ways were mischievous, its resemblances deceptive, its signs misleading. That was why, in Bacon's opinion, the scientific task needed a series of tables reporting the natural facts. Those tables aimed thus at ordinating the confused material of reality (see Rossi, 1957, 201-207; 1960, 166-168). Bacon's method was meant to bring order in the array of facts, where an order was most difficult to be found.

Jevons was certainly acquainted with Bacon's image of the universe as a forest and a labyrinth. According to both Bacon and Jevons, the scientist had to cope with the variety of nature. But they gave different solution to overcome the scientist's bewilderment in front of natural phenomena. Bacon fancied a series of tables where the natural phenomena had to be listed. Thanks to such tables the essential forms of natural objects could be sought. For his part, Jevons thought that his Ariadne's thread was the study of combinations and permutations, with a proper adjustment from the theory of probability. We shall see now how his method was shaped.

[77] Paolo Rossi made an extensive analysis of the connections between the arts of memory and the *ars combinatoria*; on Ramus in particular, see Rossi, 1960, 135-142.

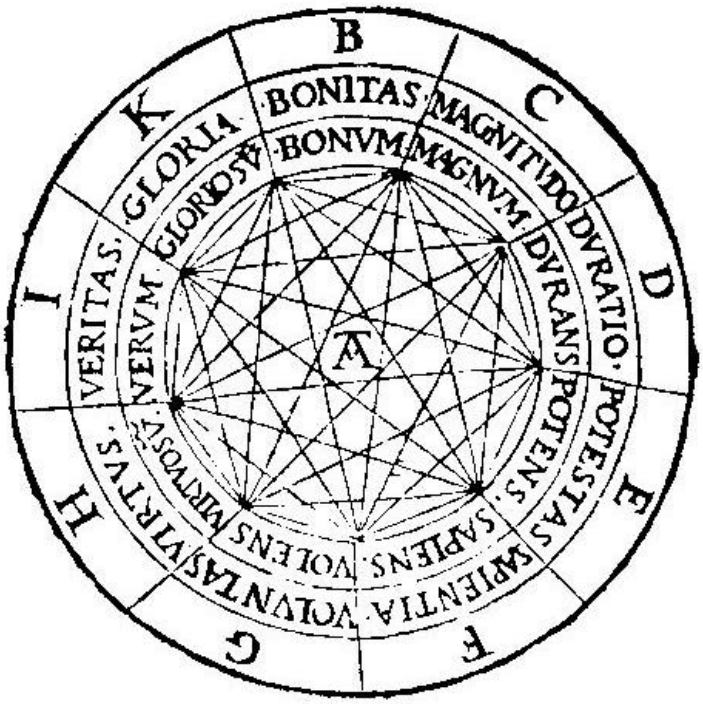

Figure 1: Llull's first figure (or figure A) of the *Ars brevis* (Llull, 1617, 116).

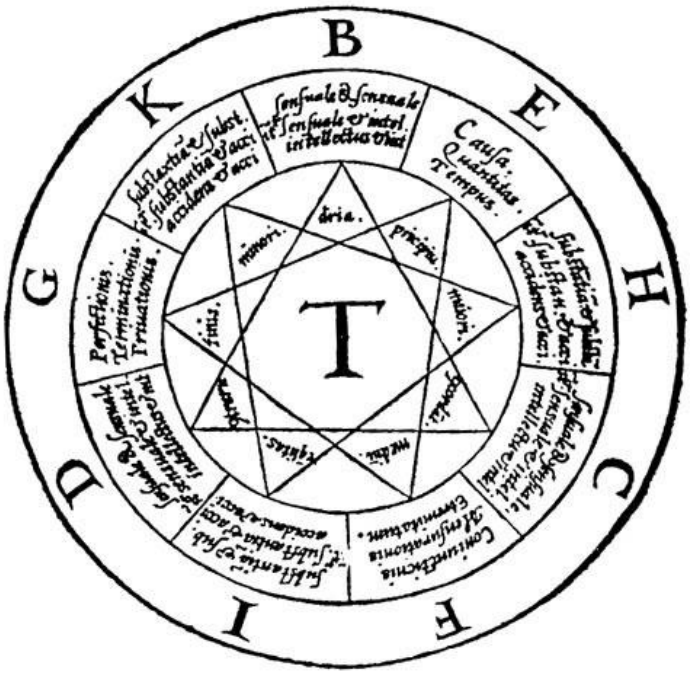

Figure 2: Llull's second figure (or figure T) of the *Ars brevis* (Llull, 1617, 116).

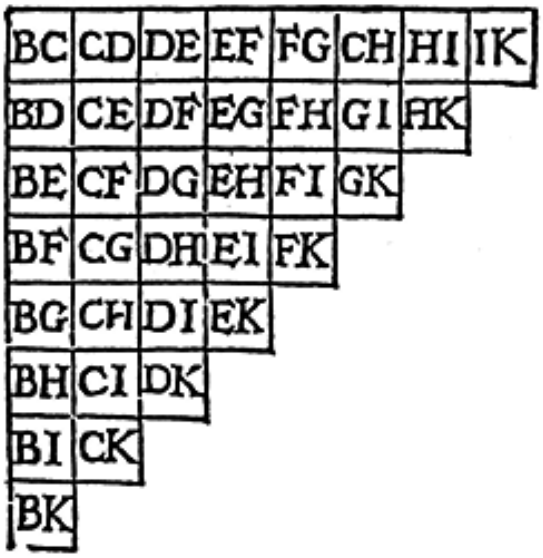

Figure 3: Llull's third figure of the *Ars brevis* (Llull, 1617, 116).

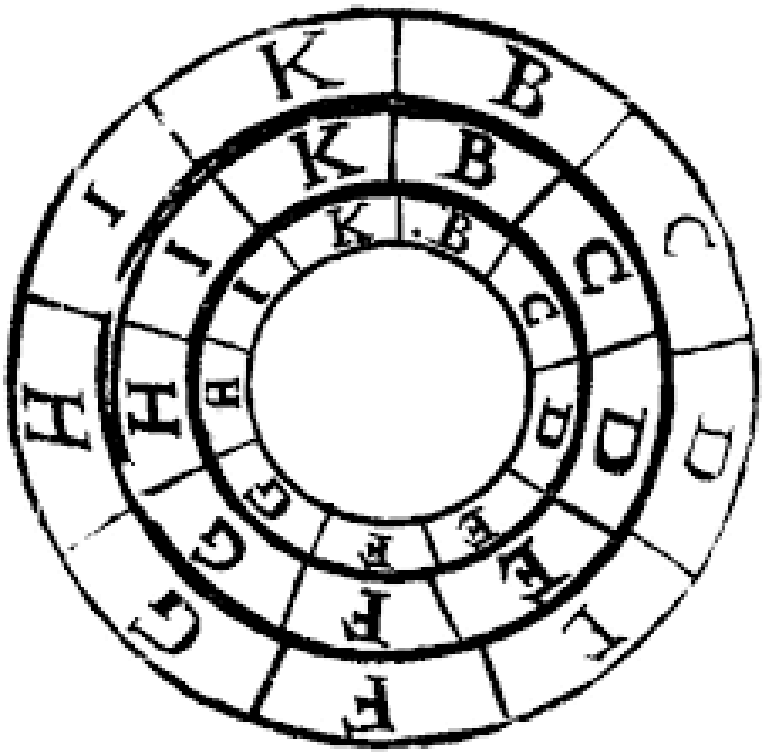

Figure 4: Llull's fourth figure of the *Ars brevis*
(Llull, 1617, 116-117, 123).

Combinations and permutations

Let us now consider the theory of combinations as presented by Jevons, mainly in the *Principles*' chapter entitled *The variety of nature, or the doctrine of combinations and permutations*. Such a title reveals how strong an entanglement this theory had with the variety of nature. Had nature been in a static and unvaried state, there would have been no such thing as a theory of combinations. A study of combinations was required because the natural objects were continuously merging and decomposing over and over again, creating new compounds. As we read at the beginning of this chapter:

> Certain it is that life demands incessant novelty, and that nature, though it probably never fails to obey the same fixed laws, yet presents to us an apparently unlimited series of varied combinations of events. It is the work of science to observe and record the kinds and comparative numbers of such combinations of phenomena, occurring spontaneously or produced by our interference. Patient and skilful examination of the records may then disclose the laws imposed on matter at its creation, and enable us more or less successfully to predict, or even to regulate, the future occurrence of any particular combination (Jevons, [1874] 1877, 173).

The study of combinations was thus the guide on which the scientist had to rely in fathoming the depths of nature. If he used it properly, he would even become able to predict events, and therefore to control the forces of nature.

After explaining the utility and purpose of the theory, Jevons elucidated its mechanism. First of all, he marked the difference between *combination* and *permutation*. The first one considered the combined phenomena only with respect to the elements involved, regardless of their order. The latter instead distinguished the results also on the basis of the order. For example, the couple of elements AB gives only one possible combination, but admits two permutations, *i.e.* AB and BA (see Jevons, [1874] 1877, 177). Consequently, as Jevons wrote, "each new object or term doubles the number of combinations, but increases the permutations by a factor continually growing" (Jevons, [1874] 1877, 179). The series of permutations would thus result by the factorial of the

number considered, namely $n!$ (in our notation)[78]. Then Jevons explained how to calculate the number of combinations selecting a given number of elements from a group, with exclusion of repetitions. This is what we call in fact "simple combinations", which are given by the following formula (Jevons, [1874] 1877, 180-182)[79]:

$$\frac{n!}{k!\,(n-k)!}$$

The results of these two formulas would give thus respectively every possible permutation and combination.

This was the highest *possible* number of combinations and permutations which could result from a given number of elements. As matter of fact, the natural laws played a relevant role in this context. Since the universe was governed by the laws of nature, it was in Jevons's opinion to a high degree *regular*. Hence, the combinations and permutations of phenomena admitted some restrictions (Jevons, [1874] 1877, 174).

Jevons explained this concept through the example of the English alphabet. From the twenty-six letters of this alphabet, an exceedingly high number of permutations, namely words, can be formed. However, we have to observe some rules lest it wouldn't be possible for these words to be uttered. For instance, the constitution of the human vocal organs may be unsuited to pronounce several consonants in a row. Now, by studying the existing English terms, we can "learn the Laws of Euphony or calculate the possible number of words" (Jevons, [1874] 1877, 175). Before calculating the possible combinations, the scientist must identify the laws which could prevent some of them from forming: "the combinations of natural phenomena are limited by a great number of conditions which are in no way brought to our knowledge except so

[78] The permutations thus obtained included repetitions though. Jevons also explained how to exclude them (see Jevons, [1874] 1877, 180).

[79] Jevons did not write the formula in this way, nor he called it the formula of "simple combinations".

far as they are disclosed in the examination of nature" (Jevons, [1874] 1877, 175).

As one can easily imagine that, the combinatorial calculus had a close connection with the theory of probability. Such a link could not have escaped Jevons's consideration, given how relevant probability was in his thought. The combinations of phenomena, being restricted by some laws, could indeed have different degrees of probability. Let us take into consideration another one of Jevons's examples where this connection is particularly evident:

> If the letters of the word *Roma* be thrown down casually in a row, what is the probability that they will form a significant Latin word? The possible arrangements of four letters are 4 x 3 x 2 x 1, or 24 in number […], and if all the arrangements be examined, seven of these will be found to have meaning, namely *Roma*, *ramo*, *oram*, *mora*, *maro*, *armo*, and *amor*. Hence the probability of a significant result is $\frac{7}{24}$ (Jevons, [1874] 1877, 203).

Jevons relied on Laplace and De Morgan for this formula. According to it, the number of favourable events must be divided by the number of total events. Therefore, a proper investigation of the phenomena's combinations would also consider the probability of each combination. And yet this connection between the combinatorial calculus and the theory of probability cannot be clarified without referring to Jevons's logic. Hence, let us address this topic.

A theatre of the world

In Jevons's eyes the natural laws limited the possibilities of phenomena's combinations. They were thus the primary principles on which the scientist had to rely in his inquiries. Nonetheless, the principles of combinations proceeded primarily from *logic*, or more specifically from the laws of thought. What then is the relation between Jevons's combinatorial calculus and his logic? And how was it embodied in the Logical Alphabet and in Jevons's logical machines?

While presenting the theory of combinations and permutations, Jevons clearly stated that its bases were to be found in logic. He thus wrote as follows in the *Principles of Science*:

> The Laws of Thought are the first and most important of all the laws which govern the combinations of phenomena, and, though they be binding on the mind, they may also be regarded as verified in the external world. The Logical Alphabet develops the utmost variety of things and events which may occur, and it is evident that as each new quality is introduced, the number of combinations is doubled. Thus four qualities may occur in 16 combinations; five qualities in 32; six qualities in 64; and so on. In general language, if n be the number of qualities, 2^n is the number of varieties of things which may be formed from them (Jevons, [1874] 1877, 173-174).

The combinations were regulated by the laws of thought, *i.e.* the principle of identity, non-contradiction and excluded middle (or duality, in Jevons's terms). Moreover, from this passage we apprehend that these laws may pertain to the human mind, but they belong to nature as well. In other words, the objects of the world are bound by the very same laws which shape thought. There was thus a continuity between the mind and the world. Jevons embraced Descartes's account, according to which the conscience was separated from the so-called external world. But the bridge between these two domains consisted in the fact that the laws of thought were principles of the mind as well as of things.

Even though each law of thought was required to found the combinational process, its real driving force was the law of duality[80]. That is why in the passage quoted above we read that for each quality considered, the number of combinations is *doubled*. For instance, if we take into account the quality of "being red" with respect to a given object, this item would be either red or not-red. No additional alternative was given, according to the principle of the excluded middle. Hence, the formula here provided suggested that we can choose one of two alternatives for an n number of times. Jevons clearly elucidated this

[80] The essential role of this law has been highlighted by Mays and Henry; see Mays, Henry 1953, 488.

process in *Studies and Exercises in Deductive Logic* (1880), where he explained that "the successive application of the Law of Duality to two, three, four, five or more terms, gives rise to the development of all possible logical combinations, called the Logical Alphabet"[81].

The Logical Alphabet was compared by Jevons to the system of bifurcate classification. This method was embedded in the very statement of the laws of thought and as such had been employed by Aristotle (see Jevons, [1874] 1877, 702). Porphyry and Ramus, as stated above, had used the dichotomic method. After them, the importance of the Porphyry's Tree had been recognized by Jeremy and George Bentham, since in their view "it is the prototype of the Logical Alphabet which lies at the basis of logical method" (Jevons, [1874] 1877, 703). Thus, Jevons's appreciation for this logical tradition led him once again to the *ars combinatoria*.

The Logical Alphabet was formed by all the combinations of qualities. Following its lines, we could formulate several propositions, excluding self-contradictory statements. The truth of these propositions was to be judged on the basis of their correspondence with real objects. The Logical Alphabet was a guide through the forest of nature, because it was a map of the world. Accordingly, as we read in the *Principles*:

> In a theoretical point of view we may conceive that the Logical Alphabet is infinitely extended. Every new quality or circumstance which can belong to an object, subdivides each combination or class, so that the number of such combinations, when unrestricted by logical conditions, is represented by an infinitely high power of two (Jevons, [1874] 1877, 95).

In Jevons's eyes the universe was certainly not constituted by letters, but it was nevertheless possible to map it through the logical combinations of symbols. From that point of view, Jevons's position shows a remarkable similarity to Llull's one. In fact they both thought that the logical combinations could ex-

[81] Jevons, (1880) 1884, 180. A similar description of the Logical Alphabet can be found in Jevons, (1874) 1877, 93-95.

press the structure of reality, as I have remarked above. Hence, Jevons's combinatorial art as well turned out to be at once logic and metaphysical.

Jevons first presented the Logical Alphabet while describing the so-called indirect method of inference. For him, a direct inference drew the consequences from the premises, where the conclusions were obtained thanks to the principle of substitution[82]. On the contrary, "the method of Indirect Inference may be described as that which points out what a thing is, by showing that it cannot be anything else". Hence, this latter method was the negative of the first and it was the logical version of the mathematical *reductio ad absurdum* (Jevons, [1874] 1877, 81).

This procedure evidently required an exhaustive list of all the various possibilities. It was therefore liable to fallacies and blunders. The Logical Alphabet was certainly of help in removing every impossible outcome. However, Jevons knew how insidious this method still was[83]. Therefore he spent a lot of effort in devising some machines which could secure its success[84]. The first

[82] See Jevons, (1874) 1877, chap. 4. The principle of substitution was also extensively illustrated in the paper of 1869, *The Substitution of Similars* (see Jevons, 1890).

[83] See, for example, Jevons, (1874) 1877, 96, where we read as follows: "the amount of labour [in Logical Deduction] is often found to be considerable. The mere writing down of sixty-four combinations of six letters each is no small task, and, if we had a problem of five premises, each of the sixty-four combinations would have to be examined in connection with each premise. The requisite comparison is often of a very tedious character, and considerable chance of error intervenes. I have given much attention, therefore, to lessening both the manual and mental labour of the process, and I shall describe several devices which may be adopted for saving trouble and risk of mistake".

[84] For an illustration of Jevons's logical machines see notably: Henry, Mays, 1953, 493-499; Maas, 2005, 124-150, where the problem was addressed from a broader point of view, considering the importance of mechanical analogies and their influence on Jevons's way of depicting the human mind.

one of these devices was the Logical Slate[85]. It simply was a blackboard on which the Logical Alphabet had been engraved. The logician was thus relieved of a grave labour, because he didn't have to write all the possibilities every time from the beginning. He could also write on the same slate his premises, so that he could easily compare them with the Logical Alphabet's structure.

The second device, the Logical Abacus[86], was much more complicated. It was contrived to further reduce the risk of error embedded in the indirect inference. As we read in *On the Mechanical Performance of Logical Inference*,

> the *fixed* order of the combinations in the written abecedarium[87] renders it necessary to consider them separately, and to pick out by repeated acts of mental attention those which fall into any particular class. Considerable labour and risk of error thus arise. The Logical Abacus was devised to avoid these objections, and was constructed by placing the combinations of the *abecedarium* upon separate movable slips of wood, which can then be easily classified, selected and arranged according to the conditions of the problem (Jevons, 1890, 151, emphasis added).

The Logical Alphabet was indeed a map of the phenomena's possible combinations. However, it was *fixed*, whereas the Abacus introduced the mechanical movement to the Alphabet.

[85] The Slate was first depicted in *The Substitution of the Similars* (Jevons, 1890, 116), then in *On the Mechanical Performance of Logical Inference* (Jevons, 1890, 151) and eventually in the *Principles* (Jevons, [1874] 1877, 95-96).

[86] The Logical Abacus was first presented before the Manchester Literary and Philosophical Society on the third of April 1866. An exhaustive description of his parts and mechanism was though included in the appendix to the *Substitution of Similars* (see Jevons, 1890, 133-136 and 151-152); see also Jevons, (1874) 1877, 104-106.

[87] "Abecedarium" is synonymous with "Alphabet".

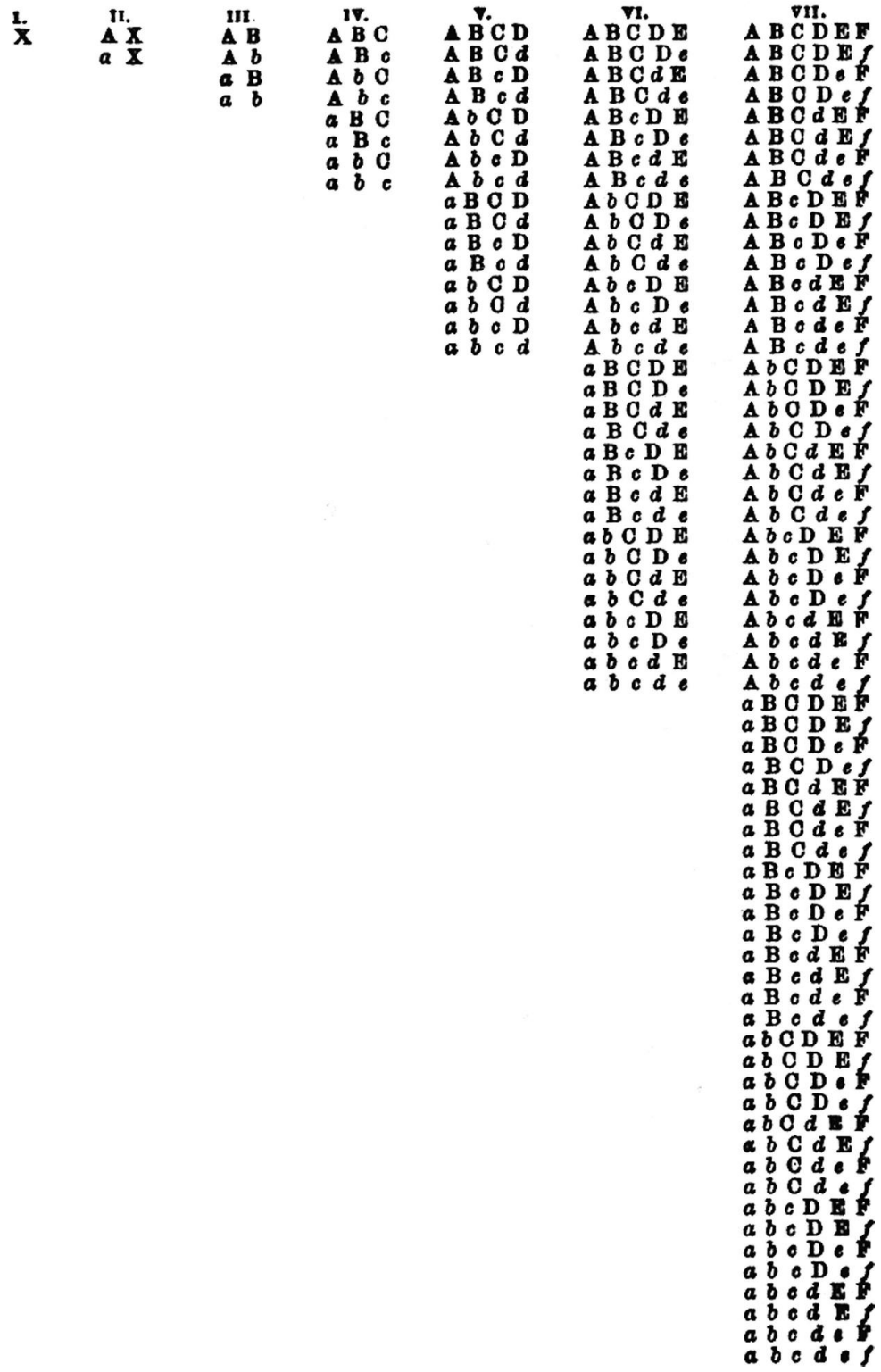

Figure 5: The Logical Alphabet (Jevons, [1874] 1877, 94).

This dynamical aspect was even more evident in the Logical Machine, by far the most sophisticated of Jevons's contrivances (Jevons, 1890, 152-172; [1874] 1877, 107-114). He illustrated its functioning to the Royal Society in 1870, not to mention that it was on the title-page of the *Principles of Science* (see Jevons, [1874] 1877, 108). The Machine had a keyboard which enabled one to express the logical sentences, according to Jevons's notation. Some keys permitted one to fill in the terms of a proposition. Each term obviously included its negative as well. There were also some operational keys, namely introducing the copula, the full-stop and the disjunctive conjunction. We could thus insert the premises of a stretch of reasoning into the machine. Once all premises had been inserted, we could press another operational key, the Finis key, to calculate the result. Eventually the Machine would eliminate every conclusion which would be inconsistent with the premises. The Logical Machine was indeed able to provide all the possible combinations resulting from the proposition inserted, in accordance with the laws of thought. As Jevons wrote,

> the machine is thus the embodiment of a true logical system. The combinations are classified, selected or rejected, just as they should be by a reasoning mind, so that at each step in a problem, the Logical Alphabet represents the proper condition of a mind exempt from mistake (Jevons, [1874] 1877, 111).

Harro Maas has argued that the Logical Machine imitated the operations performed by the human mind (Maas, 2005, 98 and 131-132). Jevons and some of his contemporaries, like Charles Babbage for instance, were thus accustomed to considering the mind itself as a machine. It should be added to Maas's remark that the Logical Machine was nonetheless constructed on the basis of the Logical Alphabet. Consequently, it only showed the mind's functioning because it represented the combinations of natural phenomena. Each configuration of the premises in the Logical Machine corresponded to a reconfiguration of the Logical Alphabet: "should the premises be self-contradictory it will be found that one or more of the letter-terms disappears entirely from the Logical Alphabet" (Jevons, [1874] 1877, 111). The Logical Machine had onto-

logical implication, since its configurations were intended as representation of the real phenomena's combinations.

The Logical Alphabet may be a map of reality, but the Logical Machine was a veritable *theatre of the world*. It added in fact a dynamical feature to the static listing of phenomena's combinations. And yet the Machine could imitate the movement of combinations thanks to the *isomorphism* between the Logical Alphabet and the world, namely because the laws of thought were regulating the mind as well as things. The logicians Mays and Henry have highlighted this character of the Alphabet very clearly, arguing that

> the set of combinations making up the Logical Alphabet may be taken as typifying the abstract structure of the world. There is an isomorphism between the assumed combinatorial character of the universe and the Logical Alphabet (Mays, Henry 1953, 490).

The Alphabet's combinations mirrored the combinatorial character of the world itself. The content could certainly change, with the transformation of the worldly objects. Though, the structure remained the same, like a skeleton covered with new flesh but itself unaltered.

Moreover, the expression "theatre of the world" could not fail to bring to mind some texts of the sixteenth century, like Giulio Camillo's *Idea del Theatro* (*The Idea of the Theatre*). According to Giulio Camillo, also known as 'il Delminio', we could depict the world as a palace whose parts were the very ontological roots of reality[88]. These fundamental elements, both perceptible and imperceptible, could be shown in the philosopher's argumentation; hence the word 'theatre', which went back to the Greek verb *théaō*, 'to see' (Camillo, 2005, 35). The edifice was indeed nothing but a manifestation of God Himself, since "non possiamo trovar magion più capace, che quella di Dio" (Camillo, 2005, 150)[89]. Camillo also aimed at offering a systematic representation of

[88] The metaphysical character of this Theatre has been elucidated by Lina Bolzoni in Camillo, 2005, 18. For this concept also see Rossi, 1960, 97-100.

[89] "We could not find a vaster dwelling than God" (my translation).

human knowledge, so that he fancied a library whose books encompassed all the branches of knowing (see Camillo, 2005, 39-43).

Let us take some steps in Camillo's theatre. In his visionary construction, each of the seven planets was associated with a *Sephiroth*, with a pillar of the palace and with an angel of God (see Camillo, 2005, 169-173). At their turn, the seven columns intersected with seven degrees, representing the passage from unity to plurality in the world. Through these degrees the divine principles attained their embodiment in nature and human beings. The columns and degrees were compounded with each other, producing forty-nine combinations in total[90]. Every part of the palace was connected with some images, as the *ars memorativa*'s tradition recommended (see Camillo, 2005, 20)[91]. This setting was far from static though. The same images assumed different meanings according to the degrees in which they were collocated. The images migrated into new combinations. Furthermore, such a mobile series of combinations recalled the mobile wheels of Llull, as Lina Bolzoni has remarked in her introduction to Camillo's text (see Camillo, 2005, 22-23). Llull fourth figure was indeed composed by concentric circles. Moving the circle, the philosopher produced new combinations, just like the Kabbalist Abulafia did spinning the names of God.

Jevons's Logical Machine displayed what was previously invisible, as well as Camillo's theatre. It showed the new possible configurations of the world, in accordance with the given premises. Moreover, the images moving through Camillo's Theatre could be compared to the new associations of qualities in Jevons's logic. Once a figure had moved in a different degree of the palace, it assumed new qualities and therefore a new meaning. In the same way the addition of a premise in Jevons's Machine excluded some combinations. We could

[90] Lina Bolzoni described very linearly this structure in the introduction (see Camillo, 2005, 21-22).

[91] Here we read: "come insegna l'arte della memoria, ogni luogo deve essere contrassegnato da una o più immagini"; in my translation: "as the art of memory teaches, every place must be indicated by one or more images". On this topic see also Rossi, 1960, 98.

notice that the movement of the images in the degrees was imaginary, whereas Jevons's Machine involved an actual dynamic process. However, Camillo's imagination was far more prolific than that. He even fancied an actual rhetorical machine (see Camillo, 2005, 58). It was a wheel – a reminiscence of Llull's fourth figure. In the middle there was the rhetor's subject matter and in the surrounding circles there were inscribed some rhetorical techniques and tools. Pulling a rope, the wheel spun. It thus suggested to the rhetor which techniques to use for embellishing his argument.

As I have argued, the Logical Machine combined displaying and moving. It was a dynamical map of the possible combinations. However, Jevons's notion of the relationship between language and reality was completely different from Camillo's or Llull's one. Consequently, his Theatre of the world had a very different appearance as well. In the example of *ars combinatoria* we have seen thus far that language had a firm grasp on reality. The Kabbalist already spoke the language of the world, because the world *was* that language. Llull and Camillo argued that their theoretical constructions touched the very essential elements of the world. This wasn't the case for Jevons. I shall now investigate this discrepancy.

The series of signs and things

The above-mentioned examples of *ars combinatoria* held that it was possible to grasp the first constituents of reality. The signs were close to things. There was a correspondence between them, if not an identity. What was Jevons's position in this regard though? He mentioned this topic several times, but he didn't investigate it extensively. For him, this problem was primarily related to logic, as we can easily imagine. The problem was tackled as follows in the introduction to the *Principles of Science*:

> I need hardly dwell upon the question whether logic treats of language, notions, or things. As reasonably might we debate whether a mathematician treats of symbols, quantities, or things. A mathematician certainly does treat of symbols, but only as the instruments whereby to facilitate his reasoning concerning quantities; and as the axioms and rules of

> mathematical science must be verified in concrete objects in order that the calculations founded upon them may have any validity or utility, it follows that the ultimate objects of mathematical science are the things themselves. In like manner I conceive that the logician treats of language so far as it is essential for the embodiment and exhibition of thought. Even if reasoning can take place in the inner consciousness of man without the use of any signs, which is doubtful, at any rate it cannot become the subject of discussion until by some system of material signs it is manifested to other persons. The logician then uses words and symbols as instruments of reasoning, and leaves the nature and peculiarities of language to the grammarian. But signs again must correspond to the thoughts and things expressed, in order that they shall serve their intended purpose. We may therefore say that logic treats ultimately of thoughts and things, and immediately of the signs which stand for them. Signs, thoughts, and exterior objects may be regarded as parallel and analogous series of phenomena, and to treat any one of the three series is equivalent to treating either of the other series (Jevons, [1874] 1877, 8-9).

The passage is dense and complex. It recalls Aristotle's famous paragraph from the *De Interpretatione*, where the Stagirite argued as follows:

> Spoken words are the symbols of mental experience and written words are the symbols of spoken words. Just as all men have not the same writing, so all men have not the same speech sounds, but the mental experiences, which these directly symbolize, are the same for all, as also are those things of which our experiences are the images (Aristotle, 1928, Vol. I, 60 [16 a, 4-12]).

It is not unlikely that Jevons knew Aristotle's passage. As we shall see, the similarities are remarkable. As for Jevons's argumentation, some observations are due. First of all, Jevons was evidently willing to put the problem aside as soon as possible. As Margaret Schabas has argued, he was not inclined to meddle into philosophical intricacies (Schabas, 1990, 55)[92]. This did not mean that he didn't acknowledge the problem at all. In his mind, the logician and the mathematician were concerned with *things*. Consequently they did not treat

[92] Margaret Schabas has rightly argued that this was the case of Jevons's allegiance to empiricist positions. Thus she held that "Jevons, like Herschel, was first and foremost the practical scientist with little patience for philosophical problems that might impede the task at hand".

symbols *per se*, but only in order to handle the objects of the world. However, symbols were not all the same. The mathematical symbols for example were particularly fit for treating quantities. Hence their suitability for political economy, whose matters had a quantitative nature (Jevons, 1871, 3-4). The symbols were tools, and as such each was suited for a different task.

The logician used the signs as instruments for constructing inferences. Here Jevons wondered if signs were not involved in thinking too. Nevertheless Jevons seemed to have dismissed this question in the course of the *Principles*. Moreover this idea wouldn't be consistent with Jevons's empiricist theoretical framework. From such a point of view, perceptive knowledge was certain and required no mediation. As Jevons held,

> if I see blue sky, I may be quite sure that I do experience the sensation of blueness. Whatever I do feel, I do feel beyond all doubt. We are indeed very likely to confuse what we really feel with what we are inclined to associate with it, or infer inductively from it; by the whole of our consciousness, as far as it is the result of pure intuition and free from inference, is certain knowledge beyond all doubt (Jevons, [1874] 1877, 236).

In Jevons's mind perceptive knowledge was certain as long as it concerned the inner conscience. He believed, as Aristotle did, that everyone had the same mental impressions of things. Once it had to enter an inference though, being expressed in signs, differences, and thus confusion and error, arose. Jevons clearly stated that in his view "all knowledge proceeds originally from experience", so that our mental impressions were the material with which scientific knowledge was built (see Jevons, [1874] 1877, 339).

Jevons's empiricist beliefs seemed to guarantee that we had an immediate connection with things. However, we could only treat things *through* signs. As Jevons argued, thoughts required the materiality of signs. Without language the reasoning process couldn't access the interpersonal dimension of knowledge. Consequently, in the passage already quoted Jevons held that there must be a correspondence of some kind between our language and the world, as well as between language and thoughts. Indeed, in the absence of such a correspond-

ence the words would have been inadequate with respect to things. But Jevons stated that the three series were analogous: we could equivalently treat any of them. Oddly enough though, we could never manifest thoughts or say things *directly*. So, the only series that we could actually treat was the one of signs. Evidently this didn't prevent us from speaking of objects. It only implied that what we could say was influenced by the nature of the signs we used.

What was the nature of those signs? As argued above, in Jevons's eyes the universe was infinite. Human knowledge was limited. Therefore, it wasn't surprising that this finiteness pertained our signs as well. Indeed, as Jevons wrote, "there is no branch of science in which our symbols can cope with the complexity of Nature" (Jevons, [1874] 1877, 216). We couldn't but see nature as in a mirror. We should add, however, that we also see it in the form of an enigma. According to Paul's verse, not only did we see nature as in a mirror, but also '*en ainigmati*'. The Greek word '*ainigma*' could be translated as 'enigma', 'puzzle', as well as 'allusion' or 'symbol'. Paul's sentence suggested that the world displayed allusive symbols, which had to be interpreted. In the same way, in Jevons's mind the signs didn't completely catch the denoted things. They were allusions.

The allusive nature of signs was connected to the probabilistic character of knowledge. Speaking of the mathematical symbols, he wrote thus as follows:

> In truth men never can solve problems fulfilling the complex circumstances of nature. All laws and explanations are in a certain sense hypothetical, and apply exactly to nothing which we can know to exist. In place of the actual objects which we see and feel, the mathematician invariably substitutes imaginary objects only partially resembling those represented, but so devised that the discrepancies may not be of an amount to alter seriously the character of the solution (Jevons, [1874] 1877, 458).

Jevons did believe that thoughts could grasp the object. However, once the thought had to be translated in some signs of any sort – mathematical or *stricto sensu* linguistic as they may be –, the object started to drift apart. Again, not that this implied the impossibility of speaking any truth. It simply meant that

we could never be certain of our statements, which were nothing more than probable.

Words and things had therefore at once a relation of distance and proximity. They were distant from the things, because they were not the things themselves. And yet they were close to them, insomuch as they could stand for them in the intersubjective exchange of information. Jevons briefly treated this subject matter in the *Principles*:

> There is no identity of nature between a word and the thing it signifies; the substance iron is a heavy solid, the word iron is either a momentary disturbance of the air, or a film of black pigment on white paper; but there is analogy between words and their significates. […] The whole structure of language and the whole utility of signs, marks, symbols, pictures, and representations of various kinds, rests upon analogy (Jevons, [1874] 1877, 628).

The Kabbalists had argued that the universe had been written by God in the letters of the Hebraic alphabet. On the contrary, for Jevons these possibilities were gone, never to come back. The first constituents of reality were to be told in human words. Were they the Kabbalist's *Sephiroths*, the elements from which nature had been composed, or Llull's divine Dignities, they were made accessible by our language. In Jevons's account, the ontology was deprived of this semantic intension. As we shall see, language had a different task. If there were some fundamental constituents of reality, their intension changed considerably.

Nonetheless, names had something in common with things. They were *similar* to them. In fact Jevons stated that the analogies took roots in some sort of similarity or resemblance (Jevons, [1874] 1877, 628)[93]. Such a resemblance was the condition of possibility for using language. As Jevons wrote,

> the use of words constantly involves analogies of a subtle kind; we should often be at a loss how to describe a notion, were we not at liber-

[93] Here we read: "A cursory examination of the way in which we popularly use the word analogy, shows that it includes all degrees of resemblance or similarity".

> ty to employ in a metaphorical sense the name of anything sufficiently resembling it (Jevons, [1874] 1877, 628).

Language had to rely upon analogies. Furthermore, analogy had a primary importance in Jevons's thought. The principle of the substitution of the similars depended on it, since for substituting two terms we have to imply that they are similar enough to each other (Jevons, [1874] 1877, 17). So, analogy owed its importance to the nature of language. As we have read, for Jevons there was no identity of nature between words and things. Thus, all we could do was to connect things and words by analogies, highlighting their resemblance.

The problem of the relation between words and things was very ancient, going back to Plato's *Cratylus*. However, Jevons's issues concerning this link were very familiar to English philosophical tradition. Francis Bacon had devoted considerable attention to it, his considerations being very influential on subsequent thinkers. This subject matter was involved in the discussion of the so-called *idola fori*, or the idols of the marketplace.

Jevons was well acquainted with this Baconian doctrine: among his manuscripts in the John Rylands Library there still are some notes of a lesson he attended, concerning this topic (Jevons's archive: Jevons's Family Papers, 6A/5/27 [15 pp.]). Those idols were in Bacon's opinion "the most troublesome of all" and they had crept "into the human understanding through the alliance of words and names" (Bacon, [1620] 1857-1874, Vol. I, second part, LIX, 261-262). In this passage Bacon explained that the words were influenced by the understanding. Though, as the common understanding was very poor, the words were shaped according to a vulgar way of thinking. Those words were thus unable to collect the essential characters of the things, focusing on wrong or inessential features. The words could also lose all contact with reality, becoming mischievous signs pointed at nothing (Bacon, [1620] 1857-1874, Vol. I, second part, LX, 262-263). Moreover, those were the words which we had to use in any case. Hence the words became obstacles. They hindered the process of definition. They were misleading advisors, providing the philosopher with

the vulgar sense crystallized in them (Bacon, [1620] 1857-1874, Vol. I, second part, LIX, 262).

Bacon's awareness of the intricacies embedded in his language prompted his interest in other linguistical systems. He spoke of Chinese ideograms as follows: "it is the use of China, and the kingdoms of the high Levant, to write in *Characters Real*, which express neither letters nor words in gross, but Things or Notions" (Bacon, [1605] 1857-1874, Vol. III, 399, emphasis added). Chinese writing reduced the distance between language and reality. As such, the ideograms were real characters. Those characters were in fact "radical words" (Bacon, [1605] 1857-1874, Vol. III, 400): an "atomistic unit of meaning" (Singer, 1989, 6). The Chinese ideograms could touch these fundamental units of sense, because they referred to notions directly. They dispended with the intermediary of letters. Though, these signs had no similarity with the things denoted. They simply attached to the notions directly but didn't depict them.

In this regard they differed from the hieroglyphs, which had a congruity or similarity with the things represented. As we read in *The Advancement of Learning* (1605):

> As to Hieroglyphics, (things of ancient use, and embraced chiefly by Aegyptians, one of the most ancient nations), they are but as continued impresses and emblems. And as for Gestures, they are transitory Hieroglyphics, and are to Hieroglyphics as words spoken are to words written, in that they abide not; but they have evermore, as well as the other, an affinity with the things signified (Bacon, [1605] 1857-1874, Vol. III, 400).

Hieroglyphs depicted things because they were themselves depictions. Moreover, hieroglyphs had a gestural nature in Bacon's eyes: they were fixed gestures. Gestures were natural reactions. Therefore the hieroglyphs displayed a much higher proximity to reality than any other language.

Bacon's treatment of real characters and hieroglyphs had a high appeal in the seventeenth century England. The idea of a language which was able to tell

things themselves started to attract several authors[94]. As Paolo Rossi has remarkably illustrated, its attractiveness was triggered by certain historical conditions. The impact of Comenius's work, due to his recent visit in England, combined with influence of the Baconian circles in the Royal Society. Furthermore, in the English context these developments were wedded to the progress of physical and mathematical sciences, which required a new language for new branches of knowledge (see Rossi, 1960, 203).

As I have stated above, Jevons was acquainted with Bacon's notion of *idola fori*. We could hear a Baconian echo when Jevons spoke of the distance between things and words, or of the impossibility of exhausting the object's nature through words. Yet his knowledge of the debate might had been more extended. He probably knew the seventeenth century discussion concerning the real characters and Bacon's linguistics. He was certainly acquainted with John Wilkins's work, as he noted it in his "Book of References". It is a ponderous notebook, still stored in the John Rylands Library's archive, containing the references to several books Jevons found worthy of reading. The book mentioned was the *Essay towards a Real Character and a Philosophical Language* and it was attached to the voice "language" (Jevons's archive: Jevons's Family Papers, 6A/6/4/13, The Book of References). Jevons added that it was a remarkable piece of work.

As for Wilkins, he shared the Baconian "distrust of language"[95]. He primarily aimed at outlining a "*Real universal Character*, that should signify not *words*, but *things* and *notions*, and consequently might be legible by any Nation in their own Tongue" (Wilkins, 1668, part I, 13, [III, 5]). Wilkins admitted, showing a considerable similarity to Jevons's account, that people generally shared the same internal notions or apprehensions of things. Unless that they had many conventional names related to these internal notions. Therefore, the

[94] For an extensive treatment of artificial languages, in relation to Bacon's linguistic problematic, see Formigari, 1970.

[95] The expression, very famous indeed, was Richard Foster Jones's formulation; see Foster Jones, 1932.

curse in the confusion of tongues could only be broken by establishing a biunivocal correspondence between the notion and its expression. Wilkins wanted to create thus a new, artificial language: simple, useful, and, more importantly, truly representing the essence of things. Due to its own qualities, such a philosophical language would have spread spontaneously (see Wilkins, 1668, part I, 20, [V, 2]).

Introducing his *Essay*, in the "Epistle to the Reader", Wilkins explained his own past mistake in this regard. He considered the Hebrew as a suitable basis for such a universal language, as it consisted of few radicals. For him it had therefore seemed the best possible choice in order to express the Baconian "radical words". Thus Wilkins held that every design of a universal language so far attempted, including his own, was mistaken in its foundations. They all started from existing languages, while a true philosophical language had to account for the nature of things. Accordingly, they ought to start from things themselves. This idea was mirrored in the tables that Wilkins had started to redact before writing the *Essay* (see Wilkins, "Epistle to the Reader"). The success of a universal character depended in fact on this imposing classificatory endeavour: the "just *Enumeration* or description of such things or notions as are to have *Marks* or *Names* assigned to them" (Wilkins, 1668, part I, 20, [V, 3]).

This encyclopaedic effort, which is reminiscent of Bacon's tables, had to provide the material for the universal character. In the wake of this classification, Wilkins's language associated some syllables to the genuses. The species would then be specified, according to their ontological differences, with the addition of a consonant. Thus, this artificial language showed a combinatorial nature: adding the appropriate differences, Wilkins composed the words starting from their supposed essential elements (Wilkins, 1668, 414-420, part IV [III]). The combinatorial process, which recalled Llull's *ars magna*, would have produced the new words of the philosophical language.

Now, what did Wilkins and Jevons have in common? What could have aroused Jevons's interest in Wilkins's work? Their connection primarily consisted in what they drew from Bacon: the distrust of language. Wilkins wanted

to get rid of natural languages. They were ambiguous, obscure, ill-suited to the scientific research. For his part, Jevons thought that logic had to correct the common mistakes of ordinary language. For him as well the everyday language was mischievous (see Jevons, 1890, 148)[96]. Given this mistrust, it is not surprising that Jevons could have appreciated Wilkins's project. And yet Jevons envisaged a different solution for the same problem. Jevons didn't believe that the solution to the faults of ordinary language was to create an artificial idiom. His *ars combinatoria* was a structure, a *syntax*. On the contrary, Wilkins's artificial language had to create a syntax as well as a semantics. Furthermore, the rules of Jevons's syntax come from elsewhere. If Wilkins founded his language on the classification of reality, Jevons trusted the laws of thought and the theory of probability.

On the other hand, Jevons's logic and Wilkins's philosophical language had in common the arbitrary character of signs. Wilkins's philosophical language even associated conventional syllables and letters to the genuses and species denoted. However, Wilkins was persuaded that his language had to catch the primary elements of reality. His new words demanded a connection with the constituents of reality for the project to have any value. Jevons's logic did associate arbitrary letters to denote the terms. However, Jevons had no pretention to grasping the radical words, the basic units of meaning composing reality. His depiction of reality depended on its *relational* aspect. The Logical Machine represented the combinations of the terms given the laws of thought and the logical principles. But the terms involved in this calculation weren't the primary constituents of reality at all.

In Jevons's opinion, symbols were imperfect tools. Consequently, we couldn't see the world but *en ainigmati*. Even admitting that the signs could grasp the real objects of the world, Jevons's interest was elsewhere. He wanted to depict the relations of phenomena, the concatenations of events. The constituents of reality were not some real elements from which the world had origi-

[96] Here Jevons explained that the use of letters in the place of terms could provide clarity and brevity to the reasoning process.

nated. Those primary elements were the laws of nature and of thought, namely the principles of combinations. Hence the syntactic character of his *ars combinatoria*. Let us then link Jevons with a philosopher who had bent the rules of *ars combinatoria* in a similar direction, *i.e.* Gottfried Wilhelm Leibniz.

A syntax of combinations

The dream of realizing an *ars combinatoria* was a long-lasting one for Leibniz. The project of a *characteristica universalis*, a universal language, engaged him throughout his life, undergoing different phases and theoretical changes. He was acquainted with the English treatises concerning a real character, from which he probably drew the term '*characteristica*'. However, he nurtured this interest independently of them, from his youth[97]. Indeed his very first work was a *Dissertatio de arte combinatoria* (Leibniz, 1875-1890, Vol. IV, 27-102), which he presented in 1666 to get a teaching position in the university of Leipzig [98]. In his mind this art was revolutionary. It was meant to cast a new light on the two traditional branches of logic, as illustrated by Porphyry and then Boethius: the *ars inveniendi* and the *ars demonstrandi* (Leibniz, 1966, XII). Here Leibniz wrote as follows:

> Since everything which exists or which can be thought must be compounded of parts, either real or at least conceptual, whatever differs in kind must necessarily either differ in that it has other parts, hence the use of complexions; or by another situs, hence the use of dispositions. The former are judged by the diversity of matter; the latter, by the diversity of form. With the aid of complexions, indeed, we may discover not only the species of things but also their attributes. Thus almost the whole of the *inventive* part of logic is grounded in complexions – both that which concerns simple terms and that which concerns complex terms; in a word, both the doctrine of *divisions* and the doctrine of *propositions*; not to mention how much we hope to illumine the *analyt-*

[97] Concerning Leibniz's knowledge of the search for a universal language in the English philosophy see Maat, 2004.

[98] See Parkinson's introduction to his translation of some of Leibniz's logical writings (Leibniz, 1966, XI-XII).

> *ic* part of logic, or the logic of judgment, by a diligent examination of the modes of the syllogism (Leibniz, [1956] 1989, 80-81).

Leibniz argued that everything was composed of parts. Therefore, there were two ways in which things were distinct from each other: either they were composed by different parts, or the parts were the same but had a different order. In the first case the objects could be compared by using the theory of combinations, which Leibniz called *complexions*. In the second case, we had to rely on the permutations, which here are called *dispositions*.

Now, Leibniz's *ars combinatoria* owed its relevance to an ontological quality, namely the fact that everything was composed of parts. Every logical procedure thus relied on the possibility of defining those parts: "in order to determine a certain complexion, however, the greater whole is to be divided into equal parts assumed as minima (that is, parts now not to be considered as further divisible)" (Leibniz, [1956] 1989, 78). These were the atomic components of a complexion. Accordingly, Leibniz defined a complexion composed of two prime terms a "com2nation", whereas one composed of three was a "com3nation" and so on (Leibniz, [1956] 1989, 78).

Leibniz returned to this idea some years later, in a text written in 1679. In these pages, whose title was *Elementa characteristicae universalis* (Leibniz, 1903, 42-92), Leibniz argued that every term could be attributed a *numerus characteristicus* (a "symbolic number"[99]), according to its definition. A prime term was denoted by a single number, whereas a complexion's number resulted from the multiplication of its components' numbers. For instance, the term 'man' was defined by the concepts of animal and that of rationality: it was therefore a "com2nation", in *De arte combinatoria*'s words. Attributing the number 2 to 'animal' and the number 3 to 'rational', the *numerus characteristicus* of 'man' turned out to be 6 (2 x 3). There was a simple method then to determine if a proposition was true or false. We had to divide the symbolic number of the subject by the one of the predicate (Leibniz, 1903, 42-43). If the result was a whole number, the proposition would be true. These were some ex-

[99] I rely on Parkinson's translation (Leibniz, 1966, 17).

amples of Leibniz's famous *characteristica*, a symbolic language that acted like a calculus of terms[100].

In these texts Leibniz seemed to suggest that we *could* find those prime indivisible elements or concepts, which he later called "primitives". The primitives were indeed those "indefinable concepts", concepts that were the mark of themselves only. As such, they were "irreducible and to be understood only through itself and therefore lacks requisite marks" (Leibniz, [1956] 1989, 292). Was this really the case though? Could we grasp the primitives? This point was a very controversial one. In *De arte combinatoria* he did suggest that without a definition of those atomic parts the art could never function. Moreover, in *De organo sive arte magna cogitandi*, in 1679, he held that "it is the greatest remedy for the mind if a few thoughts can be found from which infinite others arise in order" (Leibniz, [1934] 1997, 1)[101].

Could those few prime thoughts be found eventually? Let us look at this task in the light of the *Monadology*, the most famous of Leibniz's metaphysical texts. Here (§61) he addressed the notion of compound, which is notably related to the *ars combinatoria*'s project:

> Compound beings are in symbolic agreement with the simple. For everything is a plenum, so that all matter is bound together, and every motion in this plenum has some effect upon distant bodies in proportion to their distance, in such a way that every body not only is affected by those which touch it and somehow feels whatever happens to them but is also, by means of them, sensitive to others which adjoin those by which it is immediately touched. It follows that this communication extends to any distance whatever. As a result, every body responds to everything which happens in the universe, so that he who sees all could read in each everything that happens everywhere, and, indeed, even

[100] The word 'character' was for Leibniz a synonym of 'symbol'; see Leibniz, 1875-1890, Vol. VII, 31, where we read: "*Omnis Ratiocinatio nostra nihil aliud est quam characterum connexio et substitutio, sive illi characteres sint verba sive notae, sive denique imagines*"; see also Leibniz, 1875-1890, Vol. VII, 131, where 'character' is a synonym of 'sign'.

[101] The text was first published in Couturat's edition; see Leibniz, 1903, 429-432. For the English translation see Leibniz, (1934) 1997, 1-4.

> what has happened and will happen, observing in the present all that is removed from it, whether in space or in time. "All things are conspirant", as Hippocrates said. But a soul can read within itself only what it represents distinctly; it cannot all at once develop all that is enfolded within it, for this reaches to infinity (Leibniz, [1956] 1989, 649).

The whole universe was in each monad. The world as Leibniz saw it was kaleidoscopic: an endless game of mirrors, where every part referred to all the others.

The analysis of such a passage raises a crucial question related to the *ars combinatoria*: how could we find the primal elements of reality? Once admitted that everything was in connection with everything else, such a task was doomed to failure. The compounds and the simple things were constantly referring to each other. Every single act reverberated in every part of the universe, in an infinite warp and weft of relations. The same thought was also formulated in a short but extremely relevant text, *i.e. Primae Veritates* (Leibniz, 1903, 518-523). As Leibniz argued here, "*there are no atoms*; indeed, there is no body so small that it is not actually subdivided. […] Hence it follows that *every small part of the universe contains a world with an infinite number of creatures*" (Leibniz, [1956] 1989, 269-270). Eventually, finding the fundamental constituents of reality was not only impossible, but also absurd. Everything was in everything else. There was no such thing as a prime element.

What kind of consequences did this thought have on the *ars combinatoria*? At first we could be tempted to assume that in this framework no such art would ever be possible. Nevertheless, this wasn't the end of Leibniz's dream. He recalled the steps of his *characteristica* in a text entitled *Historia et commendatio linguae characteristicae* (Leibniz, 1875-1890, Vol. VII, 184-189). Through these pages Leibniz evoked at once the origins and the future hopes of his own art. Its roots were as old as Pythagoras, according to whom the numbers were the core of reality. This endeavour was then, in Leibniz's eyes, an attempt of redacting an alphabet of human thoughts. These primitive thoughts would have been given a number, the mentioned *numerus characteristicus*.

Combining the letters of this alphabet and analysing the compound terms, one would have been able to judge and discover everything.

This was indeed the project that Leibniz had described in his *De arte combinatoria*. However, when he wrote the *Historia et commendatio*, between 1679 and 1680, he was still persuaded that this art was possible as well as necessary. Once we had the symbolic numbers of the metaphysical and moral notions, we would have a new, marvellous reasoning instrument. Leibniz even argued that this instrument would enable us to weigh the pros and cons of a decision, making his calculus very similar to the utilitarian calculus of pleasures and pains. The *characteristica* would also be a tool for comparing the different positions in a dispute. We could measure our arguments, thus avoiding many harsh controversies. Lastly, this *ars* would clear the way for religious conversion, since it would prove the soundness of true religion with impeccable demonstrations. Leibniz showed thus that his interest was political: like Llull's *ars magna*, the *characteristica* ought to be an instrument for bringing everyone together in a reconciled Christianity[102].

However, Leibniz knew that his task depended on the identification of the prime elements. He was also aware that this project could be inconsistent with metaphysical beliefs. He therefore addressed this topic in the final passage of the *Historia and commendatio*, writing as follows:

> But we must go beyond words. It is difficult to establish the symbolic numbers of those few things which are different from any other, because of the things' marvellous intertwinement. Therefore I believed that I contrived an elegant device, by the means of which it is possible to demonstrate that all reasoning can be proved by numbers. I behave as if such remarkable symbolic numbers were already given. Then, taking into account a certain general quality of their own, I assume in the meanwhile some other numbers, which are consistent with this quality. Using them, I prove all the logical rules in a remarkable order, and I show how to estimate if some argumentations are formally valid. Then we could easily and veritably determine if the argumentations are truly valid and conclusive with respect to their subject matter, without any

[102] Josep E. Rubio highlighted how conversion was the real purpose of Llull's art: see Rubio, 2018, 82; this theme is also central in Hames's account (see Hames, 2000).

> intellectual effort or risk of error, only once we had the real symbolic numbers of things (Leibniz, 1875-1890, Vol. VII, 189, my translation)[103].

The relevance of this passage for our topic could hardly been underestimated. Here Leibniz showed how to avoid the problem of identifying the primitives. One could make *as if* there were some, postulating the symbolic numbers of things and developing the reasoning accordingly.

I translated the verb '*fingo*' with 'behave as if' to highlight the *hypothetical* nature of Leibniz's 'elegant device'. Rossella Fabbrichesi, professor of Theoretical Philosophy at the University of Milan, suggested that Leibniz's philosophy could be considered as centred on the 'as if' (Fabbrichesi, 2000, 93). Leibniz encouraged the use of quantities of complexions *as if* they were the actual symbolic numbers. He invited us to consider the primal elements *as if* they were the primitive constituents of thought and reality. In Leibniz's opinion the destiny of his *ars combinatoria* depended on the soundness of our knowledge. In this regard he agreed with Wilkins. Though for Leibniz we must not expect to have completed the encyclopaedia *before* using the calculus. Meanwhile, we could use it in this hypothetical way, since it would be a precious tool in arguments and discussions. "*Car alors raisonner et calculer sera*

[103] I transcribe here the original latin: "*Sed ultra verba eundum est. Cum vero ob admirabilem rerum connexionem paucarum rerum ab aliis diversarum Numeros characteristicos dare difficillimum sit, ideo elegans ni fallor artificium excogitavi, quo ostendi possit, quod ratiocinationes per numeros comprobare liceat. Fingo itaque Numeros characteristicos illos, tantopere mirabiles, jam dari, observataque illorum generali proprietate quadam, tales numeros qualescunque ei proprietati congruentes interim assumo, iisque adhibitis statim mirabili ratione omnes regulas Logicas per numeros demonstro et ostendo, quomodo cognosci possit an argumentationes quaedam sint in forma bonae. An vero argumenta vi materiae bona sint aut concludant, tum demum sine ullo labore animi aut errandi periculo judicari poterit, cum ipsi veri Numeri Characteristici rerum habebuntur*".

la même chose" (Leibniz, 1903, 28)[104], as he wrote commenting on Descartes's letter to Mersenne[105].

It was a fruitful make-believe. Moreover, it was a *necessary* make-believe, in the absence of which we couldn't utter a word. Indeed, both Jevons and Leibniz thought that everything required the signs to be expressed. Every human exchange, every reasoning process, every scientific enterprise demanded the signs. On this topic Leibniz was even more positive than Jevons. In *De cognitione, veritate et idea* Leibniz explained the functioning of signs, giving us a glimpse of their power:

> For the most part, especially in a longer analysis, we do not intuit the entire nature of the subject matter at once but make use of signs instead of things, though we usually omit the explanation of these signs in any actually present thought for the sake of brevity, knowing or believing that we have the power to do it. Thus when I think of a chiliogon, or a polygon of a thousand equal sides, I do not always consider the nature of a side and of equality and of a thousand (or the cube of ten), but I use these words, whose meaning appears obscurely and imperfectly to the mind, in place of the ideas which I have of them, because I remember that I know the meaning of the words but that their interpretation is not necessary for the present judgment. Such thinking I usually call *blind* or *symbolic*; we use it in algebra and in arithmetic, and indeed almost everywhere. When a concept is very complex, we certainly cannot think simultaneously of all the concepts which compose it. But when this is possible, or at least insofar as it is possible, I call the knowledge *intuitive*. There is no other knowledge than intuitive of a distinct primitive

[104] "Because then reasoning and calculating shall be the same thing" (my translation); G. W. Leibniz, 1903, 28.

[105] As all the argumentation I developed here is drawn from Leibniz's commentary on this letter, I quote the entire passage: "*Cependant quoyque cette langue depende de la vraye philosophie, elle ne depend pas de sa perfection. C'est à dire cette langue peut estre établie, quoyque la philosophie ne soit pas parfaite: et à mesure que la science des hommes croistra, cette langue croistra aussi. En attendant elle sera d'un secours merveilleux et pour se servir de ce que nous sçavons, et pour voir ce qui nous manque, et pour inventer les moyens d'y arriver, mais sur tout pour exterminer les controverses dans les matières qui dependent du raisonnement. Car alors raisonner et calculer sera la même chose*" (Leibniz, 1903, 28).

> concept, while for the most part we have only symbolic thought of composites (Leibniz, [1956] 1989, 292).

As Leibniz held, the knowledge of a primitive notion could only be intuitive. Nevertheless we rarely get this sort of understanding. Mostly we think and reason *through signs*. And only thanks to signs could we start thinking, reasoning. Thanks to signs, we can fashion a chain of argumentation even though we don't have a clear intuition of every notion included in the reasoning process. Just like we do in a geometrical demonstration. Therefore, the core of Leibniz's *ars combinatoria* turned out to be its *syntactic nature*. Notwithstanding our ignorance of the primitives, the reasoning chain of signs was able to work anyway. The guarantee of its truth wasn't the correspondence between signs and the first constituents of reality: it was its inner structure. That was why Leibniz compared this mechanism with algebra. Thus we understand that for him the *mathesis universalis* was something more than a struggle to measure everything. His art was akin to algebra not only because it attached numbers to things, but also – and more importantly – because it had the same functioning. Algebra was a *blind* thinking, as well as his *ars combinatoria*, meaning that we were not bound to define the elements in use at every turn of the process. Eventually its course would drag us to a new conclusion, a deduction, or a discovery – being an example of *ars inveniendi*. This chain didn't rely on the meaning of each element, but rather on their connections.

Now, among all the projects of an *ars combinatoria*, Leibniz's one was the most akin to Jevons's. As I have argued above, Jevons's Logical Alphabet represented the world's structure. As such, the terms he used had nothing in common with the things denoted. At every turn we drew the Alphabet, the content of the terms could change. What persisted was their order, or their syntax. The similarity with Leibniz is stunning indeed. Both Leibniz and Jevons had lost the faith in the possibilities of immediately grasping the primitives, the constituents of reality. Furthermore, the primitives changed from Leibniz to Jevons. If for the first they were the primal concepts of intellect, for the latter the constituents of reality were *the rules ordering it*.

As I have shown, the Alphabet sprung from the laws of thought and logic. Moreover, the actual combinations of phenomena were regulated by the laws of nature. These laws, governing at once the phenomena and our ways of depicting them, were the prime elements of reality. They were the secret keys that God had hidden in the world, according to Jevons's reinterpretation of the *clavis universalis*. For Jevons one didn't have to identify the complexions' atoms, in Leibniz's terms. The key for deciphering reality was understanding the laws of combinations, namely the natural laws.

Jevons and Leibniz disagreed concerning the nature of signs as well. Jevons, due to his empiricist account, nurtured a *nostalgia* for things. To him the signs were defective, dimly alluding to things themselves. Leibniz's position was different. In a letter to his friend Tschirnhaus, where he was concerned with distinguishing the algebra and his art, he wrote that

> no one should fear that the contemplation of characters will lead us away from the things themselves; on the contrary, it leads us into the interior of things. For we often have confused notions today because the characters we use are badly arranged; but then, with the aid of characters, we will easily have the most distinct notions, for we will have at hand a mechanical thread of meditation, as it were, with whose aid we can very easily resolve any idea whatever into those of which it is composed. In fact, if the character expressing any concept is considered attentively, the simpler concepts into which it is resolvable will at once come to mind. Since the analysis of concepts thus corresponds exactly to the analysis of a character, we need merely to see the characters in order to have adequate notions brought to our mind freely and without effort. We can hope for no greater aid than this in the perfection of the mind (Leibniz, [1956] 1989, 193).

After all, we had nothing but signs. Jevons intuited this possibility when he said that the signs were always needed to express thoughts. He did not draw the consequences of it though, as Leibniz did in this passage.

Jevons and Leibniz had similar positions from some points of view. For instance, they both shared a belief that the reasoning process was a mechanical one. Once the machine had started, its functioning didn't depend on human mind. Jevons explained it remarkably when he argued that the laws of thought regulated both the mind and the things. However, Leibniz and Jevons differed

regarding the problem of correspondence between signs and the things. In final part of the passage quoted from the *Historia et commendatio*, Leibniz seemed to suggest that the conclusiveness of reasoning eventually rested on the discovery of the real numeric characters. Nevertheless, all the passages analysed hinted at a different position. The blind thought was able to work autonomously, since it was also an *ars inveniendi*. Even admitting that we could never have any idea of the primitives, Leibniz's *ars* would still retain its value. In Leibniz's construction truth eventually moved apart from the correspondence between signs and things, as Fabbrichesi has noted (Fabbrichesi, 2000, 94).

By contrast, Jevons's logic was no *ars inveniendi*. He stated that deduction only unfolded some knowledge we already had (Jevons, [1874] 1877, 118). In Jevons's eyes, knowledge ultimately came from experience (Jevons, [1874] 1877, 12). But experience couldn't access the interpersonal level of knowledge without signs. Humans required language. Hence Jevons's account brings to mind Dante's *De vulgari eloquentia* (1302-1305), according to which

> of all creatures that exist, only human beings were given the power of speech, because only to them was it necessary. It was not necessary that either angels or the lower animals should be able to speak; rather, this power would have been wasted on them, and nature, of course, hates to do anything superfluous. Now, if we wish to define with precision what our intention is when we speak, it is clearly nothing other than to expound to others the concepts formed in our minds (Alighieri, [1302-1305] 1996, book I, [II, 1-2], 4-5).

Language was meant, here as well as in Jevons's account, to share ideas with others. As Dante explained in the following passage, angels didn't require any idiom because their thoughts were manifest to their own kind, thanks to their extraordinary intellectual faculties (Alighieri, [1302-1305] 1996, book I [II, 2-4], 4-8). Animals were guided by instinct. Their behaviours and passions were all the same, so that animals didn't need words to understand each other (Alighieri, [1302-1305] 1996, book I [II, 4-7], 6-15). Language solely pertained to humans.

This was also true from Jevons's point of view. In his eyes as well humans were different from angels and animals. They possessed rationality, which dis-

tinguished them from animals. And still they differed from superior creatures because they needed signs to express themselves to others. Therefore language was the mark of human deficiency. Humans, as earthly creatures, were finite. Language was the prerogative of darkly wise beings, whose knowledge was uncertain and probable, whose words were dim allusions to things.

CHAPTER 2

HUMANS AND SOCIETY AS THEY ARE AND OUGHT TO BE

Jevons's moral and political thought

2.1. Nineteenth century Unitarians

In 1836 a Liverpool minister, still young but destined to gain notoriety, conducted an inquiry concerning authority in religious matters. In this work, he launched an attack on the Unitarians, whose cold faith was in his mind unappealing:

> The Unitarian takes with him the persuasion that nothing can be scriptural which is not rational and universal, and he finds a preceptive system, in which local and circumstantial beauties are frittered into cold ethical generalities, and a doctrinal theory, in which burning orientalisms are turned into pale and sickly truisms (Martineau, [1836] 1845, 60).

At a first sight we could be inclined to think such an attack came from an Evangelical, who were known for their scepticism with regard to Unitarian positions. We couldn't be further from the truth: it is James Martineau, probably the most famous among nineteenth century Unitarians.

Given that the Unitarian creed underwent significant change during the Victorian age, Martineau's attack would be understandable[1]. Some of his ad-

[1] Concerning the rift between the two groups within the Unitarianism, one endorsing reform and the other wanting to conserve the organization and doctrinal core, see: Wilbur, 1945, 367-368 and 372; Webb, 1990, 126-149; Greenwood, Harris 2011, 49; Ledger-Lomas, 2017, Vol. III, 99-123 and 102-103.

herents rejected the iconic personalities of Unitarianism, like Joseph Priestley. They also refused the precepts of utilitarian philosophy, which had long been linked to Unitarianism. They were even loath to call themselves 'Unitarians', believing that this name was too strong a reference to a sectarian attitude. They had to abandon such a denomination if they wanted to gain more respect from Anglicans and other Dissenters[2]. The leader of the so-called reformists was James Martineau himself, together with his colleagues in Liverpool, John Hamilton Thom and John James Tayler. A strong influence on this group came from the other side of the ocean, from the famous American minister, William Ellery Channing. Arthur Boggs, professor of English at Portland State College, Oregon, has argued in the Transactions of the Unitarian Historical Society that very few ministers followed Martineau (Boggs, 1966, 149, n. 34). While it may have been a small group, it was a highly influential one due to the popularity of its members.

Taking into account what happened within Unitarianism during the nineteenth century is particularly important to studying Jevons's thought. Liverpool was an important centre in the initial phase of these reforms, as was Manchester, once John Tayler and James Martineau began teaching at Owens College (see Waller, 1986, 235). Jevons was also personally acquainted with some of the reformists, firstly with James Martineau, both because of his family relations[3] and because Jevons attended Martineau's lectures on mental philosophy at Manchester New College, in London (Jevons, 1972-1981, Vol. II, 421). As noted above, few scholars have focused on the influence of Unitarianism on

[2] On the name 'Unitarian', which James Martineau was willing to relinquish, see: Webb, 1988, 146. Martineau's distastes of the name 'Unitarian' was also apparent in his project of founding a Church detached from doctrinal and sectarian character, *i.e.* the Free Christian Union; with regard to this project, see Ledger-Lomas, 2010.

[3] The two families, both Liverpool Unitarians, were well acquainted: Jevons's older sister Lucy had even been engaged to Russell Martineau, son of James Martineau, but she broke off the engagement; see Könekamp, 1972-1981, Vol. I, 11. Another reference to Mrs. Martineau from Herbert Jevons, Stanley's brother, shows that the two families were connected: see Jevons, 1972-1981, Vol. II, 13.

Jevons's thought, Bert Mosselmans the exception who proves the rule (Mosselmans, 2007, chap. 6). Mosselmans, however, has not taken into account the division between these two trends, that is, between those endorsing reform and those opposing it. Instead, I consider that this topic cannot be neglected in a study of Jevons's religious inclinations.

The current presentation of the debate between the endorsers and opponents of reform in the Unitarian context will be mainly focused on two people: James Martineau and William Gaskell. Martineau was the leader of the reformists, whereas Gaskell was still attached to the traditional forms of the Unitarian creed. Apart from the unquestionable popularity of these ministers, the choice of focusing on them is due to their connections with Jevons. As I have noted, Jevons became acquainted with Martineau through his lectures. Gaskell had been appointed minister at Cross Street Chapel in Manchester in 1828 (Brill, 1984, 26). He lived in Manchester and preached there all his life: he gave his last sermon at Cross Street on the 13th January 1884 (Brill, 1984, 117), the same year of his death. As we know, Jevons was in Manchester between 1863 and 1876. Moreover, Gaskell was Jevons's colleague at Owens College, where he was a lecturer in English Literature from 1861 on (see Jevons, 1972-1981, Vol. III, 94, n. 3).

In Jevons's correspondence we can find a reference to Gaskell. Edward John Broadfield, journalist and early student at Manchester College, wrote to Jevons as follows: "I have been continuing to act as a substitute of Mr. Gaskell since I saw you" (Jevons, 1972-1981, Vol. III, 94)[4]. Broadfield's way of referring to the Cross Street minister, calling him simply by his family name and without introducing him, suggests that Jevons was acquainted with Gaskell. Hence, the latter could be a fair representative of the link between Jevons and the positions of the opponents to Martineau.

Together with Martineau's and Gaskell's, I take into account other people's positions. The most important among them is William Ellery Channing's. I have chosen to pay some attention to Channing by virtue of his connection to

[4] For Edward John Broadfield, see Jevons, 1972-1981, Vol. III, 70, n. 1.

Martineau. Furthermore, some of Channing's lectures, such as *Likeness to God* and *Self-culture*, are important for our purposes. Not to mention that Jevons was probably acquainted with Channing's works, as his correspondence suggests[5]. I now describe further the gulf dividing the Unitarian Church in the Victorian age. I focus in particular on the following points: the relation between determinism and free will, with reference to the rejection of Priestley's determinism, or what he called 'philosophical necessity'; the criticism of Utilitarianism and the morality of punishments and rewards; the preference of the reformists for inner faith and the stress on religious sentiments; and the opposition between reason and sentiment.

"A millstone round the neck"

Unitarianism had been entwined with determinism from its very birth. Joseph Priestley, one of the founding fathers of English Unitarianism, was the herald of philosophical determinism. Priestley was a follower of Hartley's Associationism, of which he learned while studying at Daventry Academy in the 1750s[6]. As Priestley explained in *The Doctrine of Philosophical Necessity* (1777), "there is some *fixed law of nature respecting the will*, as well as the other powers of the mind, and every thing else in the constitution of nature" (Priestley, 1777, 7). In Priestley's account, every act was determined by a cause, namely a motive, being thus bound to causal laws. These laws took roots in the sensations of pleasure and pain: our encounter with certain objects provided us with pleasurable or painful sensations. The repetition of these actions created certain habits, the main purpose of which being seeking pleasure and avoiding pain (Priestley, 1777, 36-37)[7]. Choices were thus determined by the

[5] See Jevons, 1972-1981, Vol. II, 292, where Jevons informed his brother that he was reading a lecture of Channing about labour. The editors connected this reference to the following text: Channing, (1840) 1903, Vol. V.

[6] On the relation between Priestley and Hartley, see Webb, 1990, 127-128.

[7] Here Priestley elucidated this mechanism, stating that it derived from Hartley's Associationism.

state of mind of the subject, namely his inclination or disinclination towards the object considered and the views of the ditto (Priestley, 1777, 26). The affections of the mind, informed by sensations of pleasure and pain, had the same inescapable power that gravity exercises on a stone (Priestley, 1777, 27).

Many Unitarians discovered this doctrine in Priestley's texts and in his followers, the most famous of whom was Thomas Belsham (Webb, 1990, 131). The Warrington Dissenting Academy, where Priestley had a teaching appointment from its foundation in 1757, was an important channel for spreading of his doctrines (see Wilbur, 1945, 295)[8]. However, the allegiance to determinism was undermined by the reformists in the 1830s. The attack came from Martineau, in the context of the so-called Liverpool Controversy. Given the influence of Unitarianism in Liverpool, in 1839 the Anglican minister Fielding Ould invited the Liverpool Unitarians to attend some lectures of orthodox priests showing the errors of Unitarian creed. Martineau and his colleagues John Hamilton Thom and Henry Giles consented. It became a doctrinal battle, where the Anglican and Unitarian ministers publicly argued with each other[9]. Martineau gave five lectures. One of them, entitled *The Christian View of Moral Evil*, presented a sharp attack against the doctrine of philosophical necessity.

Priestley thought that embracing a deterministic position was the only way to be consistent with the doctrine of divine prescience: as he wrote, "if man be possessed of a power of proper *self-determination*, the Deity himself cannot controll it […] and if he does not *controll* it, he cannot *foresee* it" (Priestley, 1777, 21). Hence, everything was determined by God and was part of His plan. And thus – Martineau objected – sin, suffering and evil would be a part of God's plan too. This philosophical argument was almost blasphemous in Martineau's eyes, attributing evil things to an allegedly benevolent God (Martineau, 1839a, 12 and 41).

[8] On Warrington Academy also see Raymond, Pickstone 1986, 130-133.

[9] On this subject matter see: Wilbur, 1945, 355; Waller, 1990, 245; 1994. The lectures are gathered in two volumes: Ould et alt., 1839; Giles, Martineau, Thom 1839.

Moreover, such a position attributed an external source to human wickedness. As Martineau believed, any doctrine of this kind couldn't but jeopardize the sense of individual responsibility, which in his mind was a distinguishing feature of Christianity (Martineau, 1839a, 34). Philosophical necessity favoured the passive virtues over the active ones, discarding the sense of duty and obligation. Martineau feared that

> he who is haunted by the immutability of things, and feels himself locked in with, the universal mechanism, will chafe himself with no rash spirit of resistance, nor vainly thrust his hand against the fly-wheel of nature (Martineau, 1839a, 41).

According to the doctrine of philosophical necessity, God was primarily the first cause, and the divine infinitude was worshipped more than His sanctity and His moral attributes (Martineau, 1839a, 44-45). To Martineau this was utterly unacceptable.

Martineau had been much influenced by Hartley and Priestley in his youth; an inescapable influence, given that he was educated at Manchester College, in York, where the Priestleyan tradition was strong[10]. When a minister in Liverpool, Martineau began to drift away from the two deterministic thinkers. In 1833 he published three articles on Priestley in the *Monthly Repository*, acknowledging his debt towards him as well as their differences of opinion[11]. As Ralph Waller has remarked, William Ellery Channing played a considerable role in Martineau's change of allegiance (Waller, 1986, 244-245). The American preacher was so pleased with Martineau's extensive criticism of determinism that he wrote him to express his appreciation:

> The part of your discourse which gave me the sincerest delight, and for which I would especially thank you, is that in which you protest against the doctrine of philosophical necessity. Nothing for a long time has given me so much pleasure. I have felt that that doctrine, with its natural connections, was a millstone round the neck of Unitarianism in England. I know no one who has so clearly and strongly pointed out as

[10] On Martineau's education, see Waller, 1986, 228-232.

[11] These papers are now collected in Martineau, 1890.

> yourself its inconsistency with moral sentiments in God, and with the exercise of moral sentiments towards him by his creatures (Channing, 1880, 447).

When he wrote this letter to his British colleague, Channing had already being publicly critical of Priestleyan determinism. And these commentaries inspired many ministers overseas, including Martineau, Thom and Tayler (see Wach, 1993, 455-456). As early as 1819, during the famous Baltimore Discourse, Channing made his opposition to determinism clear. Had God an irresistible power over the human heart, humans would be deprived of every sense of moral responsibility and God would turn out to be the cause of every evil deed. Humans would be nothing but machines (see Channing, 1819, 67). In a sermon called *Likeness to God* (1828), Channing made his position even clearer, stating as follows:

> Man has animal propensities as well as intellectual and moral powers. He has a body as well as mind; He has passions to war with reason, and selflove with conscience. He is a free being, and a tempted being, and thus constituted he may and does sin, and often sins grievously (Channing, 1828).

Humans were free beings. They could do either good or evil, behave well or sin. That was why the likeness to God and His moral attributes were essential to Channing. In this view, God was a model of moral behaviour and humans had the capacity of coming closer to Him.

Humans were no machines, Channing argued. This meant they were endowed with a free will, as Martineau stated too. Both Martineau and Channing felt that denying the existence of such a free will would imply the denial of moral responsibility. Their battle against the doctrine of philosophical necessity was first and foremost driven by that reason. Martineau committed to this position in the Liverpool Controversy:

> Let each consider his own life as an indivisible unit of responsibility, no less complete, no less free, no less invested with solemn and solitary power, than if he dwelt, and always had dwelt, in the universe alone with God. […] We cannot, by ancestral or historical relations, renounce

> our own free-will, or escape one iota of its awful trusts. No faith which fails to keep this truth distinct and prominent, no faith which shuffles with the sinner's moral identity, contains the requisites of a 'doctrine according to godliness' (Martineau, 1839a, 37-38).

When it is a matter of how to behave, everyone is alone before God and the choice is each of our own.

If the endorsers of the 'new school' were eager to mark their difference from Priestley and his philosophical doctrines, this wasn't the case for all Unitarians. Gaskell kept true to the founding father of English Unitarianism. As the historian Robert K. Webb has written, "the Priestleyan verities ran like a ground bass through all he did and said" (Webb, 1988, 152). There are notably two sermons showing these influences. The first one is the sermon given at the death of his friend John Ashton Nicholls. This was a profession of faith of the materialism and determinism of Priestley. Not that Gaskell or Priestley denied the resurrection of the dead. Spirit is not confined to our mortal flesh. Nonetheless, Gaskell described death in terms of decomposing particles:

> What, then, is Death? […] It is not destruction. Nothing in the universe is ever destroyed, nothing ever allowed to perish. Go question Science, and it will assure you of that. It will shew you, that not a single particle of matter is ever lost. You may compose or decompose the substances in nature to infinity, but put them out of existence you cannot. Even the fire, which is deemed so destructive an agent, does not really destroy, but always resolve things into their elements. This teaches us with regard to the body, that though it will undergo great changes, and assume new forms, and enter into fresh combinations, it can never be annihilated (W. Gaskell, 1859, 9).

Gaskell didn't hesitate to use a scientific vocabulary, mentioning elements and combinations. He used a chemist's language – the kind of argument which Priestley would have much appreciated.

Perhaps Priestley would have appreciated even more Gaskell's following remark on the divine government: "Divine Providence", as the Manchester preacher stated, "[…] for our good, has placed us under a severe and painful system of discipline. It is by the same agency that we are trained for a new and higher condition of being" (W. Gaskell, 1859, 12). Although Gaskell always

depicted God as a benevolent Creator[12], he acknowledged the role of God in shaping our moral behaviour. This feature of God's plan was also very apparent in a sermon Gaskell preached in 1878. Here, he stated that nature had a fixed course: vice inevitably produced punishment; virtue necessarily brought reward. The world has its immutable order and only thanks to it alone we can shape our demeanour. As Gaskell said,

> it is pervaded by universal relations and dependencies, their foundation is laid for our instruction and guidance. By these means the sciences are built up; by these means the ultimate object of the world's existence is discovered; and by these means we turn from the present to the past, and bring back to us lessons of an important and valuable kind (W. Gaskell, as quoted in Webb, 1988, 152).

God's government is as ordered as a clock. That is why we can – and ought to – make inquiries concerning the moral character and the consequences of our actions, as Gaskell himself pointed out here.

These statements are starkly different from Channing's and Martineau's ones. According to them, God endowed us with free will and thus gave us the responsibility to choose good instead of evil. On the contrary, in Gaskell's account Divine Providence educated us, guiding human beings towards good. Thus Gaskell did nothing but endorse Priestley's principles: in *The Doctrine of Philosophical Necessity* God was described as a loving father, who wanted to secure our happiness and therefore made us subject to His discipline (Priestley, 1777, 78-79).

As a matter of fact, Priestley answered *ante litteram* to Martineau's criticism, namely that ruling out free will would result in annihilating moral responsibility (see Priestley, 1777, 73-89). From Priestley's point of view, whenever we praise someone by saying that he behaves well, we are actually praising them for their disposition. It is their disposition which is good, and their actions will necessarily be good due to the constraint of their disposition (Priest-

[12] See for instance the beginning of this very sermon, where Gaskell argued that God had placed us into a joyful universe (W. Gaskell, 1859, 7-8).

ley, 1777, 80). Hence, human nature as it is conceived by the deterministic philosopher was in Priestley's mind consistent with moral judgement. Such a person would have a good disposition, by virtue of Divine government. We could be sure that praise wouldn't be in vain, because every action proceeding from a good disposition would be good. We cannot state the same for someone provided with free will, since their will might interpose between their disposition and action. Therefore, if we assumed that humans have free will, they would behave whimsically. Their actions would have no comprehensible reason or pattern: a self-determining person is ultimately unreliable (Priestley, 1777, 76-77).

Punishments and rewards

In Priestley's account, people's actions were determined by sensations of pleasure and pain. Their behaviour was thus foreseeable, and therefore the agent was reliable. Such a vision of human nature was connected to a morality of punishments and rewards: God educated humans by repaying good actions with rewards and punishing wicked behaviour. This was Priestley's as well as Paley's view of morality (Paley, [1785] 1815, 52). Moreover, this was the basis of utilitarian moral theory, both of Paley's religious version or of Bentham's secular one (see Schneewind, 1977, 122). Indeed, Martineau's 'new school' was at odds with this moral system as well.

Martineau developed his argument against Utilitarianism at length in a review of Bentham's *Deontology*, published in the *Monthly Repository* in 1834. In his mind, Bentham's view of human nature was too restrictive: he reduced every purpose to the quest for happiness, ultimately assuming a selfish individual, incapable of altruistic deeds (Martineau, 1834, 615 and 618-619). Furthermore, the Benthamite version of punishments and rewards, namely the sanctions, turned out to reduce human dignity. Martineau was critical of Bentham for his conception of humans as only influenced by *exterior* pleasures and pains, such as other people's approval (moral or popular approval) or negative consequences on health and well-being (physical sanction). The utilitarian

agent lacked the capacity to feel *interior* pleasures. Are there, asked Martineau, no actions pleasurable in themselves, regardless of their consequences? Doesn't the exercise of a benevolent deed provide in itself pleasure to the agent who performs it? "The contemplation", continued Martineau,

> and still more, the exercise of compassion, integrity, benevolence, awaken feelings which have so little concern with the outward advantages of these virtues that, at the moment of excitement, they repudiate the idea of them as an unworthy intrusion (Martineau, 1834, 618-619).

As Martineau argued, Bentham excluded the possibility of disinterested acts, namely of actions "which are willed solely from their internal qualities" (Martineau, 1834, 620). Therefore, disinterested actions were absurd in a moral system founded on punishments and rewards.

Martineau reaffirmed this point in the preface to his book of hymns. Here he started by remarking that "worship is an attitude which our nature assumes, not *for a purpose*, but *from an emotion*" (Martineau, 1840, V). It is not intended to persuade God to make our own advantage; rather, it is a natural disposition. As Martineau added, "in opposition to this *Natural* idea of worship stands the *Utilitarian*, which considers it an 'Instrumental act'". The utilitarian worshipper, in what the author was likely to consider a Paleyan attitude, asked: 'What for'? The true believer asked for nothing, in Martineau's eyes, because he didn't calculate his advantages and rewards. This view of worship had no holiness in it, it had no contact with the soul. Martineau connected the natural attitude towards worship to artistic and poetic power:

> Sacred poetry in particular, has its origin in the natural, and its decline in the Utilitarian view of worship. Every simple utterance of a deep affection, not poured out with an aim, but merely overflowing, is poetry in its essence, whatever be its form: and on the other hand, no expression of thought or feeling which has an ulterior purpose, of instruction, exposition, persuasion, impression, can have the spirit of poetry (Martineau, 1840, VII).

A warm-blooded and inner faith

This quotation exemplifies a relevant feature of the 'new school': its commitment to religious sentiment. This turn has been properly explained by Webb in his paper *Views of Unitarianism from Halley's Comet* (Webb, 1986, 188-189). Unitarian believers had long been accustomed to hearing doctrinal sermons, where the ministers were stating the difference between their sect and orthodoxy or other Dissenters. During the 1830s the atmosphere changed, and the reformists were sensible to that. Then "even the most rational-minded of Unitarians thrilled to the soul-stirring appeals of William Ellery Channing" (Webb, 1986, 189) as Webb has written. For the reformists, the roots of religion were to be found in the heart, not in a dogma or in the intellect. As the Unitarian minister John Tayler said in a discourse entitled *The Religion of the Intellect and the Religions of the Heart* (1851), it was feeling which made the unlearned savages religious: "the same feeling which fills the bosom of the child with wondering reverence and awe when the name of God is first associated with the beauty and grandeur and immensity of the visible universe" (Tayler, 1851, 290).

Martineau reproached Priestley for his lack of poetic spirit, which made his faith cold-blooded, deprived of warm feeling (Martineau, 1890, Vol. I, 25-27). What he valued in Channing, by contrast, was this: the intensity of his moral feeling, absorbing everything else into itself (Martineau, 1890, Vol. I, 91). The American minister was indeed renowned for stressing the sentimental features of the Christian creed. In the Baltimore discourse he stated that the love of God was the most important virtue for Unitarian Christianity:

> We believe, that this principle is the true end and happiness of our being, that we were made for union with our Creator, that his infinite perfection is the only sufficient object and true resting-place for the insatiable desires and unlimited capacities of the human mind, and that without him our noblest sentiments – admiration, veneration, hope, and love – would wither and decay (Channing, 1819, 68).

This stress on the sentimental aspects of religious experience matched another important point which distinguished the 'new' from the 'old school', namely the *inner character* of religion. Unitarianism was traditionally connected to the framework of natural theology. According to the latter, God's plan was apparent in the order of nature and the natural laws were consistent with Divine Providence. Consequently, one could search for the signs of God's hand in nature. The book of nature was then meant to harmonize with the Scriptures. As Gaskell argued in a lecture called *Strong Points of Unitarian Christianity* (1873), Unitarianism stated that God was one and thus found corroboration in the natural order:

> Nature on this point is in harmony with the Bible. In all departments of science one plan, one purpose, one presiding Mind is manifest. The laws in operation show that one Author framed them. The heavenly bodies move in one direction, and as one system; one principle of attraction governs all their motions; they are related to one great scheme; the same Spirit worketh all in all. Our natural intelligence vouches for the same truth (W. Gaskell, 1873, 22).

The natural laws guaranteed the existence of a Supreme Contriver.

The 'new school' questioned this view. As I have explained above, the reformists were critical of the moral system of punishments and rewards because it was extrinsic to the moral subject. Moreover, they were loath to seek Divine traces in nature: the natural seat of religion was inside the believer, in the depths of his conscience. In the Liverpool Controversy Martineau expressed this thought very clearly, saying that "our own conscience is the window of heaven through which we gaze on God" (Martineau, 1839a, 3). Thus, when one strays from the Christian moral path, God's eye could be discerned in one's own accusing heart: "our moral nature, left to itself, intuitively believes that guilt is an estrangement from God, – an unqualified opposition to his will" (Martineau, 1839a, 4). In Martineau's mind, if God was to be found within

ourselves, then He was also intuitively known to us. In that he agreed with Channing, as Ralph Waller has noticed (see Waller, 1986, 244)[13].

Reason and sentiment

As we have seen, the reformists stressed the relevance of religious sentiment. However, it is worth considering that praising religious sentiment, intuition and the inner view of faith did not trigger an irrational or mystical account of religion for the reformists. Their call for a warmer faith didn't make them less confident in the progress of scientific knowledge. The 'new' and the 'old school' agreed in this: Gaskell greeted the advancement of science (see W. Gaskell, 1875, 16) and his Manchester colleague Tayler praised his friend Charles Lyell for disposing of "the old cosmical view of things, when creation was limited to some six thousand years, and shut up within the narrow boundaries of the Ptolemaic system" (John Tayler to Charles Lyell, as quoted in Wach, 1991, 450). As a matter of fact, no one was more open to the call of rationality than Martineau himself, who nonetheless struggled to affirm the sentimental character of religion. Martineau was invariably associated with the movement of higher criticism which he first met with in Bristol from Lant Carpenter (Waller, 1986, 230). First and foremost, Martineau had a 'critical mind', in the words of Ralph Waller (Waller, 2002)[14].

Martineau was very unwilling to leave to science the domain of rationality and to seclude religion in the domain of sentiment. Martineau took this position while criticizing the modern materialist thought, in a lecture delivered at Manchester New College, in 1874. Here he explained that science was far from

[13] Here Waller has quoted an interesting passage from a letter from Channing to Martineau, where the former stated that the truth of God's goodness came intuitively to him.

[14] In this paper, the author has investigated Martineau's thought in the light of the tension between the "critical mind" and the "will to believe". Thus, Waller has argued that Martineau applied critical thought to discard some religious positions, while passionately endorsing those aspects he considered as fundamental to the Christian faith.

dismissing the idea of God. The scientist struggled to explain everything in material terms, but they were at a loss to explain mental phenomena with matter. They tried to forge *ad hoc* categories in order to account for what was unaccountable in the terms of matter. Therefore some of the words they used implied an unacknowledged theological view: such words were *théofora onómata*, as Martineau called them, "terms that bear God in them" (Martineau, 1890, Vol. IV, 175). The scientist had expelled God from his theory, lest He made it unscientific. But eventually he reintroduced Him. As Martineau said, with quite a touch of irony,

> such extremely clever Matter, – Matter that is up to everything, even to writing Hamlet, and finding out its own evolution, and substituting a molecular plébiscite for a divine monarchy of the world, may fairly be regarded as a little too modest in its disclaimer of the attributes of Mind (Martineau, 1890, Vol. IV, 175).

As Martineau stated, in terms which are reminiscent of the Uniformitarian-Catastrophist debate, it is impossible to explain the universe without any reference to the Supreme Mind regulating it and ensuring the continuity of being (see Martineau, 1890, Vol. IV, 172)[15]. Martineau considered that this account wasn't only theoretically unacceptable: it was also dangerous from a moral point of view. Were we willing to rule out God, we would remain deprived of every adequate source for our moral and higher qualities (see Martineau, 1890, Vol. IV, 186). This would leave us in a world populated by base, selfish beings, ready to abuse others (see Martineau, 1890, Vol. IV, 188-189). Without religion, Martineau argued, we would have no means to make our higher faculties prevail: we would be abandoned to the tyranny of our nature, incapable of doing what *ought* to be done (see Martineau, 1890, Vol. IV, 192-193).

The only way to reconcile religion and science, as Martineau concluded, was not by

> lodging the one in the Reason and the other in the Imagination, in order to keep them from quarrelling, but in recognizing a Duality in the func-

[15] For the Uniformitarian-Catastrophist debate, see the first chapter.

> tions of Reason itself, according as it deals with phenomena or their ground, with law or with causality, with material consecution or with moral alternatives, with the definite relations of space and time or with the indefinite intensities of beauty and values of affection which bear us to the infinitely Good (Martineau, 1890, Vol. IV, 194).

Reason couldn't be left to science: religion had to claim its role in the intellectual as well as in the moral life.

Having presented the main characteristics of the 'new' and 'old school', let us focus on Jevons's thought, paying attention to his link with these theories and doctrines.

2.2. Jevons as a Unitarian

Jevons had always been a godly man, as his grandniece Rosamond Könekamp remarked in the *Biographical Introduction* to the *Papers and Correspondences of William Stanley Jevons* (see Könekamp, 1972-1981, Vol. I, 52). Moreover, he had always been a Unitarian. In this section, I consider Jevons's link with Unitarianism.

A lifelong Unitarian

The correspondence between the young Stanley and his sister Henrietta collects various religious speculations and we can also find evidence of Jevons's allegiance to Unitarianism. In a letter dated 3rd May 1856, when Jevons was a young man of twenty, he wrote to his sister that

> the exterior religion has varied with different times & people, from the most barbarous (examples it is unnecessary to name) in which the inward meaning was often quite lost sight of or misrepresented, down to the most simple & truth-like which I have no hesitation in saying, is, among creeds, the Unitarian (Jevons, 1972-1981, Vol. II, 225-226).

On the 1st October of the same year Jevons expressed again to his sister his beliefs concerning the superiority of Unitarianism. In contrast to many other religious creeds, Unitarian faith wasn't a matter of doctrine. Its followers didn't

condemn believers on the basis of their religious opinions, not to mention that they didn't consider eternal damnation or salvation to depend on such opinions[16]. As Jevons stated,

> [Unitarians] do not profess to teach people any creed and therefore do not exhibit the bigoted zeal of other sects which seems to succeed so well. In general they only teach others to be good & principled, a thing too indefinite and uninviting for most minds. At least this is my view of Unitarianism, and only thus far would I call myself a Unitarian (Jevons, 1972-1981, Vol. II, 242).

Jevons underlined what he considered to be the strongest point of Unitarian faith: its *moral* inclination. From his point of view, Unitarianism was preferable to any other creed because of its moral teachings. As Boggs said, Unitarianism was a religion "without dogma, without creed" (see Boggs, 1966). From the Unitarian point of view, it doesn't matter what one believes, but how one behaves. This position was one of the foundations of Unitarianism[17], and Jevons utterly embraced it. In the above quoted letter of the 3rd May 1856, he wrote that the various religious faiths were nothing but the exterior manifestations of few, simple moral truths (see Jevons, 1972-1981, Vol. II, 225).

Jevons also wrote to his sister that he had thrown away all dogmas: "I judge", he said, "of a religion by the abstract morality it contains, and by its effects on the character, condition & happiness of men" (Jevons, 1972-1981, Vol. II, 296). Accordingly he called Christ "a great genius", one devoting his powers to morality instead of science or art (see Jevons, 1972-1981, Vol. I,

[16] This idea was one of the fundamental points of Unitarianism: see Boggs, 1966, 144; see also W. Gaskell, 1844, 14-15 especially.

[17] On this topic see, for example: Wilbur, (1945) 1947, 5, where Wilbur stated that Unitarians were "far more concerned with the underlying spirit of Christianity in its application to the situations of practical life than with the intellectual formulations of Christian thought"; Smith, 2006, 25, where the author illustrated how the Racovian Catechism, by Socinus, advocated a rational approach to the Scriptures and put the emphasis on moral conduct.

155). Jevons believed, together with many Unitarians[18], that Christ was merely a human being.

Nor were these ideas solely confined to Jevons's youth. His wife collected some notes about religious topics, which were meant to be a preparation for the *Tenth Bridgewater Treatise* he intended to write. Thanks to these notes it can be understood that there was a substantial continuity in Jevons's religious views. For instance, he clarified his beliefs concerning Christ as follows: "my veneration for Jesus is wholly founded on the heartfelt beauty of His teachings, and the manifest workings of a Divine Spirit in His life and works" (Jevons, 1886, 454). Jevons still considered Jesus, although inspired, just a human being. We shall see that attributing divine inspiration to Jesus tied Jevons's position to Martineau's one. However, it is apparent by these notes, as well as by Jevons's project of writing a *Bridgewater Treatise*, that he engaged in religious speculations throughout all his life

Jevons's religious ideas have already been investigated in the first chapter, in connection with his epistemology and philosophy of science. In this chapter I consider Jevons's religious views in connection with his moral philosophy and his Unitarian allegiance. This issue involves a question: where to place Jevons with respect to the debate between the 'new' and 'old school' in nineteenth-century Unitarianism? By this question I do not imply that Jevons actually took a position for or against either of these parties. Rather, I raise the question concerning who influenced Jevons throughout his life and studies. We shall see that Jevons was in line with the natural theology's account of the universe, consistent with the 'old school'. He also inclined towards a deterministic view of human behaviour. I also focus on Jevons's projects for social reform, connecting them with the Unitarianism. I argue that social reform was mostly conceived of as moral reform. As a consequence, Jevons's deterministic account faced a challenge. His commitment to the moral reform of individual character was difficult to reconcile with moral determinism. Hence, I argue that

[18] See Smith, 2006, chap. 12, *"Humanitarians" Unitarianism*, where the author investigated the origins of this position. Moreover, this was also Priestley's conviction.

Jevons was influenced by the moral views of James Martineau, whose concept of free ensured the possibility of self-improvement.

The continuity with the 'old school'

Let us first address Jevons's conception of the universe. As I argued in the first chapter, Jevons considered the universe to be ordered by laws and God's design. The language and concepts he expressed recalled the work of William Paley, as I have argued. In the first chapter I have addressed this topic with reference to the *Principles of Science*. However, we can find further examples in his correspondence and private journals. In a journal entry dated 28th January 1857, Jevons admitted that he had recently been disturbed by the problem of finding a solid basis for his religious beliefs: a basis which could put together religion and science (Jevons, 1972-1981, Vol. I, 154)[19]. Here he also confessed his rejection of revealed religion. In Jevons's eyes, the very idea of Revelation was almost blasphemous. God had no need to break the order of nature to reveal himself. This would be a sign of imperfection. Jevons considered that "God is seen if anywhere in the wonderful order and simplicity of Nature, in the adaptation of means to ends, and in the creation of man to which everything refers, with power capable of indefinite improvement" (Jevons, 1972-1981, Vol. I, 155).

His scientific education surely made Jevons inclined to look at the world as ordered by laws. However, such an account had a religious character. Moreover, in the Unitarian circles, where scientific efforts were widely pursued, natural theology was popular. Gaskell, as I have shown above, embraced natural theology, and deduced from it a deterministic view of the world, where the Priestleyan and Paleyan legacies harmonized. In his turn, Jevons fitted this tradition perfectly. Indeed, not only did he think that the universe was regulated by necessary laws; he also considered humans as bound by these laws. Thus,

[19] This passage and topic have already been addressed in the first chapter.

his position shows a remarkable similarity with Gaskell's one. Let us focus on Jevons's observations about these two topics.

On the 3rd May 1856, Jevons wrote that "God is but the *embodiment* of the first & greatest principle of the world, viz, *universal good, order* tending towards good, *design*, all coming under the comprehensive term Providence" (Jevons, 1972-1981, Vol. II, 226). A further specification of this thought can be found in Jevons's journal, where we read as follows: "the world is evidently but one vast organism full of motion and intelligence; it is not mere matter, for the very order & form of it express intention & mind" (Jevons, 1972-1981, Vol. I, 155). This last statement proves that Jevons was unwilling to assume that such an order could be inherent in nature alone: in front of such a perfect adaptation of means to ends and constant improvement one could only admit the presence of an ordering Mind. Paley's *Natural Theology* demonstrates a close similarity to Jevons's thought:

> Others have chosen to refer everything to a principle of order in nature. A principle of order is the word: but what is meant by a principle of order, as different from an intelligent Creator, has not been explained either by definition or example. […] Order itself is only the adaptation of means to an end: a principle of order therefore can only signify the mind and intention which so adapts them (Paley, [1802] 2009, 76).

I have already presented Gaskell's strong belief in the inescapable power of causality. In his view, God's government was indeed manifest in the ordered structure of causal relations. Jevons's account was very similar. In the notes collected by his wife he addressed the topic of prayer, questioning the piety of interpreting prayers as requests to God. "A single ounce of air or water", argued Jevons,

> cannot be diverted from its appointed course without breaking through the framework of nature. The universe might be destroyed and recreated as easily as a leaf be made to fall otherwise than as predetermined causes make it (Jevons, 1886, 452).

According to Jevons, prayers were unacceptable because they neglected the inescapable power of divine providence. A prayer "implies an impeachment of

His goodness and His wisdom. It is as much as to say that God has ordered things in one way and we think they should be otherwise" (Jevons, 1886, 452). Consequently, prayers could only be pious if understood differently: "cannot we ask that God, instead of bending His course to ours, will bend our course to His?" (Jevons, 1886, 452).

These notes had been written when Jevons was approaching his premature death. A comparison with previous statements, dating from his youth, shows a remarkable continuity of thought. Indeed when he was only eighteen he called himself a "Dependant Moralist" (Jevons, 1972-1981, Vol. I, 66). Human behaviour was in his mind determined by animal instincts. Jevons would later identify such principles with the desire for seeking pleasure and avoiding pain, consistent with utilitarian moral theory.

Michael White has underlined that Jevons embraced this position while he was in Australia (see M. White, 1982, 34). Indeed on the 13th September 1856, after attending a lecture by John Woolley entitled 'The Selfish Theory of Morals', Jevons made some important remarks in his journal. He stated that

> in its action on the body the mind must follow a simple & universal law of seeking the most pleasure, and follow it as implicitly as the railway train follows the curves & turns of the line upon which it is running (Jevons, 1972-1981, Vol. I, 133).

He then added that "a mans mind and character may be likened to a complicated piece of machinery moved by steam" (Jevons, 1972-1981, Vol. I, 133), its steam being self-interest. The constraint of this principle was absolute, so that it was "beyond a mans nature to act otherwise" (Jevons, 1972-1981, Vol. I, 133).

The universe was regulated by natural laws, expressing God's order and design, and humans were no exception. In Jevons's own words, each individual person must be "a creature of *cause & effect*" (Jevons, 1972-1981, Vol. II, 361). If we wanted to understand humans, we had thus to identify the general rules and principles of their behaviour. As Jevons claimed,

> Men possess animal powers & functions; they have logical minds; they have a series of emotions; and they are placed in contact with definite but extremely variable external circumstances. A perfect consideration of all these data, in fact of all the causes in operation must result in a determination of all effects; for instance in the case of a single person it must explain every trait of his character, every action of his life, every word he has spoken, every thought he has conceived (Jevons, 1972-1981, Vol. II, 362).

A complete, scientific study of the human being would give an account of everything. This was an ideal, as Jevons himself admitted. However, had we an exhaustive knowledge of the circumstances, no act or thought would remain unexplained.

Thus, if we compare Jevons's position with Gaskell's sermons on divine government the similarity is remarkable. Both considered God's providence as a series of causes and effects. Moreover, they both believed that humans were determined by these causes, consistent with Priestley's account. Jevons was indeed unwilling to admit free will if this meant that certain acts would be uncaused: "man is said to possess *free* will but however this be, he is at least a phenomenon in which *effect* is always connected with *cause*" (Jevons, 1972-1981, Vol. II, 362). Jevons's belief in the deterministic character of the universe and therefore of human action corresponded with the view of the 'old school': in a Paleyan or Priestleyan world, where nothing is without cause, human beings couldn't but be entangled in the causal order too.

The commitment to social reform

Let us take into account another feature of Jevons's work where the Unitarian influence is particularly evident: the commitment to social reform. As Raymond Holt has pointed out in his pioneering study, *The Unitarian Contribution to Social Progress in England*, Unitarians had a leading role in many social changes (see Holt, 1938, 13 for instance). This was primarily triggered by Unitarian theology. Unitarians valued righteous demeanour much more than adherence to creeds. Consequently, they paid particular attention to moral norms, the respect of which solely made a Christian worthy of his name (see

Holt, 1938, 16)[20]. Jevons was in complete agreement with this attitude: in his opinion, a sincere and moral Catholic was preferable to an immoral Anglican (Jevons, 1972-1981, Vol. II, 296).

The stress they put on the moral features of religion made Unitarians very attentive to people's social conditions. Unitarians, like the physician Southwood Smith, were engaged in the draft of the Poor Laws of 1834 (see Holt, 1938, 157). The concern for the conditions of the poor was shared by Unitarians overseas. The American Unitarian Association, founded in Boston in 1825 (Harris, 2009, XXI), was alarmed by the growing destitution of Boston labourers. They thus created the Boston Ministry to the Poor in 1827, appointing the post of Minister to Reverend Joseph Tuckerman (see Wach, 1993, 539). Thanks to his engagement, Tuckerman became well-known in England as well. Consequently, his second visit to England in 1833 encouraged the English Unitarian ministers to found, in the main industrial towns, the so-called Domestic Missions, on the model of Tuckerman's organization (see Wach, 1993, 540).

For Unitarians, social reform was also a means to transmit the middle-class values where they seemed to be in danger. Some social historians, like Howard Wach and John Seed, have remarked how Unitarian chapels and Domestic Missions were a breeding ground for middle-class ideology (see Wach, 1991; 1993; J. Seed, 1982; 1986). For instance, Tuckerman expressed his worries concerning the social consequences of industrialization. Labour took women and children away from the hearth, jeopardizing the family and consequently society as a whole (see Wach, 1993, 539). Unitarian ministers promulgated from the pulpit the ideals of thrift, temperance and domesticity (see Wach, 1991, 434-435; Seed, 1986, 134-136). Thus Unitarianism was an important ve-

[20] Here we read: "the letter killeth but the Spirit giveth life and so attach less importance to assent to the Creeds than to the lives that men live. In the words of one of the early Unitarians, *Michael Servetus*: "To be a Christian is to be like Christ"". Holt has been very liberal in the use of the term 'Unitarian'. Strictly speaking, Servetus wasn't a Unitarian. Despite questioning the truth of Trinity, a more appropriate denomination would be "Socinian". As a matter of fact, the term 'Unitarianism' was born much later, in the second half of the eighteenth-century; see Wilbur, 1945, 262.

hicle for the consolidation of those middle-class virtues which became representative of Victorian age itself. They certainly were a small group[21] but still a very influential one, since the Unitarian chapels often numbered among their followers some very important members of the social elites[22].

A similar concern for social reform could also be found in Jevons's works. Such commitment grew stronger in the last years of his life, as various scholars have noted[23]. Whatever the cause of this growing interest may be, I would like to stress how consonant his efforts were with the Unitarian perspective. For instance, Jevons shared with Tuckerman the concern about family relations in the industrial environment, as seen in the paper *Married Women in Factories*, later included in *Methods of Social Reform* (see Jevons, 1883, 156-179). Although such concerns for the role of women in the household was wide-spread in the Victorian England, in Jevons's case this issue turns out to be closely connected with the Manchester Unitarians.

As for the above-mentioned paper, Jevons mainly relied on his experience of working class conditions in Manchester[24]. Given the pervasive presence of Unitarians in Manchester, it could easily be argued that Jevons's interest in these issues was triggered by his acquaintance with such circles. This argument

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[21] Concerning the number of Unitarian Congregations, their attendants and their social composition, see Webb, 1986, 180-187.

[22] See Seed, 1982, 4, concerning Manchester specifically; 1986, 120-121, concerning other cities as well.

[23] For the importance of social reform in Jevons's thought, see: Hutchison, 1982; Bowman, 1989; 1997, where the author addressed the problem of education in relation to classical economists; Peart, 1996, where the topic is investigated diffusely; Mosselmans, 2007, 78-81, for the role of policy with respect to religion, and 100-104, for this topic in relation to music.

[24] See Jevons, 1972-1981, Vol. V, 164, where, answering to a criticism in the *Manchester Guardian*, Jevons wrote as follows: "I am not quite so ignorant of a factory population as [Mr. Darbyshire] supposes, having lived thirteen years at Manchester, and lost no opportunity of becoming acquainted with the subjects about which I have the temerity to write".

is buttressed by the fact that Jevons was investigating this topic with the help of Edward Herford. The latter was a Unitarian, founder of the Manchester Statistical Society, and brother of the minister William Henry Herford (Jevons, 1972-1981, Vol. V, 167).

Jevons was very concerned with infant mortality. He compared the Reports of the Medical Officers to the Privy Council of some rural areas in England with the reports on industrial areas. Starting from the high rate of infant mortality in rural districts, Jevons connected infant mortality with the absence of the mother from the household. Mothers, needing to work, were forced to leave their infant children to nurses. Consequently, the children often died of neglect (see Jevons, 1883, 164). This phenomenon had come to public attention at various times, as Jevons stated. However, no significant change had occurred. "Can such things be in a Christian country?" (Jevons, 1883, 157), remonstrated Jevons. He thus showed how he considered the care of the poor and wretched to be a Christian responsibility.

Moreover, Jevons's position has to be seen in the middle-class context of which Tuckerman's statements were an example: the woman was the symbol of the household, the embodiment of the pureness of feelings[25]. It is not surprising that Jevons thought that children were to be taken care of only by their own mothers. "There can be no doubt that the proper place of a good housewife is in her house" (Jevons, 1972.1981, Vol. V, 165), stated Jevons, thus endorsing the middle-class model of the respectable household.

Social reform as moral reform

Before continuing the exposition of Jevons's efforts as a social reformer, it is worth noting that, in the eyes of Victorians, political and social reform was first and foremost *moral reform*, a reform of individual motives or behaviour, or both. Stefan Collini, in his work *Public Moralists*, has argued that moral

[25] For the construction of such an ideal of womanhood, investigated in relation to Evangelical religious thought, see Davidoff, Hall 1987, 95-96, 149-172.

speculations had an unquestionable primacy during the Victorian age (see Collini, 1991, 64). Hence, any political change had to rely on a change in the moral attitudes of individuals (see Collini, 1991, 107). Consistent with this idea, political measures were often refused because they weakened people's character (see Collini, 1991, 100). Jevons's account was no exception. In his view, proper political reform should aim to reform individual character[26]. This view implied an individualistic understanding of society. I will address this topic later. Let us now focus on the link between Unitarianism and the reform of character in Jevons's work.

As I remarked above, since they avoided to stress the doctrinal features of their belief, Unitarians put a stronger accent on the moral aspect of religion. They openly acknowledged the moral penchant of Unitarian faith. Moreover, this attitude was equally shared by the two branches of nineteenth-century Unitarianism. For instance, in the *Rationale of Religious Belief*, Martineau distinguished two views of the beneficial effects provided by the Christian faith. According to the first one, believing in the doctrine of atonement was enough to ensure salvation for the believer. The sacrifice of Christ for humankind was thus compared to a charm, magically saving humans from the wrath of a vindictive God. "The other view of the value and influence of religion", continued Martineau, "supposes it to act, not on the mind of God, but on the character of man; and conceives it to be essential to the loftiness, refinement, and energy of that character" (Martineau, [1836] 1845, 82). According to this second view, with which the author was sympathetic, religion saved humans by *improving* them (see Martineau, [1836] 1845, 83).

On this point, there was such a consonance of ideas between Martineau and Gaskell that they even used the same words. Like Martineau, Gaskell was at odds with the endorsers of the dogma of atonement, according to which

[26] On the centrality of character in Jevons's thought, see M. White, 1994, 430, where the author explains how the notion of character "provided the analytical link between the universal 'natural' laws of behavior implicit in marginal utility theory and the social behavior which verified those laws".

"trust in Jesus is made to act like a *charm*" (see W. Gaskell, 1875, 11, emphasis added). On the contrary, Gaskell stressed the practical attitude of Christianity. Jesus had encouraged his disciples to follow his example, to put what he said into practice. Hence, every Christian who did not acknowledged Jesus's moral promptings had misunderstood the message of Christ, confining it to an array of dead precepts (see W. Gaskell, 1875, 12).

Everyone ought to pursue this path of moral improvement. However, such a task was more urgent for those who lived in a destitute condition. Material wretchedness engendered moral corruption – a much more insidious kind of privation. As Channing claimed, "the great calamity of the poor is not their poverty, understanding this word in the usual sense, but the tendency of their privations, and of their social rank, to degradation of mind" (Channing, [1835] 1903, 266)[27]. Both the leading figures of the 'old' and 'new school' intended to guide the working classes and the poor towards moral improvement. This process was often understood as a promise of future salvation, while the social relations of the *status quo* remained unaltered.

This tendency was for instance very evident in John Tayler's sermons, which endorsed the contemporary division of society and supported the values of the rising middle-class. In a lecture entitled *The Moral Education of the People*, Tayler explained that such education required an understanding one's station in life and one's circumstances. One should also understand that assuming a correct moral behaviour was the only way to acquire happiness. Right conduct was then interpreted as "respectful demeanour towards superiors in age and worldly station" (J. Tayler, as quoted in Wach, 1993, 456). It is worth mentioning that this lecture was delivered in 1833, in Manchester. Tayler's teaching aimed at finding a resolution to Manchester conflicts through the solid morality of the middle-class (see Wach, 1991, 425-430 especially; 1993, 540-542, and 546-548).

As Wach has noticed, Tayler's solution to class conflicts was primarily moral rather than political. As Tayler said, there was "something wrong in so-

[27] On this topic, with respect to Channing's thought, see also Wach, 1993, 545.

ciety; – something out of joint in mutual relations of its different classes; – some deep-seated disease in the heart of it, which is not to be expelled by political reform alone" (J. Tayler, as quoted in Wach, 1993, 447). The answer was to be found in recognizing that the "the interests of that two classes cannot really be separated" (J. Tayler, as quoted in Wach, 1993, 447). The opposing classes should understand that their opposition was vain and counterproductive. Interests should then be reconciled and harmonize together.

This response to political, social and economic conflict was a commonplace of the Victorian age. One might look at some industrial novels of the 1830s for instances of it. For example, Elizabeth Gaskell, William Gaskell's wife, expressed this hope very clearly. In her novel *North and South*, Higgings, a leader of the strike which was taking place in the imaginary city of Milton, wished for such a conciliation. Against the conflict tearing apart masters and men, "our only chance", said Higgings, "is binding men together in one common interest; and if some are cowards and some are fools, they mun come along and join the great march, whose only strength is in numbers" (E. Gaskell, 1982, 233). Mr. Hale, a Dissenter who was pushed by his religious integrity to a refusal of his appointment as an Anglican minister, answered as follows: "your Union in itself would be beautiful, glorious, – it would be Christianity itself – if it were but for an end which affected the good of all, instead of that of merely one class as opposed to another" (E. Gaskell, 1982, 233).

Just like in the case of Higgings in *North and South*, this conciliation often implied that the working class had to learn and embrace the laws of political economy. According to Tayler, the working classes had to be explained how the rate of wages were bound to economic laws (see Wach, 1991, 447). Naturally there were slight differences among the Unitarian ministers here mentioned. Tuckerman, whose acquaintance with the conditions of the poor was extensive, wasn't so consonant with economic precepts as Tayler was. Tuckerman questioned the theory of full employment, according to which the market functioning naturally ruled out unemployment. Tuckerman, in contrast, argued that poor people could be poor not due to their unwillingness to work, but because they couldn't obtain any employment (see Wach, 1993, 544). If on the

one hand Tuckerman and his colleague Channing criticized the crude mechanism of political economy, on the other Martineau sided with the contemporary understanding of economic law. Thus Martineau reproached Channing for attacking the economists' statements without a real knowledge of the subject matter (Martineau, 1890, Vol. I, 124-125).

Working classes had to follow economic laws and take the middle class as a model of right behaviour. As Martineau stated, the working class ought to acquire the "habits of providence, which, as a rule characterize the middle classes" (J. Martineau, as quoted in: Ledger-Lomas, 2017, 119). In *Theologies of Power*, John Seed has shown how strongly the ideals of thrift and accountability were supported amongst Unitarians. Seed drew on the journal of George Heywood, a member of Cross Street Chapel in Manchester, between 1813 and 1840 (Seed, 1986, 134-136). When he still was a young grocer, Heywood understood, from the Manchester minister John Grundy, that business success was a reward for one's virtue. One's effort, as Grundy's sermons taught him, ought to be carefully watched by the means of self-examination: that was why Heywood started to keep a diary to "answer the examination of our conduct and actions" (G. Heywood's diary, as quoted in Seed, 1986, 135). As John Seed has argued, Heywood's case was a perfect instance of Unitarian values in the early nineteenth century: "the vindication of self-help, the confidence in the blessing of Providence, the celebration of moderate worldly pleasure, the disdain for those who fail to become independent and successful" (Seed, 1986, 135).

Self-culture*: Channing on moral improvement*

The best example of exhortation to moral improvement in a Unitarian context was Channing's *Self-culture*. Channing delivered this lecture in September 1839, in Boston. This was an introduction to the Franklin Lectures, a course specifically addressed to manual labourers. Channing dedicated his lecture to the concept of self-culture, "or the care which every man owes to himself, to the unfolding and perfecting of his nature" (Channing, 1839, 6). It was a pro-

cess of self-improvement, conducted for its own sake, regardless of any material advantage (see Channing, 1839, 18-19). "A man […] is to cultivate himself because he is a man" (Channing, 1839, 19), simply *qua* human being. Putting the self-culture into practice meant to harmonize all the principles of our nature, like the moral, religious, intellectual and social principles. Channing clarified the meaning of self-culture as follows:

> To cultivate anything, be it a plant, an animal, a mind, is to make grow. Growth, expansion is the end. Nothing admits culture, but that which has a principle of life capable of being expanded. He, therefore, who does what he can to unfold all his powers and capacities, especially his nobler ones, so as to become a well-proportioned, vigorous, excellent, happy being, practises self-culture (Channing, 1839, 8).

Cultivating oneself meant to develop one's best faculties, like the capacity of seeing beauty, as well as the eternity and infinity dwelling in beauty itself (see Channing, 1839, 13-15). However, any push towards improvement ought to start from morality. The intellectual faculty, which often was considered to have priority over the others, had to be exercised in a disinterested way. "Without this fairness of mind", remarked Channing, "which is only another phrase for disinterested love of truth, great native powers of understanding are perverted and led astray; genius runs wild; 'the light within us becomes darkness'" (Channing, 1839, 10). The most wonderful power of the intellect consisted in "rising from particular facts to general laws or universal truths" (Channing, 1839, 11). Channing took Newton as an example of this intellectual excellence:

> Men had for ages seen pieces of wood, stones, metals, falling to the ground. Newton seized on these particular facts, and rose to the idea that all matter tends, or is attracted, towards all matter; and then defined the law according to which this attraction or force acts at different distances (Channing, 1839, 12).

However, where did the ability to cultivate oneself come from? What were its conditions of possibility? As I have already noted, Channing relied on free will. Consequently, one could make use of this power to put self-culture into

practice. “A man has within him capacities of growth” (Channing, 1839, 15), wrote Channing. Hence, self-culture had also a role to play in Channing’s criticism of Priestleyan determinism:

> I do not look on a human being as a machine, made to be kept in action by a foreign force, to accomplish an unvarying succession of motions, to do a fixed amount of work, and then to fall to pieces at death; but as a being of free spiritual powers (Channing, 1839, 15).

As for self-culture’s conditions of possibility, Channing was explicit: “there are two powers of the human soul which make self-culture possible, the self-searching and the self-forming power” (Channing, 1839, 7). The self-searching power was, as Channing explained, the faculty of turning the mind on itself. We could thus “discern not only what we already are, but what we may become” (Channing, 1839, 7). We could watch the germ of a superior perfection, which is the purpose of our life. Furthermore, it was this introspective capacity that distinguished the civilized person from the brute, who lacked such an ability.

The self-searching power was a necessary but not sufficient condition for self-culture: “we have a still nobler power, that of acting on, determining, and forming ourselves” (Channing, 1839, 7). This self-forming power had even more relevance, due to its connection with responsibility. In Channing’s account, people had the power of regulating their faculties and efforts; and consequently also the responsibility of what they might become. Thanks to this power, we could ascend the heights of virtue, happiness and fate. That was why self-culture “transcends in importance all our power over outward nature. There is more of divinity in it, than in the force which impels the outward universe” (Channing, 1839, 8).

Self-culture was possible because it had its foundation in our nature. Moreover, it wasn’t simply given to us for our own purpose: it was our “solemn duty” (Channing, 1839, 8). Channing was confident that this duty and privilege of ours could be actualised. His age, in Channing’s eyes, was one of “progress of the mass of the people in intelligence, self-respect, and all the

comforts of life" (Channing, 1839, 42). This improvement owed its success to religion: "it was religion, which, by teaching men their near relation to God, awakened in them the consciousness of their importance as individuals" (Channing, 1839, 43). According to Channing, religion had brought the individual to attention. Whatever the cause of this attention may be, all the mentioned Unitarians believed that the improvement of the individual had a pivotal role in the progress of society. This was the case for Jevons too.

The improvement of character

Jevons's main answer to the social problem of his time was also moral. In the preface to the second edition of *The Coal Question* (1866), he wrote that, in times of lessening prosperity, we had increasingly to take care of social improvement. Such an improvement first and foremost had to be attained by raising "the character of the people appreciably" (Jevons, [1865] 1906, XLVII). Then Jevons specified that this urgency concerned primarily the lower classes: "ignorance and pauperism and vice" lived among the English (Jevons, [1865] 1906, XLVII). Some measures had to be taken against these evils: "the ignorance, improvidence and brutish drunkenness of our lower working classes must be dispelled by a general system of education, which may effect for a future generation what is hopeless for the present generation" (Jevons, [1865] 1906, XLVIII). It is not surprising that Jevons put a lot of emphasis on education, since this was the main means to attain social improvement through the improvement of character[28].

Jevons believed the working classes to be intemperate: in his own words, the "want of self-reliance and providence […] is the crowning defect of the poorer classes" (Jevons, [1865] 1906, 200). He often expressed this conviction. For instance, he took this topic into consideration in the address to Section F of

[28] Concerning Jevons's stress on education, see Hutchison, 1969, 236; Bowman, 1989; 1997; Peart, 1996, where this topic has been analysed at length (especially chap. 2, with regard to the *Coal Question*, and 42, about education in relation to business cycles).

the British Association for the Advancement of Science. Here he stated that the solution to the pauperism of the working classes could never lie in raising their wages. Even if their wages were higher, they would simply spend more than before, finding themselves in the same circumstances again. As Jevons stated, "there are comparatively few signs that the wages of the working-classes, even when sufficient, are saved and applied really to advance the condition of the recipients" (Jevons, 1883, 205).

The same thought was stated in *The State in Relation to Labour* (1882), the last of Jevons's works. Here we read that "those who know not how to spend well are often injured rather than bettered by higher earnings" (Jevons, [1882] 1910, 74). Hence, Jevons concluded that the real solution was to reform the individual character: "it is only with the increase of education and temperance that the increase of wages will prove a solid advantage" (Jevons, 1883, 205). Policy alone was at a loss as to how make permanent changes, without changing the individuals first.

Evidently this principle was consistent with liberalism and free trade, even though we shall see that Jevons was far from being a blind advocate of free trade. Policy measures were evaluated on the bases of their capacity to develop good moral qualities, like self-reliance and temperance. For the same reason Jevons was enthusiast of the Poor Laws (see Jevons, 1883, 192, 197-198, 266). Thus, Jevons criticized "indiscriminate charity", which "tends to create and perpetuate a class living in hopeless poverty" (Jevons, 1883, 197). Medical charities suffered the same problem: they discouraged self-reliance and thrift. Medical institutions should provide relief from accidents, not ordinary care. The latter should be left to individuals. "No working man is solvent unless he lay by so much of his wages as will meet the average amount of sickness falling to the lot of the man or his family" (Jevons, 1883, 199), stated Jevons. In their turn, trade unions ought to favour these practices, and only thus "they manifest that spirit of self-reliance which is the true remedy of pauperism" (Jevons, 1883, 199).

Jevons addressed these topics in a lecture delivered in Manchester, in 1866. As professor of Political Economy at Owens College, he opened the se-

ries of evening classes organized by the Cobden Memorial Committee (see Jevons, 1972-1981, Vol. VII, 37-54). These lectures were addressed to public school teachers. Following the spirit of their founders, Jevons chose to deal with the diffusion of knowledge of political economy among the working classes. However, this lecture, in Jevons's own words, "brought some little criticism from the part of the Radicals" (Jevons, 1972-1981, Vol. I, 207). In response to one of them, Jevons quoted Cobden to show how aligned their views were concerning the responsibilities of the labouring classes:

> No people were ever yet elevated except through their own advancing wealth, morality, and intelligence; and anyone who tells the workingmen of this country that they may be raised in the social scale by any other process than that of reformation in themselves, is interested either in flattering or deceiving them (Jevons, 1883, 121).

Jevons clarified his own position through Cobden's words: every social reform ought to rely on moral reform. In the absence of the latter, political reform could have no grasp on people.

In Jevons's mind, the lower classes ought to take the middle-class as a model of morality. The real difference between these two classes was not their earnings, but their attitude towards thrift:

> There is no doubt that the very poorest classes of labourers are really unable to save any appreciable sum of money, but I believe that this is by no means the case with artizans. Receiving often £75 or £100 a year, they are really much better able to save that many clerks, shopmen, and others who would nevertheless be more provident (Jevons, 1883, 146).

Jevons then agreed with the Unitarian ministers, of the likes of Tayler and Martineau.

This belief that the middle-class ought to be taken as a model of behaviour was pivotal for some of Jevons's works. Bert Mosselmans has investigated this topic through his study of Jevons's musical writings (see Mosselmans, 2007, 100-104). In the paper *Amusements of the People* (1878) Jevons addressed the problem of the "progressive degradation of popular amusements" (Jevons, 1883, 3). According to him, the lower classes indulged in some activi-

ties which he wouldn't call respectable, but rather clumsy and vulgar (Jevons, 1883, 4). The English working class also had an inclination for the worst of habits, namely drunkenness.

Jevons remarked that amusement had often been considered an evil, that is, as sinful. For his part, Jevons refused this idea. He thus proved himself to be consistent with the Unitarian faith, which was far from condemning earthly pleasures as sinful in themselves[29]. On the contrary, Unitarians encouraged mild and respectable leisure. Jevons was thus in perfect harmony with Unitarian beliefs when he tried to encourage wise and instructive amusements for the 'hands'. Intemperate as they were, they should learn how to wisely spend their earnings, since in his view "they earn well, but they spend badly" (Jevons, 1883, 6). They should be taught to spend better and to appreciate refined amusements. And they could only learn more refined taste by taking as an example those who already had such habits, namely the educated middle class. In its turn, the middle class should endorse this development, and not refuse mixing with the lower classes:

> Too often the least tendency towards culture is condemned. If a factory-girl or a housemaid appears in a smart bonnet and a well-made dress, our high-class moralists object at once that she is aping her betters. How can good earnings be better spent than in aping your betters? How is real civilisation to be attained if the mere necessaries of life are to be good enough for the bulk of the people (Jevons, 1883, 6-7)?

Jevons was persuaded that such an educative task would be accomplished perfectly by music, the worthiest of all amusements. Here he also gave way to his religious beliefs: "pure and sacred music [are] the deepest products of feeling of the mind" (Jevons, 1883, 15). The pureness of melody, as Jevons described it, seemed "to raise the hearer above the trifling affairs of life. At times it 'brings all Heaven before our eyes'" (Jevons, 1883, 10). This last sentence

[29] For an example, see Channing, 1839, 40; here Channing explained that he was far from suggesting that the labourers had to turn down leisure and amusements in favour of self-improvement. On the contrary, self-culture multiplied the occasions for enjoyment.

was a quotation from a hymn by William Cowper. It is remarkable that Martineau had included this hymn in his collection, *Hymns for a Christian Church and Home* (Martineau, 1849, hymn n. 46). Martineau might have been Jevons's source here.

In Jevons's mind these musical performances should take place in the East End of London, a neighbourhood where pure amusements were much needed. However, this educational purpose could only be reached with the help of the higher classes:

> Our hopes of elevating public taste would be sadly dashed to the ground, were vulgarism to invade our highest places of entertainment. Nor do I believe that there would be any gain in the end. Long may the time be distant; but if once such a place be deserted by the middle and upper classes and set down as vulgar, the course of its decline can be foreseen. Whatever our great caterers do, they must make a point of mingling all classes together, and retaining a reputation as places of fashionable resort (Jevons, 1883, 18).

As mentioned above, Tayler believed that the different classes had to go beyond their disagreements, towards a conciliation of the whole society. Only the meeting of members of the classes with one another would solve the conflict.

The same thought inspired Jevons's analysis of so-called industrial partnership. Jevons was persuaded that the 'hands' would never put enough effort in their work until they had a share in profits. Thus, he suggested an industrial partnership where workers shared profits with their employers, thanks to which workmen would become by degrees "their own capitalists" (Jevons, 1883, 119). Such a partnership ought to bind together people from different classes:

> The advocates of industrial partnerships wish to see honest labour meet with its due reward. They consider that combination should be in a perpendicular, and not in a horizontal, direction. The master is to combine with his men, to be their true leader, and after all the ordinary costs of wages, interest, and superintendence are provided for, the surplus is to be fairly divided among all who have contributed towards it (Jevons, 1883, 127).

Trade unions tended to create associations among the labourers of the same trade. Thus, trade unions made labourers stick together, encouraging mistrust towards their employers. Moreover, they supported workers in need, and consequently, like medical charities, they discouraged zealous and skilful work (Jevons, 1883, 126-127). They weakened the necessity of self-help. On the contrary, if workers saw their own benefit in the business, they would work harder. This purpose could only be attained if workers and their employers would acknowledge their common interest and start cooperating: "could [the employee] really be made to feel his interests identical with those of his employers, there can be no doubt that the profits of the trade could be greatly increased in many cases" (Jevons, 1883, 127).

Every class could take advantage of cooperation. Furthermore, in Jevons's mind, moral improvement didn't concern labourers exclusively. Bankers and capitalists ought to develop their capacity of decision-making as well. This point was raised by Sandra Peart, in her discussion of the process of intertemporal decision-making (Peart, 1996, 148-150 especially). Peart has shown that what working classes particularly lacked was the capacity of taking wise decision concerning their future. They spent their money improvidently. They married too early without considering the consequences on their future offspring (Jevons, 1883, 172). They systematically underestimated the importance of the future with respect to the present. However, she has further argued that middle classes weren't so skilled in making long term decisions either (Peart, 1996, 54). In his analysis of the business cycle, Jevons explained that bankers and investors managed business recklessly, being incapable of reading the signs of imminent crises. In *Commercial Crises and Sunspots* Jevons even attributed an 'inflammable spirit' to investors (Jevons, [1878-1879] 1884, 243). Jevons spoke thus the language of moral reform: the speculators ought to temperate their hot spirits in the coolness of prudence and self-control. As Channing had argued, humans had to cultivate themselves because they were *humans*, regardless of their employment or role in society.

2.3. "The Creature of a Creator"

Like many Victorians, Jevons believed that humans ought to follow the path of moral improvement. However, we should now shed light on a problem involved in Jevons's thought. As argued above, Jevons had a deterministic conception of the universe. Humans were a part of the universe, and, as such, regulated by fixed laws too.

Hence, two questions arise. First, if we are governed by unbending laws, what is the condition of possibility of self-improvement? Channing numbered two faculties, the self-inspecting and self-forming one, in order to ensure that self-culture was possible. As for Jevons, what made moral reform possible? Second, the problem is even more profound than that, involving a question of consistency: if we are creatures in a universe regulated by God's plan, why is it *necessary* for us to improve ourselves? Addressing the topic of prayer, Jevons excluded petitions for any change in the order of things:

> To ask the Creator distinctly for any concrete object or service is not only vain and useless, but it is more – it borders on impiety. It implies an impeachment of His goodness and His wisdom. It is as much as to say that God has ordered things in one way and we think they should be otherwise. But are there no other petitions which we can make? Cannot we ask that God, instead of bending His course to ours, will bend our course to His (Jevons, 1886, 452)?

This account would be consistent with a deterministic interpretation of the universe and humans. Instead of bending things to our will, we should find our place in God's providence. However, Jevons wasn't always so firm on that. As a matter of fact, advocating for the improvement of the individual character implied hoping for a modification in the course of the universe. Investigating this ambiguity in Jevons's thought shall be the purpose of the following pages.

The gulf between mind and matter

The problem tackled here is related to the one already treated in the first chapter with respect to logic. In the first chapter I asked whether Jevons's logic

was descriptive or prescriptive. The same could be asked concerning Jevons's theory of morals: is human behaviour eligible for prescription or description? How do these levels overlap or differ? Jevons's endorsement of determinism might suggest that human behaviour could only be studied scientifically and then described. He called himself a 'dependant moralist' in his young age. I have quoted above several passages from his where his position seemed transparent. According to Jevons, humans were directed by their animal instincts and thus sought pleasure. Once we knew every relevant variable, we would be able to predict human behaviour fully. Just like a train on its tracks, humans could not be diverted from their path. However, if we are bound by our nature to act in such a way, is there any latitude for moral improvement?

Jevons didn't confine himself to the territory of description. Otherwise his exhortations for moral improvement would be pointless. Jevons admitted, not without a certain ambiguity, both description and prescription. Bruce Mazlish has underlined this intricacy in Jevons's account. In a letter to his sister, as Mazlish has argued, Jevons gave her advices for her education. He suggested, using a notion most similar to the modern one of human capital[30], that she had to complete her education before undertaking other tasks. This attitude is manifestly prescriptive: as Mazlish has noticed, "the particles in molecular physics do not have to be told how to behave; human beings, as self-interpreting creatures, do" (Mazlish, 1986, 143).

A proper investigation of this topic requires a comparison with Harro Maas' argument on mechanical reasoning in Jevons's thought. In his book *William Stanley Jevons and the Making of Modern Economics*, Maas has rightly highlighted the importance of mechanical analogies in Jevons's account. Maas has remarked, agreeing with White (see M. White, 1994a), that the progress of psychological science in Jevons's time "tended to blur the notorious distinction between mind and matter" (Maas, 2005, 10). Hence, the distinction between moral and physical sciences faded away as well (Maas, 2005, 9). Mind and matter were ordered by the same rules. Thus some scientists undertook the

[30] On this topic, see also Bowman, 1997, 464.

study of mechanical contrivances. One could investigate the functioning of machines in order to cast light on logical reasoning and on nature itself (Maas, 2005, chap. 5). That was why, as Maas has argued, Jevons constructed his logical machines: "Jevons believed that his mechanical contrivance mimicked the process of logical inference of ordinary individuals" (Maas, 2005, 132, in the original there is emphasis on 'process').

Maas has clearly stated that Jevons's didn't consider humans to be machines (Maas, 2005, 131)[31]. Mechanical contrivances only *mimicked* the reasoning process. Nonetheless, where does this difference between human beings and machines lie? Maas hasn't investigated this point, although it is a fundamental one. My contention here is that, in Jevons's account, there will always be a gulf between humans and machines. Such a gulf is related to the distinction between 'is' and 'ought': only humans dwell in the realm of 'ought', whereas machines are bound to 'is'. Prescription has a meaning only for creatures who can change themselves. Machines can be described, but it would be useless to give them any prescription. We shall also see that this difference is founded on Jevons's religious thought, namely on the ontological gap between the infinite and the finite.

As argued above, Jevons didn't draw all the consequences of assuming a deterministic universe regulated by divine providence. Jevons never tackled the inconsistency implied in the encouragement for moral improvement, within a universe ordered by God's plan. He simply assumed that an improvement of that sort was necessary. This ordered plan had to allow us the possibility of moral improvement through self-help, as Jevons's texts on social reform showed. Humans could – and *ought* to – improve themselves. This is the first and fundamental discrepancy between human beings and mechanical contrivances. Machines simply are what they are, they know no 'ought'. Humans, in-

[31] Here Maas also distinguished his position from Mirowski's one. According to the latter, mental processes were reducible to material operations, so humans were just like machines. In this regard, see Mirowski, 2002, 40.

stead, belong to both the realms of 'is' and 'ought', being at once liable to prescription and description.

Moreover, Jevons had an interest in preserving the possibility and necessity of individual improvement. I have explained how deeply the Victorians relied on individual improvement in view of social reform: no reform would have been possible without a change in the character of the people. Hence, ruling out such a possibility would have meant abandoning society to its current state, which for them was unacceptable. Jevons found in the precepts of self-help, self-reliance and cooperation a *desideratum*, a proper set of values for a moral system. Moral and social sciences may be approaching the model of physical ones, but they would never correspond with them. In Jevons's account, moral sciences were still supposed to offer a model of good behaviour. As Jevons stated in the Address to the British Association,

> Chemistry cannot analyse the heart; it cannot show us how to temper the passions or mould the habits. The social sciences are the necessary complement to the physical sciences, for by their aid alone can the main body of the population be rendered honest, temperate, provident, and intelligent (Jevons, 1883, 196).

Physical sciences described behaviour, but an investigation of the heart and a set of prescriptions was needed too, without which the individual, as well as the whole society, would be lost.

Furthermore, if humans have to follow moral prescriptions, it is because *they make mistakes*. Once one is given a prescription, it can be complied *or not*. As Jevons wrote in *The State in Relation to Labour*, "people are always reasoning, well or ill – usually ill" (Jevons, [1882] 1910, 19). They even inclined towards bad reasoning. This apparently insignificant point states another important difference with machines, and thus between matter and spirit: a machine does not err. This problem has also been addressed in the first chapter with respect to logic. If, in Jevons's view, logic was rooted in the human mind, how could logical mistakes be accounted for? As a matter of fact, Jevons's logical machines were meant to help avoid those errors. That was why, after de-

signing the Logical Abacus, "a second step towards a mechanical logic was soon seen to be easy and *desirable*" (Jevons, 1890, 151, emphasis added):

> The fixed order of the combinations in the written abecedarium renders it necessary to consider them separately, and to pick out by repeated acts of mental attention those which fall into any particular class. Considerable labour and risk of mistakes thus arises (Jevons, 1890, 151).

The Logical Abacus found a remedy to this inconvenience. Once properly set, the mechanism didn't admit errors. A machine's mistake is simply a malfunctioning. Strictly speaking, machines cannot be mistaken: it is foreign to their nature. Mistakes are only possible in the scope of mind, namely of spirit. Only humans *ought* to reason properly, and so only humans can make errors of reasoning.

As for the difference between matter and spirit, there are other occurrences in Jevons's works where such difference is implied. In a short paper entitled "A Deduction from Darwin's Theory", Jevons touched on this topic. Here he stated that the highest forms of civilization develop in temperate climates. In conclusion to his argument, he added the following statement:

> the utmost result of speculations of this kind, supposing them to be valid, would consist in establishing a *general tendency* […]. I do not for a moment suppose that any common physical cause, such as soil, climate, mineral wealth, or geographical position, or any combination of such causes, can alone account for the rise and growth of civilization in Assyria, Egypt, Greece, Italy, or England. Material resources are nothing without the mind which knows how to use them. No physiology of protoplasm, no science that yet has a name, or perhaps ever will have a name, can account for the evolution of the intellect in all its endless developments (Jevons, 1869, 232).

Despite the progress of psychology, mind continued to have rules of its own. Science couldn't explain anything because matter was insufficient to cast light on intellectual phenomena, as Martineau argued at length in his battle against modern materialism.

The idea that mind wasn't reducible to matter was crucial in the closing passage of the *Principles of Science* too. Here, Jevons wrote as follows:

> Now among the most unquestionable rules of scientific method is that first law that *whatever phenomenon is, is*. […] If then there is to be competition for scientific recognition, the world without us must yield to the undoubted existence of the spirit within. Our own hopes and wishes and determinations are the most undoubted phenomena within the sphere of consciousness. If men do act, feel, and live as if they were not merely the brief products of a casual conjunction of atoms, but the instruments of a far-reaching purpose, are we to record all other phenomena and pass over these? We investigate the instincts of the ant and the bee and the beaver, and discover that they are led by an inscrutable agency to work towards a distant purpose. Let us be faithful to our scientific method, and investigate also those instincts of the human mind by which man is led to work as if the approval of a Higher Being were the aim of life (Jevons, [1874] 1877, 769).

This passage is interesting to our purposes. Here Jevons stated that the existence of the spirit dwelling within us excluded the possibility that human life could be a product of mere chance. Humans have a sense of a higher purpose and strove to deserve the approval of a Higher Being.

In the passage quoted above, not only did Jevons assert that mind was not reducible to matter. He also relied on phenomena of the inner conscience to provide evidence of God's influence over us. He suggested that our inner experience was enough to prove 'the undoubted existence of the spirit within'. This position echoed the words of Martineau, who often highlighted the inner character of religion. In Martineau's words, "our own conscience is the window of heaven through which we gaze on God" (Martineau, 1839, 3). As I have stated above, Jevons embraced the framework of natural theology. However, in the dense quoted passage above, he relied on self-consciousness in order to show the ultimate purpose of the human being and the existence of a Higher Being. A similar position can be found in his notes about religion collected by his wife:

> The very wish for immortality, the very protest which the mind makes against its own extinction, gives a presumption that all accounts are not here closed. Whence come these feelings of hope, of confidence in deepest despair, if they are not God-inspired (Jevons, 1886, 452)?

In a journal entry, on the 4th March 1866, Jevons expressed the same thought:

> How can we doubt that there is a God when we feel Him moving in us? […] Whence is this feeling that even failure in a high aim is better than success in a lower one? It must be from a Higher Source, for all lower nature loves & worships success, & cheerful life (Jevons, 1972-1981, Vol. I, 202).

Putting the accent on the inner life of conscience and its feelings showed that Jevons was liable to the influence of the 'new school'. This influence is relevant, since Jevons used this argument to argue for the very existence of a Creator. Jevons also suggested that our inner perception of God was at the foundations of our moral duty, providing us with an aim higher than our nature's. Such a statement brings Channing and Martineau to mind, since they had strongly argued that God's moral features were prior to anything else in His nature.

As I have discussed in the first chapter, the human mind was considered transparent to itself, thus, in Jevons's eyes our inner experience revealed the existence of the Almighty as well. "Creation is not yet concluded", wrote Jevons, "and there is no one of us who may not become conscious in his heart that he is no Automaton, no mere lump of Protoplasm, but the Creature of a Creator" (Jevons, 1890, 294). As Channing stated, humans are no machines, or automata in Jevons's terms. Here Jevons also distinguished humans from 'lower beings', like unicellular ones, implying that we solely are the proper creatures of God.

Exceeding matter

Humans are not mechanic contrivances. They are endowed with spiritual features, which are not reducible to the mechanisms of matter. Hence, matter and spirit do not overlap, and humans and machines differ from one another. Nonetheless, *how* do machines and humans differ? Jevons was a committed partisan of unity in method: from his point of view, the scientific method could and should be introduced in all domains of knowledge. However, when applied

to the study of the individual mind, scientific investigation was challenged. Jevons followed Aristotelian metaphysics and argued that no science of the individual was possible: "*an individual cannot be defined*, and can only be made known by the exhibition of the individual itself" (Jevons, [1874] 1877, 711)[32]. Therefore, science was necessarily at a loss to account for the phenomena of individual life. In the *Principles of Science* Jevons wrote as follows:

> It is apparent that in human character there is unfathomable and inexhaustible diversity. Every mind is more or less like every other mind; there is always a basis of similarity, but there is a superstructure of feelings, impulses, and motives which is distinctive for each person. […] The complexities of existing phenomena probably develop themselves more rapidly than scientific method can overtake them. In spite of all the boasted powers of science, we cannot really apply scientific method to our own minds and characters, which are more important to us than all the stars and nebulae (Jevons, [1874] 1877, 733-734).

The most unaccountable of all individual features was genius. As Jevons explained in the *Principles of Science*, before giving portraits of some eminent scientists, "nothing, indeed, is less amenable than genius to scientific analysis and explanation" (Jevons, [1874] 1877, 576). Genius didn't bend to scientific explanation because it was a breach of the ordinary course of nature: "as genius is essentially creative, and consists in divergence from the ordinary grooves of thought and action, it must necessarily be a phenomenon beyond the domain of the laws of nature" (Jevons, [1874] 1877, 576). In the notes he wrote towards the end of his life Jevons was quite clear about the origin of such a power. "Among the lower animals", as he stated, "is the bounded variety – that sameness that is truly hopeless. But man may possess genius. We know not whence it comes, but *from the mysterious working of the Primary Cause*" (Jevons, 1886, 453, emphasis added).

Genius could break the laws of nature because it was not of this world, resulting from divine intervention. Consequently, history could never be scientif-

[32] See also Jevons, (1874) 1877, 595, where Jevons quoted Plato and Aristotle concerning the impossibility of acquiring any knowledge of the individual.

ically explained, since it implied the action of genius. As we have seen in the last chapter of the *Principles of Science*, God had the power of interfering with the series of natural causes[33]. Genius was just an instance of God's ability to modify the universe according to His will. Furthermore, through genius God also gave humans the possibility of *creation*, namely of escaping their own boundaries and the boundaries of nature. The human mind could break through the 'is', or its ordinary course of thought; something which no machine could ever accomplish.

However, genius wasn't the only faculty which depended on the Primary Cause. "Are not all high thoughts", asked Jevons, "all pure desires, the gift of God? Are not all hearts moved in more or less degree towards the good they would not otherwise have conceived?" (Jevons, 1886, 455). God was thus a guide to our moral sentiments, and showed the path of goodness and higher motives. Thus, Jevons seems to suggest that the condition of possibility for moral improvement rested on a divine gift. Channing had postulated a self-inspecting and self-forming faculty to secure the steps of the person engaged in self-culture. In his turn, Jevons postulated that God had provided His creature with the purest sentiments and the capacity to conceive goodness. And yet, unlike Channing, Jevons didn't tackle this foundational problem explicitly, leaving us to mere hypotheses concerning the condition of possibility of moral improvement.

According to Jevons, the divine hand was also visible in Jesus, whose nature showed "the manifest workings of a Divine Spirit in His life and works" (Jevons, 1886, 454). It is worth mentioning that this position recalled Martineau's theory of Christ's inspiration. As Martineau argued in the Liverpool Controversy, "the inspiration of Christ is not any solitary, barren, incommunicable prodigy; but diffusive, creative, vivifying as the energy of God" (Martineau, 1839b, 7). In Martineau's mind, Christ was completely filled by this divine energy, which in him was present more intensively than in anything or an-

[33] See the Uniformitarian-Catastrophist debate as explained in the first chapter.

yone else (see Martineau, 1900, Vol. II, 212)[34]. Thus, Jevons mentioning the divine spirit in Christ proves again that he was informed by the position of the reformers. However, the divine spirit wasn't at work in moral sentiments exclusively. As Jevons wrote in *The State in Relation to Labour*, "reason is a Divine gift" (Jevons, [1882] 1910, 170) as well. Hence, we had the responsibility to use it – and to use it properly. Furthermore, the supernatural origin of these sentiments and faculties implied that human knowledge, which is finite, could never grasp them fully. As Jevons wrote, "I do believe that there spring forth from the human mind and heart – the feelings which science will never analyse – hope and trust and self-devotion" (Jevons, 1886, 455).

Here Jevons was firmer in stating that science could never attain a complete understanding of those feelings. They *exceed* our knowledge, they surpass it. Thus, I would like to call the spirit '*an excess*' with respect to matter, in order to clarify Jevons's position. Jevons was positive that those feeling would never be analysed, because they inherently surpassed the order of nature. Being directly caused by God, their origin was infinite. Those faculties were in his mind 'a window through which we gaze on the *infinity*', and thus will always exceed our finite knowledge. Not to mention that such an excess couldn't be ascribed to any machine, since contrivances are the product of human knowledge.

Reason, genius, pure desires, are all gifts of God. Consequently, they shall always exceed the series of causes regulating nature. They added an element of novelty and unpredictability to human action. This view of mental faculties was, however, at odds with Jevons's desire to found social sciences on a sound scientific basis. This tension runs through his major economic work, *The Theory of Political Economy*, as Michael White has rightly pointed out (see M. White, 1994a, 216-219). Here Jevons claimed that his work was a "mechanics of human interest" (Jevons, 1871, 24). His work on the laws of muscular exertion, where he tries to reconstruct "the mathematical relations upon which the science of economy is founded" (Jevons, 1870, 158), also went in this direc-

[34] On this topic see also Waller, 2002, 347-350.

tion. Nonetheless, in his *Theory* Jevons argued that the economic agent *chose* his course of action: "the mind of an individual is the balance which makes its own comparisons, and is the final judge of quantities of feelings" (Jevons, 1871, 19). "Pleasures", Jevons added, "are, for the time being, as the mind estimates them; so that we cannot make a choice, or manifest the will in any way, without indicating thereby an excess of pleasure in some direction" (Jevons, 1871, 19). White has highlighted the ambiguity of this argument: Jevons didn't clarify if this will had a mechanical nature or was free to choose (see M. White, 1994a, 218).

The difference between 'is' and 'ought' plays a preponderant role in this problem. If the agent's decisions weren't voluntary, every decision would be acceptable. Indeed the agent would have no choice but the one actually made. No prescription could reasonably apply to this agent's behaviour, since the agent could not behave differently. However, Jevons held that some decisions might be more *desirable* than others. Thus, while discriminating a lower from a higher rank of feelings, he wrote as follows: "if the claims of a family or of friends fall upon him, it may become desirable that he should deny his own desires and even his physical needs their full customary gratification" (Jevons, 1871, 30). The hierarchy of feelings in Jevons's economic theory shall be further investigated in the next chapter. Here, it is important to connect this passage with the 'is-ought question'. Jevons used the term '*should*', which is connected to the domain of 'ought'. In the face of a greater good, the economic agent had to relinquish his immediate desires. He *ought to* act in such a way. Not to mention that humans generally reasoned badly. As argued above, in Jevons's eyes all classes had to learn how to make more cautious decisions. The labourer *ought to* spend better, the businessman *ought to* restrain himself from rash investments and to foresee crises in the market.

Consequently, Jevons kept a place for moral decision and improvement even in his 'mechanics of interest'. It is worth mentioning that this oscillation gave a high degree of ambiguity to his theory. But what was the *reason* for this ambiguity? Why was Jevons so eager to give his agent the capacity of choice? According to White's hint, Jevons was well aware of the moral implication of

physiological psychology (see M. White, 1994a, 220). A deterministic theory of morals might jeopardize individual responsibility, and with it the harmony of the whole society. That was why Jevons was inclined to leave some latitude to free will. Ruling the 'ought' out of human behaviour would result in an immoral individual, and thus an immoral society. Jevons expressed this concern in the final chapter of the *Principles*, where he wondered if science was meant to be materialistic: "if so, our boasted free will become a delusion, moral responsibility a fiction, spirit a mere name for the more curious manifestations of material energy" (Jevons, [1874] 1877, 736). As I have shown in the first chapter, for Jevons, assuming that science could explain everything within its framework was a mistaken and arrogant philosophy of science. The universe, as an infinite creation of an infinite Being, could not be encompassed in a materialistic account.

As we have seen from his notes and works, for Jevons humans were no automata. Human beings were creatures of 'ought' and 'is' at once. Matter would never exhaust spirit. White has suggested that Jevons was uneasy about Martineau's criticism of scientific psychology. Despite being dissatisfied with Martineau's knowledge of this domain, the Unitarian minister produced Jevons the urge to reconcile religion and science. According to White, Jevons's way to harmonize them was to keep them analytically separate: beliefs and knowledge divorced from one another in Jevons's view (see M. White, 1994a, 222-223). My contention here is that Jevons was far more haunted than that by Martineau's argument. The head of the reformers had provided Jevons with a way to focus on the peculiarities of spirit with respect to matter. That was why Jevons's religious beliefs couldn't be confined to the private sphere. Religious categories were at the foundation of his epistemology as well as of his moral precepts. In Jevons's view, God was the infinite source of man's moral qualities, his path towards good. Humans were no machines, but the creatures of a Creator (see Jevons, 1890, 294).

2.4. Individuals and society

As we have seen, Jevons primarily conceived social reform in terms of individual improvement. However, how did he conceive of *society*? What was the place of the individual within society? In the present section, I address these questions. I argue that Jevons had an individualistic account of society. I will then distinguish moral from political individualism, explaining that Jevons was a moral individualist, but not a political one. Moreover, I stress how Jevons, like many Victorians, dreaded that his beliefs could be seen as an endorsement of egoism.

The primacy of the individual

Jevons tackled this problem while reading Whately's *Lectures on Political Economy*, in Australia[35]. According to Whately, as Jevons remarked in his notes, humans were endowed with a social instinct "conferred by God on Man, the system of cooperation, and exchange which civilized Society always presents, being a remarkable & very striking because unexpected example of *design* in Providence" (Jevons, 1972-1981, Vol. I, 158). Jevons utterly agreed with Whately in this respect. While Whately considered that divine providence was the means through which society progressed from an uncivilized to a civilized state, Jevons took progress in civilization instead to be the result of the divine gift of reason. As we read in his notes,

> the proposition that none can raise themselves from the *savage state etc.*, the first civilizing influence being the direct agency of God is changed to the prop. that none can raise themselves but by the aid of reason derived from God, but that having received this in their creation, all *have* risen to a degree of civilization proportional to their mental capabilities (Jevons, 1972-1981, Vol. I, 159).

[35] Micheal White has already brought these notes to attention, pointing out Whately's importance in Jevons's elaboration of his "crude" Utilitarianism; see M. White, 1982, 38-39.

Once again, religion had a pivotal role in Jevons's thought, for the principle at the basis of society – *i.e.* reason – was a divine gift.

Moreover, the individual had obligations towards society. These duties firstly consisted in the moral obligation of the middle-class towards the labouring classes:

> In the eye of the economist and the statesman, in regard to the public interests, and before the face of God, the welfare of the working-man and the workingman's class is as much an object of care as that of the wealthiest capitalist; and, indeed, in proportion to the numbers concerned, vastly more so (Jevons, 1890, 107).

It is worth mentioning that William Gaskell preached a sermon entitled *The Duties of the Individual to Society*, at Cross Street in 1858. In this sermon Gaskell praised the departed manufacturer John Potter for his social engagement. Whoever forsook society, argued Gaskell, forsook their best instincts – instincts which made them acknowledge all as their brethren (see W. Gaskell, 1858, 4): "self is not the only object of our existence, else why were we endowed with social affections, and made susceptible of social wants and enjoyments?" (W. Gaskell, 1858, 5). The individual ought to give something in exchange of all the advantages that society offered. Our service should take into account the whole world, "for it is the world of our fellow-beings" (W. Gaskell, 1858, 4).

Both for Jevons and Gaskell, God had provided humans with social instincts. Human beings lived in a society of brothers. However, our previous investigations suggest that Jevons's view of society was *individualistic*. As I have argued, individual character was for him the ground where social reform took root. If the singular person had this intermediary function between society and reform, it was because of his primacy. Primacy in the sense that the individual was the engine and the core of society. This is manifest in Jevons's conception of history, in which it was individual action and genius which altered the course of history gave history and made it unpredictable:

> There have been writers who, however industrious, were shallow, for they thought that science could account for the course of history. They utterly failed to see that a nation as a whole is the most complicated of phenomena, because not only is each individual different from each other, but any one may act upon the whole in a manner wholly incalculable. Genius or ingenium means inborn powers, of which no one can give a further account (Jevons, 1886, 453).

These statements entail an individualistic account of society. Indeed, from Jevons's perspective, the individual behaviour could not be explained collectively.

Moreover, the endeavours of private individuals were the pillars of social progress. As Jevons stated in *Experimental Legislation and the Drink Traffic*, society progressed thanks to tentative attempts to innovate it. Whenever such an 'experiment' succeeded, and was replicated, we had a new discovery (Jevons, 1883, 256-257). The credit for such inventions went entirely to private individuals: "every new heading that is inserted in the London Trades' Directory is claimed by those private individuals who have tried a new trade" (Jevons, 1883, 256). As Jevons added, "the struggle for existence makes us all look out for chances of profit. We are all, perhaps, in some degree inventors" (Jevons, 1883, 256-257). Everyone had to make their own way in the struggle for life. Competition triggered the search for novelty through experimentation. As Jevons concluded,

> If we had time to trace the history of the steam engine, of gas lighting, of electric telegraphs, of submarine cables, of electric lighting, or of any other great improvement, we should see, in like manner, that the wisdom of Parliament has had nothing to do with planning it. From the first to the last the rule of progress has been that of the ancient nursery rhyme – Try, try, try: And if at first you don't succeed, Try, try, try again (Jevons, 1883, 257-258).

Inventions flourished by virtue of private initiative; the state had little or nothing to do with them. It is not surprising that Jevons was an avid reader of Samuel Smiles's *Lives of Engineers*[36].

[36] See Jevons's remark on the excellence of Samuel Smiles's work in Jevons, (1865) 1906, 102. Jevons's connection with Samuel Smiles has also been pointed out by

Jevons's faith in private initiative and his individualistic interpretation of society were in accordance with his liberalism, endorsement of free trade and discouragement of state intervention. This commitment to free trade was particularly strong in Jevons's youth. He expressed his position clearly in a letter to the *Empire* newspaper. The subject matter was the Australian railway system. Here the young Jevons argued that a misconception of economic theory could entail counterproductive decisions on the part of government. Thus he wrote that "when starting thus upon principles of economy radically false, it becomes doubly necessary to watch the steps of those who are charged with executive power, and entertain such opinions" (Jevons, 1972-1981, Vol. II, 266)[37].

For instance, a public investment in the extension of the railway lines would increase the public debt, hindering economic growth: "unproductive expenditure and a public debt will only burden and retard this colony" (Jevons, 1972-1981, Vol. II, 268). Expenditures should be repaid by ticket fares, so that the investments would be counterbalanced by the appropriate returns. In Jevons's mind, private investors had proven to be far more longsighted than public organizations:

> In the States […] the lines of railway are, I believe, projected and executed by private speculators, Yankee men of business, of well-known foresight and acuteness. Does the general success of Government works in this colony or any other country whatever, warrant us in supposing the same economy and foresight will be employed, or the same success attend the Government railway undertakings at present in question (Jevons, 1972-1981, Vol. II, 267).

Jevons expressed his endorsement of free trade in *The Coal Question* as well. Here, taking into consideration the English policy, Jevons wrote as follows: "our growth has been nourished by freedom, not by restrictions" (Jevons, [1865] 1906, 434).

Mays; see Mays, 1962, 244, where this topic had been addressed with respect to scientific methodology.

[37] W. S. Jevons, 1972-1981, Vol. II, 266.

Moral and political individualism

Jevons's individualistic views made him inclined to consider the private initiative more efficient than state intervention. However, his stance against state intervention wasn't as strict as it may seem. This statement could be bewildering, without an elucidation of the term 'individualism'. Jevons surely had an individualistic account of society – unless that several forms of individualism can be identified. Differentiating these forms turns out to be productive to investigate Jevons's thought.

Stefan Collini, in *Liberalism and Sociology*, has distinguished political from moral individualism. Individualism had a political feature, advocating against state intervention, collectivism and socialism. This political form of individualism was often buttressed by a moral individualism, even though the two forms did not overlap. The moral individualist considered the subject as self-centred, and individual action as free and independent. This subject was free to pursue their own ends, so that the word 'individualism' was often interpreted as a synonym of egoism (see Collini, 1979, 16)[38]. Collini's account of individualism is set in the 1880s, where the political sense became increasingly widespread. At the same time the moral sense was increasingly associated with egoistic pursuits (see Collini, 1979, 18). Consequently, in 1885 Sigdwick wrote that "Individualism of the extreme kind has clearly had its day" (H. Sidgwick, as quoted in Collini, 1979, 17), trying to distinguish his own position from the predominant harsh interpretation of the term.

Where does Jevons's individualism fit into Collini's scheme? Jevons was first and foremost a *moral individualist*. A clear statement of his moral individualism can be found in his notes. While explaining that the human mind and character could be compared to a piece of machinery, Jevons also presented the basis of his moral account:

[38] Collini has relied on the entries of the *Oxford English Dictionary* in the distinction of these two senses of the word.

> I regard man in reality as essentially selfish, that is as doing everything with a view to gain enjoyment or avoid pain. This self interest is certainly the main-spring of all his actions, and I believe that it is beyond a mans nature to act otherwise, just as food, his *fuel* is the source of all his bodily actions, and his only possible maintainance. […] In its action on the body the mind must follow a simple & universal law of seeking the most pleasure, and follow it as implicitly as the railway train follows the curves & turns of the line upon which it is running (Jevons, 1972-1981, Vol. I, 133).

Jevons's considerations were triggered by John Woolley's lecture on the selfish theory of morals (Jevons, 1972-1981, Vol. I, 132). And yet these were the basic principles of Utilitarianism as Jeremy Bentham presented it. Indeed Bentham's *Introduction to the Principles of Moral and Legislation* opened with a very similar statement:

> Nature has placed mankind under the governance of two sovereign masters, *pain* and *pleasure*. It is for them alone to point out what we ought to do, as well as to determine what we shall do. On the one hand the standard of right and wrong, on the other the chain of causes and effects, are fastened to their throne. They govern us in all we do, in all we say, in all we think: every effort we can make to throw off our subjection, will serve but to demonstrate and confirm it (Bentham, [1823] 1996, 11).

According to Robert Collison Black, Jevons didn't study Bentham's philosophy extensively until he went back to University College of London in 1859. There he attended John Hoppus's course on Philosophy of Mind and Logic, which encompassed Bentham's work. Black has also suggested that Jevons's acquaintance with Bentham's theory of morals had been transmitted by James Martineau (see R. D. C. Black, 1972a, 123-124). In any case Bentham's influence on Jevons's thought became significant, corroborating the moral individualism which Jevons had outlined in his notes. Black has rightly highlighted how Jevons's endorsement of Utilitarianism wasn't nominal at all, notwithstanding Ross Robertson's tendency to minimize the utilitarian influ-

ence on Jevons (see R. D. C. Black, 1972a, 123)[39]. Indeed, as we shall see in the next chapter, Jevons's economic theory involved a self-interested agent maximizing pleasure. Jevons himself asserted in the *Theory* that he had "no hesitation in accepting the Utilitarian theory of morals which does uphold the effect upon the happiness of mankind as the criterion of what is right and wrong" (Jevons, 1871, 27).

As argued above, Jevons was a moral individualist. His position was consistent with the utilitarian theory of morals. However, the ultimate utilitarian goal was far from being the happiness of the individual person, as Bentham had explained well (see Bentham, [1823] 1996, 12-13). Bentham had clarified that the principle of utility was nothing but an expression designating the greatest happiness of the greatest number (see Bentham, [1823] 1996, 14, n. d). Hence, Bentham's utilitarianism was founded on a form of moral individualism, but wasn't selfish from a *political* point of view.

Jevons agreed with Bentham completely, as is shown in *The State in Relation to Labour*, a text in which Jevons's allegiance to the utilitarian political theory was evident. As Jevons wrote, paraphrasing Bentham's *Introduction*, "the State is justified in passing any law, or even in doing any single act which, without ulterior consequences, adds to the sum total of happiness" (Jevons, [1882] 1910, 13)[40]. The supreme law was the *salus populi*, the well-being of the community (see Jevons, [1882] 1910, 17). Jevons took a practical – or experimental – point of view, arguing that no abstract principle could survive fully intact into social legislation. In his mind, the latter was "a complex calculus

[39] Wolfe Mays has denied that Jevons's position had been informed by Bentham too. According to Mays, "Jevons's statement that economics deals with pleasures and pains would then seem little else but a *façon de parler*" (see Mays, 1962, 240). As for Ross Robertson's thesis, see R. Robertson, 1951, 233-234.

[40] It is worth mentioning that Bentham encouraged understanding government's measures in the light of the greatest happiness principle: "a measure of government […] may be said to be conformable to or dictated by the principle of utility, when […] the tendency which it has to augment the happiness of the community is greater than any which it has to diminish it" (Bentham, (1823) 1996, 13).

of good and evil" (Jevons, [1882] 1910, 16). Nonetheless, every social decision had to be evaluated in accordance with the principle of the greatest happiness. Thus, we can easily understand how for Jevons free trade wasn't a dogma. Free trade is an abstract rule, and as such it ought to be ignored if its application seems to entail more evil than good (Jevons, [1882] 1910, 17).

The spectre of selfishness

Neither Bentham nor Jevons were advocating individualism in the sense of political egoism. Indeed, Jevons was constantly worried that his perspective might entail an egoistic view of individual behaviour. The harsh connotation of self-interest as egoism haunted him from his youth. If human action was triggered by seeking for pleasure, this wouldn't itself be grounds for saying humans are selfish. This utilitarian agent "is not necessarily what we should call an avaricious, interested or in fact in its full sense a *selfish* man" (Jevons, 1972-1981, Vol. I, 133). As Jevons explained,

> it is by the quality of those pleasures which he is continually seeking and by the causes of pain he equally flies from that he is to be judged. It is quite possible that one of his chief pleasures may be to see another person happy, or that he may have a friend connected to him by such intimacy, similarity of feelings, and in short complete *sympathy*, that pain to the friend is pain to himself (Jevons, 1972-1981, Vol. I, 133).

And yet this statement couldn't jeopardize the main assumption, namely the self-interested character of the individual. The moral agent was bound to the research of pleasure. As for what we call 'selfishness' in its proper sense,

> it is in the nature & spontaneous impulses of the soul itself and its relation, by sympathetic feelings to other souls, that what we shall call, unselfishness, disinterestedness or benevolence consist. […] The truly selfish man will be he who has no such connections with the souls of others, and whose enjoyments are completely or material or perhaps misanthropical (Jevons, 1972-1981, Vol. I, 133).

Collini, in *Public Moralists*, has highlighted how strongly many Victorians were concerned with the egoistic implications of their moral theories. They de-

nied that self-interest necessarily implied egoism. A self-interested agent could also have altruistic feelings; on the contrary, his actions *ought to* take into account the good of others (see Collini, 1991, 60-90). Jevons fitted perfectly into this cultural atmosphere. Once he admitted our main motives to be self-interested, he had to avoid reducing the moral agent to a dangerous, selfish individual. While Jevons was coping with the poor reception of his *A Serious Fall in the Value of Gold Ascertained*, he was also struggling to understand the nature of his own motives, and determine whether they were selfish. Thus, he wrote: "faulty as I am in so many ways – I yet feel that my inmost motives are hardly selfish" (Jevons, 1972-1981, Vol. I, 191). He believed that his role as a writer on political economy was to give a service to society (Jevons, 1972-1981, Vol. I, 191-192)[41]. Now, what is important here is that Jevons considered analysing his own feelings in order to escape from the charge of being selfish.

He tackled the problem of selfishness in a very interesting way in his reflections on *My Novel*, by Bulwler-Lytton. Jevons wrote about the difference of the two main characters, Leonard and Randal: "I cannot quite understand the exact difference which lies perhaps under the same mystery as *selfishness* does in my mind" (Jevons, 1972-1981, Vol. I, 130). Apparently, the question was linked to ambition. Is it acceptable to pursue one's own ends for one's own satisfaction, regardless of the purity of the prompting motives? Jevons implicitly answered negatively. Indeed this was the difference between the characters: Leonard, the positive character, was in Jevons's mind "prompted & urged on by an inward, perhaps innate sense of the *Good & Great*, an idea which working within him, leads him, without any positive view to his own or others mere happiness & comfort" (Jevons, 1972-1981, Vol. I, 130). Leonard didn't improve himself for the sake of glory or power. He did it in a disinterested man-

[41] Here we read: "sometimes I even feel that I should not care for reputation wealth, comfort or even life itself if I could feel that all my efforts were not without their use. Could I do it all anonymously, I perhaps might consent to it. And yet the condemnation of friends & all you meet is hard to be borne, & their praise or admiration must be sweet".

ner, while Randal didn't have "the slightest appreciation of the meaning of Good or Great" (Jevons, 1972-1981, Vol. I, 131). Therefore, whenever he could, Randal was always "ready to take a short cut in which he thinks he will be unobserved though it be by a *dishonourable step*" (Jevons, 1972-1981, Vol. I, 131).

According to Jevons's interpretation of *My Novel*, the unselfish man keeps true to his principles and acts in a disinterested way, whereas the selfish one only cares for his reputation. The difference between the two of them lies in the integrity of their *motives*:

> Leonard & Randal are indeed something like two men setting off to circumnavigate the Globe for instance one with the genuine love of travel & improvement, the other for the sake of the name he will obtain on his return; each might visit the identical same places, yet the one find everywhere gratification and interest whereas the other perhaps detests each place he comes to counts up the stages of travel still remaining, and arriving home again, gains a suitable reward by being discovered and his superficialness exposed (Jevons, 1972-1981, Vol. I, 131).

Jevons considered thus that investigating the notion of selfishness required an exploration of inwardness, that is, intention. One could be blamed on the basis of the motives underlying their actions, like Randal.

Jevons didn't fail to condemn selfish motives as well as actions. For instance, in his paper *The Rationale of Free Public Libraries* (1881), Jevons reproached those who possessed beautiful artworks and kept them in their private rooms, away from the eyes of the world: "if a beautiful picture be hung in the dining room of a private house it may perhaps be gazed at by a few guests a score or two of times in the year. Its real utility is too often that of ministering to the *selfish pride* of its owner" (Jevons, 1883, 29, emphasis added). Had that artwork its place in a museum instead, it would be admired by many, increasing the amount of happiness, *i.e.* utility, of the community. Selfishness deprived the community of happiness: nothing could be worse in the eyes of a utilitarian philosopher.

It is important to note that this position marked a difference between Jevons and Bentham. The moral theory of the latter was only concerned with con-

sequences[42], whereas the former's brought inner motives into moral thought. Ellen Frankel Paul has highlighted this point with respect to Jevons's distinction between morality and legislation in *The State in Relation to Labour* (see Paul, 1979, 279). For Bentham, humans were certainly endowed with 'extra-regarding', or altruistic feelings (see Bentham, 1983, 154; [1815] 1983, 16-18). Utilitarian orthodoxy admitted then that we could feel sympathy for others. And yet what really mattered was the outcome of one's actions: as long as the agent doesn't harm anyone, he cannot be blamed on the grounds of his motives. Moreover, according to Bentham, the agent was the best judge of his own welfare. Nobody should be encouraged to relinquish self-regarding motives in favour of extra-regarding ones. This would be, from Bentham's point of view, an unacceptable abuse of the individual, and contrary to the increase of general happiness (see Bentham, 1983, 121).

Jevons's account was quite different. One could and should be blamed for having selfish motives. Scrutiny of people's motives not only distanced Jevons's position from Bentham's; it also brought Jevons closer to James Martineau's moral account. The utilitarian tradition of Bentham and Paley valued the material consequences of actions, whereas Martineau considered that moral behaviour couldn't be such in the absence of a sincere moral conscience. Hence, Jevons's attention to motives was more consistent with Martineau's thought than with the utilitarian tradition. Jevons felt the spectre of selfishness lingering on his moral theory. We can now see that Jevons was placed in a complicated conundrum: how could a society based on moral individualism be imagined? I now turn to this problem as it was tackled by Jevons, Bentham and John Stuart Mill.

[42] Concerning consequentialism, see Bentham, (1823) 1996, 74.

2.5. A sum of number ones

We can now see that Jevons was placed in a complicated conundrum: how could a society based on moral individualism be imagined? I now turn to this problem as it was tackled by Jevons, Bentham and John Stuart Mill.

Number one, the magic number

As I have argued, Jevons was persuaded that selfishness, properly so called, was unacceptable and did great harm to society. He was aware that the line between selfishness and self-interest was thin. Nonetheless, Jevons's account inherited an old and thorny problem, which had long been haunting the utilitarian philosophers and many others: how a society composed of self-interested individuals is unified?

This difficulty was all the more relevant considering that it had an ontological foundation. From the ontological point of view, we could ask: how a society where the fundamental unity is the singular individual does not disintegrate? That is, how a society resulting from a sum of *number ones* is unified? Such was Bentham's definition of the community:

> The community is a fictitious *body*, composed of the individual persons who are considered as constituting as it were its *members*. The interest of the community then, is what? – the sum of the interests of the several members who compose it (Bentham, [1823] 1996, 12).

Society was a fictitious body, that is, it didn't have an ontological foundation[43]. 'Community' was a conventional term indicating the sum of individuals. Hence, society was the result of the sum one plus one, plus one, plus one, and so on. Consequently, the interest of such a community was reduced to the sum of its members' interests.

The risk was letting society fall apart in such a count: one by one, the interest of the whole may never be composed. On the basis of these theoretical

[43] For the notion of fiction, see Bentham, 1838-1843, 195-213.

foundations, there would be no such thing as social unity, but only the temporary appearance of it. Let us now take into account a passage of *Oliver Twist*, where the same problem is tackled. Fagin, who heads a criminal group in East London, explained to one of his accomplices his view of how their community could stick together:

> "Some conjurers say that number three is the magic number, and some say number seven. It's neither, my friend, neither. It's number one".
> "Ha! ha!" cried Mr. Bolter. 'Number one for ever'.
> "In a little community like ours, my dear", said Fagin, who felt it necessary to qualify this position, "we have a general number one; that is, you can't consider yourself as number one, without considering me too as the same, and all the other young people".
> "Oh, the devil!" exclaimed Mr. Bolter.
> "You see", pursued Fagin, affecting to disregard this interruption, "we are so mixed up together, and identified in our interests, that it must be so. For instance, it's your object to take care of number one – meaning yourself".
> "Certainly", replied Mr. Bolter. "Yer about right there".
> "Well! You can't take care of yourself, number one, without taking care of me, number one".
> "Number two, you mean", said Mr. Bolter, who was largely endowed with the quality of selfishness.
> "No, I don't!" retorted Fagin. "I'm of the same importance to you, as you are to yourself" (Dickens, 1968, 327).

The little community of criminals was bound by the same interests, and nonetheless every member was caring for himself exclusively. Each of them was a 'number one', namely a self-interested individual endowed with the quality of selfishness, like Bolter. That was why taking care of the other members didn't make the count go on: everyone, by looking after the interests of the others, was really minding their own interest. The interest of the individual is the only unity of measure for one's behaviour. Though describing a group of criminals, Dickens's picture applied to every community of self-interested individuals. Such a society couldn't but be skating on thin ice: it was harmonious so far as the interests of the others coincided with one's own. Once these fortuitous circumstances failed, the agreement among the members of the community would crumble to dust. Jevons feared that such would be the fate of the

society he depicted, due to the dangerous similarity between self-interest and selfishness.

The need for direct intervention

Jevons discovered a first answer to this conundrum in the social instinct, as Whately described it. The social instinct bound humans together, so that the pursuit of one's own good turned out to benefit everyone else. In Jevons's mind, Whately explained this mechanism, as:

> That hidden and seldom noticed principle in the nature of masses of associated men, which leads each to labour on ceaselessly in that very pursuit which will most benefit the whole body though himself seeking all the while his own exclusive advancement (Jevons, 1972-1981, Vol. I, 157).

Social instinct, a divine endowment, had a pivotal role in the world. If individual competition was the basic principle regulating human behaviour, and if human action was driven by a social instinct, the two principles taken together explained

> how a number of men all really and entirely selfish might yet, by means of the advantageous & equitable arrangements which fair & free Competition always ensures work together unconsciously or at least unintentionally each for the good of all (Jevons, 1972-1981, Vol. I, 158).

In Jevons's mind, society was indeed a sum of number ones, as his endorsement of Whately's account shows. However, Jevons wasn't always so confident that those interests harmonized spontaneously. He became more and more persuaded that some conflicts in society needed strategies to find appeasement. This was the case of the conflict between 'masters and men': we could hardly imagine that such conflict would vanish spontaneously. Hence, Jevons favoured the decision of Parliament to institute the so-called Boards of Conciliation, or Arbitration (Jevons, 1883, 124; [1882] 1910, chap. 7), which was given the task to mediate between the two antagonists. Jevons encouraged their intervention, so long as they didn't claim the right to regulate prices and

wages. These were, in Jevons's mind, the necessary result of economic laws, so that attempting to modify them would elicit 'unmeasured evils' (Jevons, 1883, 124). However, Jevons admitted there was anyway latitude – and need – for intervention from these boards:

> There are many details of trade relating to the hours and conditions of labour, the safety, comfort, and welfare of the men, which are rightly the subject of regulation; and in respect to such matters I wish to see the vigilance and energy of the unions and councils increased rather than diminished (Jevons, 1883, 124).

Jevons tackled similar problems in *The State in Relation to Labour*. Herbert Somerton Foxwell, who was appointed Jevons's successor at University College in 1881 (Jevons, 1972-1981, Vol. V, 136-137), expressed, in the following letter, his hopes concerning this book prior to publication:

> I hope to find that you have taken up – well I wont say a Socialistic position, because some dislike the word: but at all events a position from which you recognize the obligation of the individual to society, and the necessity for some control, in the public interest, of his endeavours to secure his private gain. The more I read about the condition of labour, the more convinced I am of the necessity and advantage of organisation and control (Jevons, 1972-1981, Vol. V, 186).

According to Jevons's answer to this letter, Foxwell's wishes would be fulfilled: "judging from what you say", observed Jevons, "I fancy the new book will almost exactly meet your views" (Jevons, 1972-1981, Vol. V, 187).

In this book Jevons dealt with the problem of labour regulation, with respect to the limits and functions of legislation (Jevons, [1882] 1910, 1). From a theoretical point of view, every individual was his own master, free to choose whatever they preferred in accordance with their interest. However, the matter was more complicated: in the presence of indisputable calamities, the state ought to implement some measures. Jevons gave the example of a worker using dangerous machinery. The labourer may expose himself to considerable risk of death and mutilation, neglecting his own well-being in pursuit of wages.

Once we found that the individual could not act in their own best interest, we would turn our regard to the employer. "We might", argued Jevons,

> assume that the owner of dangerous machinery would fence it from motives of mere humanity, if not from those of self-interest. But here again experience proves the existence of unaccountable thoughtlessness, if not heartlessness. Before the legislature began to intervene, hardly any owner of machinery thought of incurring the small additional percentage of cost requisite to render the machinery safe to the operatives (Jevons, [1882] 1910, 3).

In case of patent need such as this, we could not rely on the alleged humanity of people, nor could we wait for the person concerned to learn from their errors.

This topic is evidently connected to the problem mentioned above: the risk of social breakdown when everyone is only pursuing their own interest. The employers who didn't care for the welfare of their employees were the perfect examples of the selfish subject. Jevons was interested in the question of how the social damage that such behaviour might entail could be controlled. He noticed that we couldn't depend on the humanity of those people. Perhaps humans were provided with a social instinct, yet it wasn't enough to prevent them from harming their fellow citizens. The parts of society were not willing or able to take care of everything needful for the whole – in some cases not even of their own needs. Whenever this was the case, Jevons suggested, state intervention was required. As for dangerous machinery, for instance, "the law may command that dangerous machinery shall be fenced, and the executive government may appoint inspectors to go round and prosecute such owners as disobey the law" (Jevons, [1882] 1910, 4). The state had the responsibility to intervene whenever private individuals lacked sympathetic feelings and social instinct. State intervention was meant to put together the number ones composing society.

Moreover, the state had to protect the interest of its members. It was simply unrealistic to think that everyone would, in every situation, be the best judge of their own good. As Jevons remarked, citizens often lacked some specialistic

competencies which were the necessary requisite to choose properly. Certain commodities, for example, had to be checked by government inspectors. This measure was far from being a violent intrusion of the state in the private affairs of its citizens: "those who examine such things as herrings, butter, gun-barrels, coffee, tea, pepper, butcher'-meat, and the like, cannot be charged with indifference or opposition to the good of the common people" (Jevons, [1882] 1910, 42). Jevons justified the enforcement of those inspections by explaining that the commodities were divided into two categories, "according as the purchaser is or is not the best judge of what he wants" (Jevons, [1882] 1910, 42). If one was purchasing a house, they would need the opinion of an expert to certify that its well was free from "deadly sewage poison" (Jevons, [1882] 1910, 43). As Jevons concluded, "*Laisser faire* policy might still be maintained if everybody understood his interest. But the very point of the matter is that ignorant people cannot take precautions against dangers of which they are ignorant" (Jevons, [1882] 1910, 43). Consequently, "there are many cases where the expert is a far better judge than the individual purchaser" (Jevons, [1882] 1910, 43).

Protecting the individual: John Stuart Mill's On Liberty

As Sidgwick would argue, political and moral individualism didn't exclude state intervention: the government could – and should – protect children, control public health, enforce professional standards and so on (see Collini, 1979, 20-21). Jevons's position in *The State in Relation to Labour* was certainly consistent with this thought. These investigations evidently touched a topic of great theoretical moment: the question of *liberty*. The concept of liberty plays a preponderant role in the theoretical framework of individualism. In a society where the fundamental element is the individual, individuals must be granted the right to freely pursue their own desires. This argument was also at the basis of free trade, since every limitation to freedom in the market was seen

as a limitation to the very freedom of the subject[44]. This intertwining set of notions was at the core of John Stuart Mill's essay *On Liberty*. Jevons couldn't but think of Mill's work while writing on these topics. Therefore, let us take into consideration Mill's text.

John Stuart Mill's perspective was consistent with Bentham's definition of society as a sum of individuals. Society was reduced to what Mill considered to be its basic elements: the individuals. Hence, according to Mill, "the worth of a State, in the long run, is the worth of the individuals composing it" (Mill, [1859] 1977, Vol. XVIII, 310). It follows that for Mill *individuality* was the main principle of society, its engine and its real substance. As Mill stated, "Individuality is the same thing with development, and […] it is only the cultivation of individuality which produces, or can produce, well-developed human beings" (Mill, [1859] 1977, Vol. XVIII, 267). The development of one's own character and faculties was at the basis not only of personal improvement, but of social progress as well: "where, not the person's own character, but the traditions or customs of other people are the rule of conduct, there is wanting one of the principal ingredients of human happiness, and quite the chief ingredient of individual and social progress" (Mill, [1859] 1977, Vol. XVIII, 261). Thus, the subject ought to be free to express his own individuality, according to his character, without any constraint from others or society itself.

Nonetheless, this account did imply some restrictions. *Qua* members of the same community, individuals often found themselves fighting one another. Living together multiplied the occasions of conflict: "all that makes existence valuable to any one, depends on the enforcement of restraints upon the actions of other people. Some rules of conduct, therefore, must be imposed" (Mill, [1859] 1977, Vol. XVIII, 226). Hence Mill's well-known limitation of the exercise of liberty, according to what is currently often called "the Harm Principle" (see Macleod, Miller 2017, 409): "the liberty of the individual must be thus far limited: he must not make himself a nuisance to other people" (Mill,

[44] Concerning the relation between political, moral and economic individualism, see Collini, 1979, 23-25.

[1859] 1977, Vol. XVIII, 260). Underlying this theory, we can distinguish the same difficulty that Bentham and Jevons had: once we have given primacy to individuality, how can the action of the individual be reconciled with respectful social behaviour? Mill had to cope with the same conundrum, that is, prevent society from dissolving because of the conflict of radically independent individuals. Consequently, he admitted free action on the part of the individual only in so far as this action didn't injure others.

Mill's concern, however, was not to prevent conflict in society, as much as to protect the singular person from society's impositions and violence. Mill warned us against "the tyranny of the prevailing opinion and feeling" (Mill, [1859] 1977, Vol. XVIII, 220), which hindered dissent and free self-development. Mill was eager to put strict boundaries on the exercise of power by society. He thus stated that

> the sole end for which mankind are warranted, individually or collectively, in interfering with the liberty of action of any of their number, is self-protection. That the only purpose for which power can be rightful exercised over any member of a civilized community, against his will, is to prevent harm to others (Mill, [1859] 1977, Vol. XVIII, 223).

No one could claim the right to interfere with somebody else, justifying his action under the pretence that he understood the individual's good better than the individual himself. As Mill concluded, "over himself, over his own body and mind, the individual is sovereign" (Mill, [1859] 1977, Vol. XVIII, 224). By drawing a clear line on the interference of society, Mill attempted to respect the peculiar differences of everyone. In his view, "free scope should be given to varieties of character, short of injury to others" (Mill, [1859] 1977, Vol. XVIII, 261).

"The dry old Jeremy"

Jevons was an admirer of Mill's essay *On Liberty*. In a letter to the editor of the *Manchester Examiner and Times*, published in 1866 following his con-

troversial Cobden Lecture[45], Jevons asserted that he wished "to see cherished and developed in England such liberalism as Mr. Mill has deliberately described in his brief but great essay on liberty" (Jevons, 1972-1981,Vol. III, 132). As we have seen, Jevons was often very critical of Mill's work. However, their views on individuality were in harmony. Both considered, following Bentham's account, that the singular subject was the core of society. In Jevons's mind too, individual development was the only path towards social progress. Furthermore, he endorsed Mill's liberalism: in Jevons's mind, the individual had the right to freely pursue his own desires.

How then did their accounts differ? It is a question of *priority*. On the one hand, Mill subordinated every decision to the principle of liberty: each individual was their own master. Provided they didn't harm others in their pursuits, individuals had absolute liberty. On the other hand, Jevons's attention was directed towards a different end. In *The State in Relation to Labour*, where this problem was specifically addressed, Jevons considered, as noted above, that the *salus populi* had absolute primacy: "the State is justified in passing any law, or even in doing any single act which, without ulterior consequences, adds to the sum total of happiness" (Jevons, [1882] 1910, 13). With respect to this principle, which was nothing but a reformulation of the old utility principle, even liberty was of secondary importance[46]. Thus, Jevons launched an attack on the advocates of the so-called "principle of equal freedom" (Jevons, [1882] 1910, 14). Given that the section was entitled *The Evolutionist Doctrine of Freedom*, Jevons's criticism was probably directed at Spencer's *Social Statics*. The principle, as defined in that work, was that: "*every man has freedom to do all that he wills, provided he infringes not the equal freedom of any other man*" (Spencer, [1851] 1868, 121). Given that this definition was almost identical to

[45] Concerning this episode, see the fourth section of the second chapter, as well as the last section of the third chapter.

[46] This tension between the principle of utility and liberty of action has already been highlighted. See, for example, Bowman, 1989, 1126; Paul, 1979, 280-281.

Mill's concept of liberty, it is likely that Jevons meant to strike Spencer and Mill at once.

As for Jevons's argument for this attack, he noticed that among the principles ruling society, "none would seem more sacred than the principle of freedom – the right of the individual to pursue his own course towards his own ideal end" (Jevons, [1882] 1910, 13-14). Nonetheless, he refused to give this principle the primacy that Spencer and Mill had accorded to it. He expressed his doubts in the following terms:

> It would lead me too far to attempt in this place to inquire whether the present course of industrial legislation, and the remarks to be made upon it in the present volume, are really reconcilable with this principle. I am inclined to think that the reconciliation is not impossible; but that, when applied to the vast communities of modern society, *the principle fails to give a sure guiding light*. So intricate are the ways, industrial, sanitary, or political, in which one class or section of the people affect other classes or sections, that there is hardly any limit to the interference of the legislator (Jevons, [1882] 1910, 14-15, emphasis added).

As I have shown above, in *The State in Relation to Labour* Jevons put the principle of utility before any other rule. The legislator had every right to restrict the liberty of citizens, on condition that they did so in the basis of the welfare of the community. Furthermore, Jevons specified how this idea of state intervention wasn't necessarily in opposition to the principle of freedom: "I do not think", he wrote,

> that such interference, applying, as it would, only to the simpler physical conditions of the body, can be said, in a reasonable point of view, to diminish freedom. As physical conditions become more regulated, the intellectual and emotional nature of man expands even more freely (Jevons, [1882] 1910, 15).

Thus, in *The State in Relation to Labour* Jevons acknowledged the priority of the utility principle over anything else. Ellen Frankel Paul has rightly remarked that Mill was more individualist than Jevons: for instance, the latter admitted that the legislator could prevent the workers from engaging in a contract if it endangered them. The legislator was justified in restricting the liberty

of people when that same liberty implied an unacknowledged limitation of their own welfare (see Paul, 1979, 280). Such an interpretation of the legislator's role was plainly in line with Bentham's view. Jevons held fast "to the dry old Jeremy" (Jevons, 1890, 286), as he wrote in his *Utilitarianism* (1877). The Benthamite legislator was responsible for their fellow citizens' happiness: they were in charge of maximizing the total utility, even though this task was mostly fulfilled assuring advantages such as security or equality[47]. Similarly, in Jevons's eyes the state had to assure that people didn't act against their welfare whenever they lacked the capacity to decide autonomously. Hence, he advocated the intervention of the legislator, or he favoured the intercession of experts who could provide the consumer with precious advice[48]. In some situations, Jevons seems to suggest, freedom of choice turns out to be a mere delusion, due to the ignorance of the person taking the choice. Therefore, Jevons denied that proper state intervention was contrary to the freedom of the individual. It rather increased it, since it gave the citizens the means to choose properly.

It can rightly be argued that Jevons held fast to dry old Jeremy for other reasons as well. What Jevons ultimately refused of Mill's perspective was the assumption of rules trumping the utility principle. Thus Jevons took a position in a debate dividing the field of nineteenth-century Utilitarianism: the debate concerning secondary rules guiding the application of the utility principle (see Schneewind, 1977, 169-188). Mill favoured the implementation of "secondary or middle principles, capable of serving as premises for a body of ethical doctrine not derived from existing opinions" (Mill, [1852] 1969, Vol. X, 173). Moreover, Mill attributed this position to Bentham himself (Mill, [1852] 1969,

[47] See, for example, Bentham, *Introduction*, (1823) 1996, 282-283, where the art of government is defined as the art of directing human actions towards the greatest happiness. See Bentham, (1823) 1996, 158. Some scholars have argued that Bentham relied on other universal human interests (security, abundance, subsistence and equality) in the attempt to produce the maximization of the total happiness. In this regard, see: Kelly, 1990; Rosen, 2003, chap. 13; Postema, 2006; Quinn, 2008.

[48] The legislator's role has also been pointed out by Richiardi and Sigot; see Richiardi, Sigot 2013, 238-239.

Vol. X, 173). As for Jevons, in his mind the only goal was the *salus populi*. However, this principle didn't need any additional rule to be applied. It solely required a practical scrutiny, situation by situation, to be properly implemented.

It is worth mentioning that this position wasn't so far from Mill's account as Jevons thought. Isaiah Berlin has shown how Mill was committed to an empirical criterion of probability: all opinion may turn out to be false, so each situation requires a different treatment (Berlin, [1959] 2002, 231-232). However, Jevons was willing to detach his attitude from Mill's one, ruling out the appeal to any other principle than the greatest happiness one. Jevons tried thus to accomplish this end by assuming an eminently practical attitude[49]: "in social philosophy, or rather in practical legislation, the first step is to throw aside all supposed absolute rights or inflexible principles" (Jevons, [1882] 1910, 9). That was because legislation "is not a science at all. […] It is a matter of *practical work,* creating human institutions" (Jevons, [1882] 1910, 9, emphasis added).

We could rely on no strict rules in the attempt to realize the greatest happiness, since "before we can bring the principles down to practice they run into infinite complications, and break up into all kinds of exceptions and apparent anomalies" (Jevons, [1882] 1910, 10). As we know from his logical work, Jevons was strongly persuaded that any reasoning required deduction, *i.e.* general principles. Legislation was no exception. However, this belief didn't make Jevons more willing to accept Mill's appeal to secondary rules. In Jevons's words, "legislation must be Baconian" (Jevons, [1882] 1910, 23). According to Jevons, we always use general arguments,

> but there may be all degrees of proximateness or remoteness between our real premises of fact and our ultimate conclusion. What I venture to maintain is that Baconian legislation will always proceed by reasoning from the most nearly proximate and analogous experience which is available (Jevons, [1882] 1910, 24).

[49] Concerning Jevons's practical attitude, see: Paul, 1979, 278-279; Richiardi, Sigot 2013, 230-231.

Harmonizing the interests within society

It is important to notice that Jevons's allegiance to the principle of utility brings us back to the puzzle: how can conflict among the self-interested members of society be avoided and thereby increase the total happiness? Bentham was well aware of the problem. He constantly strove to find a way to reconcile the interest of the community with that of the individual, without sacrificing any of them[50]. He attributed this task to the legislator. The latter would create the conditions under which the interest of the singular person would coincide with the common interest (see Bentham, [1815] 1983, 66). The legislator guided individual behaviour, by means of laws and penalties. Thus, new occasions of pleasure and pain are crafted by means of sanctions, which enter into the individual's decision-making[51].

John Stuart Mill focused on a similar problem in *On Liberty*, though he saw it from a different point of view. He treated the risk of conflict in the community, but he was mainly concerned about the possibility that society would annihilate individuality. As Isaiah Berlin has pointed out, Mill, together with many Victorians, dreaded *claustrophobia*, a society suffocating personal pursuits (see Berlin, [1959] 2002, 243). For Mill, the individual was prior to everything else, since, in Mill's view, only a society of fulfilled and developed subjects could progress. Mill considered the free expression of different opinions, characters and identities as the very foundation of a happy society. His view was of inspiration to many contributors to contemporary liberalism[52]. It is worth mentioning that Mill's attitude towards individuality was correlated to his reinterpretation of the utilitarian tradition, and notably his desertion of the

[50] See, for example, Bentham, (1815) 1983, 50, where we read: "*Per* Utilitarianism: 'Cause duty and interest to coincide […]'".

[51] A sanction, as Bentham had defined it in the *Introduction*, is a source of pleasure and pain (see Bentham, [1823] 1996, 34). The legislator made use of the political sanction, which was notably the legal punishment, to influence the subject's conduct.

[52] See: Young, 1990; C. Taylor, 1994. For a treatment of Mill's individuality with respect to its influence on these sources, see Macleod, Miller 2017, 431-434.

utility principle as a maximization of the total happiness[53]. The principle of utility persisted in Mill's thought as a criterion of the end, relying on secondary rules to provide for the means to reach it. Hence, the attempt of maximising the happiness was no longer the foundation of his moral theory. As Brown has clarified, "the principle of utility itself approves as the best set of rules, in the desirable enterprise of securing happiness to all, not rules coercing maximally expedient conduct, but rules maintaining the basic social conditions in which individual development can flourish" (Brown, 2010, 14).

As we have seen, Jevons found himself facing the same difficulties. He admitted that the agent had sympathetic feelings and he endeavoured to distinguish self-interest from selfishness. Notwithstanding these efforts, he couldn't deny that society included conflicting, selfish individuals. Some conflicts simply didn't harmonize by themselves, as the conflict between 'masters and men'. Thus, Jevons couldn't but *prescribe* unselfish behaviour. As I have highlighted above, Jevons thought that there were lower and higher motives. If there was a conflict between these two kinds of motives, the higher motives (for instance the duty towards the offspring or the nation), *ought to* guide one's behaviour.

The question is evidently the same as the one presented in the last section: what are the conditions of possibility for such a prescription? How could an agent whose fuel is self-interest renounce his own good in favour of someone else's? What latitude is there for altruism in a context of moral individualism? If each of us is a *number one,* how can a common good ever be attained, for won't the sum of all interests always be in contrast with the interest of society? As I will argue, Jevons tried to solve this problem by combining Spencer's evolutionary perspective and the utilitarian moral theory; a perspective that, in Jevons's view, both Bentham and Mill lacked. We shall see that Spencer's theory also provided him with a way to cope with the gap between 'is' and

[53] This is what the Revisionist scholarly interpretation has argued. For an exposition of this interpretative stream see Brown, 2010; as for Mill's reading of the utility principle, see Brown, 2010, 7-15.

'ought', in the attempt to reconcile the individual happiness with the welfare of society.

2.6. The prescriptive fallacy

As I have argued above, the utilitarian definition of the subject in terms of moral individualism entailed a challenge: how such a subject can be reconciled with society? This difficulty was magnified by the definition of society as a sum of individuals. Jevons, who followed the utilitarian line of thought, had to face this problem too. My contention here is that Jevons found a satisfying answer in the philosophy of Herbert Spencer. Jevons expressed his appreciation for Spencer's theory at various times. However, Spencer's role in the development of Jevons's moral thought went beyond a faint appreciation. Spencer described evolution as a path towards a harmonious society, where the individual's interest was at one with the interest of the whole society. According to Spencer, the individual spontaneously develops a sympathetic and altruistic sentiments in the course of the evolutive process. Jevons couldn't but find this conception appealing, given his struggle to secure at once the individual's welfare and the welfare of the community.

Moreover, such a view is related to another topic to which I devoted considerable attention: the relation between prescription and description, or 'ought' and 'is'. Both Spencer and Jevons had a deterministic account of the individual's behaviour, *i.e.* a deterministic theory of morals: the subject was necessarily bound to follow his self-interest, to seek pleasure and avoid pain. Given this framework, two questions arise. First, how could one prescribe, to an egoistic individual, renouncing his own welfare in favour of society's one, if they are bound by self-interest? Second, how can we reconcile such an individual with society without implying the sacrifice of the individual's good?

I shall argue that Spencer provided an answer to both these questions in the context of his evolutionist thought. Spencer claimed that evolution shaped the subject as follows: starting from a selfish attitude, humans developed an altruistic nature. Therefore, what they saw before as a sacrifice of their interest

wouldn't be such anymore. They naturally incorporated what once was seen as a moral prescription. They followed these prescriptions spontaneously, so that strictly speaking these moral rules weren't such anymore. If a prescription is automatically complied with, it cannot be reasonably called a prescription. It becomes *natural*. In other terms, the 'is' and the 'ought' eventually overlap in Spencer's evolutionist theory.

However, evolution had to come to its limit for this transformation to be complete. In the long run, society would at once entail no sacrifice of the individual good and be perfectly pacific. Nonetheless, the moral code of a perfect harmonious society, which was meant to become second nature to humans, acted as a driver of present evolution in Spencer's eyes. Hence, I shall here suggest a reinterpretation of George Edward Moore's statement, namely that Spencer fell into a 'naturalistic fallacy'. I argue that Spencer never fell into this fallacy, but he did fall into its converse. Spencer never deduced his ethics from nature, but he did deduce nature from his ethics. This is what I shall call a 'prescriptive fallacy'. Such a fallacy consists in deducing the 'is' from the 'ought', postulating that in an unspecified lapse of time what is now prescribed will become spontaneous.

My argument is as follows. First I elaborate Spencer's definition of the individual and his political individualism. After that, I will address the problem of the relation between altruism and egoism, showing how Spencer conceived their relationship in the final stage of evolution. Then, I explain how Spencer's argument was founded on a relevant assumption, namely the teleological drive of evolution. Finally, I elucidate what I consider to be Spencer's fallacy and explain how the Spencerian account influenced Jevons.

The individual according to Spencer

In order to investigate Spencer's position concerning individualism, let us start by recalling his definition of the 'individual'. In the *Principles of Biology* (1864-1867), Spencer stated that the individual was to be defined on the basis of self-sufficiency, as: "any organised mass which is capable of independently

carrying on that continuous adjustment of inner to outer relations which constitutes Life" (Spencer, [1864-1867] 1898-1899, Vol. I, § 74, 251). Despite the alleged clarity of this definition, Spencer warned that this solution resulted from a compromise. He observed that no definition of an individual would ever be unobjectionable (Spencer, [1864-1867] 1898-1899, Vol. I, § 74, 249). However, whenever we can acknowledge that an organism was able to survive independently, we could reasonably call it an individual. In Spencer's eyes, this definition of the individual from a biological point of view embrace human individuals too. Such definition sheds light on the constitution of humans as individuals. For instance Spencer argued that, for someone's individuality to be fully expressed in a social context, it is essential for the individual to be "that which he naturally is – to do just what he would spontaneously do" (Spencer, [1851] 1868, 474). Hence, the individual was described as a self-sufficient and self-developing entity.

However, Spencer's individual was not such an isolated being, shaping itself solely according to its own inner nature. Spencer clearly ruled out this interpretation by stressing that a biological individual had to "continuously adjust its internal relations to external relations, so as to maintain the equilibrium of its functions" (Spencer, [1864-1867] 1898-1899, Vol. I, § 74, 249). The individual may be distinguished by virtue of its self-sufficiency, but it was nonetheless shaped by the natural and social environment. Furthermore, this external influence exceeded the boundaries of the single individual, who resulted from the evolution of the whole species or race (Spencer, [1860] 1891a, Vol. I, 256). Thus, the hereditary characteristics of the species constituted the starting point of the subject, showing that Spencer was at odds with the representation of the human mind as a *tabula rasa*.

To better understand the nature of Spencer's individualism, I turn to his paper "The Social Organism" (1860). Here Spencer made a parallel between biological organisms and society. The latter, just like a natural organism, was compounded of several mutually dependent parts. However, despite the similarities, social and natural organisms presented some relevant dissimilarities too. Vis-à-vis the present argument, this deserves attention.

This discrepancy concerned the concept of perception: in a biological organism, no part was capable of independent perception, while in a social organism each individual had the capacity to perceive independently from the whole. (Spencer, [1860] 1891b, Vol. I, 276). This difference had an important consequence. In a political body each part was endowed with an autonomous consciousness, but the body as a whole had none. Hence, it was unacceptable to demand a sacrifice for the sake of the whole. Spencer asserted this principle as follows:

> It is well that the lives of all parts of an animal should be merged in the life of the whole, because the whole has a corporate consciousness capable of happiness or misery. But it is not so with society; since its living units do not and cannot lose individual consciousness, and since the community as a whole has no corporate consciousness. This is an everlasting reason why the welfare of the citizens cannot be sacrificed to some supposed benefit of the State, and why, on the other hand, the State is to be maintained solely to the benefit of the citizens. *The corporate life must here be subservient to the lives of the parts*, instead of the lives of the parts being subservient to the corporate life (Spencer, [1860] 1891b, Vol. I, 276-277, emphasis added).

According to Spencer, the political body's *raison d'être* was to favour the happiness of its components. As a matter of fact, Spencer was a partisan of the utilitarian principle of the greatest happiness for the greatest number, which was at once the community's aim and the ultimate aim of evolution[54]. However, this aim never implied the sacrifice of individuals. Such a sacrifice would even be absurd, considering that society as a whole didn't have a conscience of its own[55]. Spencer did state that society was a real entity, namely that we

[54] Concerning the peculiar characters of Spencer's utilitarianism, see Weinstein, 1998.

[55] The connection between the utilitarian principles of the greatest happiness and the refusal to sacrifice the individual welfare has also been noticed by Mark Francis; see Francis, 2007, 7. Michael Taylor has rightly pointed out that such a refusal implied a criticism of Comte's sociology, according to which society had interests transcending the individual's scope; see M. Taylor, 2007, 97.

shouldn't consider it as a mere sum of individuals[56]. Nonetheless he considered society to be a result of individual characters. He thus observed in his *Autobiography* that the individual character was the original factor, whereas the character of society was a derived one (see Spencer, 1904, Vol. II, 465-466). That was why, as Tim S. Gray highlighted, every social reform had to take root in the prior reform of individual character (see Gray, 1996, 19).

This interpretation, which highlights Spencer's political individualism, is in clear opposition to Gray's reading of Spencer's as reconciling organicism and individualism (see Gray, 1985; 1996). I acknowledge that organicism and individualism were theoretically bound to each other in Spencer's thought, since the individual was the result of a back and forth with the environment (see Gray, 1985, 245-253). However, although the reference to society and external environment was unavoidable to understand the individual constitution, the crucial question is: in case of conflict between the society and the individual, which entity had to be put first? As I have shown, Spencer never admitted the possibility of sacrificing the individual welfare to an alleged welfare of society. On the contrary, I argue that organicist thought necessarily entails the representation of the whole as something going beyond the sum of its parts. According to organicism, the whole – in this case society – has primacy over the parts – *i.e.* individuals. Consequently, political organicism wouldn't be such without the recognition that the single individual had to renounce – at least partially – his own welfare for the sake of the community. In the absence of this condition, no political organicism is conceivable[57].

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[56] See Wiltshire, 1978, 234; this position was probably meant to criticize Bentham's definition of the community as a fiction, namely an artificial entity. Moreover, Spencer also assumed this definition of the social organism to oppose the endorsement of social engineering typical of some utilitarian philosophers.

[57] My argument in favour of Spencer's political individualism is far from being isolated. In this regard, see: Peel, 1992, 187-191; M. Taylor, 1992, 165; McCann, 2004, 125. However, this topic has triggered a great debate. Apart from the Gray's interpretation, Mark Francis has argued that Spencer was neither individualist nor organicist, since Spencer's interest laid in the concept of individuation: see Francis, 2007, 11-13.

Spencer advocated the safeguarding of single units in the body politic, so that his ideal society could be the shelter for the individual to flourish. Now, given that Spencer was unwilling to sacrifice individual's welfare in favour of society's, another question arises: how could Spencer at once secure the individual from the pain inflicted by society and provide for the attainment of the greatest happiness of all? This problem was made more acute in consideration of the fact that his individual was firstly described as egoistic.

Egoism and altruism

In *Data of Ethics* (1879) Spencer depicted the individual in the way that Stefan Collini would refer to as expressing a "moral individualism" (see Collini, 1979, 18)[58]. It is self-evident, Spencer argued, that individuals first and foremost had to *survive*. In his own words, "the acts by which each [creature] maintains his own life must, speaking generally, precede in imperativeness all other acts of which he is capable" (Spencer, 1879, § 68, 187). As Spencer concluded, therefore "Ethics has to recognize the truth, recognized in unethical thought, that egoism comes before altruism" (Spencer, 1879, § 68, 187). Spencer did temper this view by admitting that altruism was a natural feeling too. Altruism was thus firstly defined as the inclination to preserve one's offspring: "self-sacrifice, then, is no less primordial than self-preservation" (Spencer, 1879, § 75, 203). During the course of evolution, this habit of self-sacrifice in favour of one's offspring became more and more conscious, while before it was automatic and unconscious. Moreover, this altruistic behaviour was meant to propagate the social body. Indeed egoistic parents, who didn't take care for their offspring, automatically ruled out the chances of their offspring's surviv-

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In his turn, Weinstein has highlighted the tension between the greatest happiness principle and the individual welfare: see Weinstein, 1998, 8. Furthermore, David Wiltshire made a quite interesting claim, stating that Spencer's individualism entailed the annihilation of individualism itself: see Wiltshire, 1978, 2.

[58] For this concept, see also the fourth section of the second chapter.

al, so that "every species is continually purifying itself from the unduly egoistic individuals" (Spencer, 1879, § 75, 204).

Spencer's position, then, begins from unavoidable egoistic behaviour. Living together, the individuals eventually acknowledged that a peaceful society couldn't but benefit everyone, themselves included (see Spencer, 1879, § 77, 207). Thus the single person recognized that in a community "the well-being of each rises and falls with the well-being of all" (Spencer, 1879, § 78, 208). The sentiment of sympathy played a crucial role in the passage from egoism to altruism in the social body. As Spencer explained in *The Principles of Psychology* (1855), "intelligent creatures that live in presence of one another, and are exposed to like causes of pleasure and pain, acquire capacities for participating in one another's pleasures and pains" (Spencer, [1855] 1881, § 526, 610). Altruistic feelings were originally "sympathetic excitements of egoistic feelings" (Spencer, [1855] 1881, § 527, 612). Such sympathetic dispositions towards others would eventually produce genuine altruistic feelings. These latter were such only if they involved a representation – and consequently a consideration – for the feelings of the other. That was why, as Charles R. McCann has observed, an altruistic act necessarily included an unselfish component (see McCann, 2004, 108). Such altruistic sentiments would then become more and more complex, culminating in the sentiment of justice, *i.e.* the most refined of all altruistic sentiments (Spencer, [1855] 1881, § 530, 616).

The Lamarckian concept of use-inheritance has been used to explain this process[59]. Spencer, in "The Factors of Organic Evolution" (1886), clearly elaborated how important the inheritance of acquired characteristics was:

> Though mental phenomena of many kinds, and especially of the simple kinds, are explicable only as resulting from the natural selection of favourable variations; yet there are, I believe, still more numerous mental phenomena, including all those of any considerable complexity, which cannot be explained otherwise that as results of the inheritance of functionally-produced modifications (Spencer, [1886] 1891, Vol. I, 464).

[59] Concerning use-inheritance in Spencer's thought, see especially: Peel, 1992, 152; M. Taylor, 1992, 85; 2007, 106; Weinstein, 1998, 25-31.

Thus, in Spencer's eyes the mental phenomena, such as altruistic feelings, was a product of evolution and in particular of use-inheritance.

As he claimed in *Data of Ethics*, it was rational to believe that human society moved towards civilization (see Spencer, 1879, § 67, 185). The key concept of this process is *adaptation*. According to Spencer's definition, conduct is "adjustment of acts to ends" (Spencer, 1879, § 2, 5). Moreover, "acts are called good or bad, according as they are well or ill adjusted to ends" (Spencer, 1879, § 8, 25). Since in his mind the "good is universally the pleasurable" (Spencer, 1879, § 10, 30), it follows that for Spencer well adapted acts were sources of pleasure. The evolutionary meaning of good conduct was also clearly established by Spencer, since he explained that good or well-adapted acts were subservient to life (see Spencer, 1879, § 10, 30). The intertwinement of adaptation, pleasure and good conduct triggered the drive toward increasing forms of civilization. In Spencer's own words, "there is no kind of activity which will not become a source of pleasure if continued; and that therefore pleasure will eventually accompany every mode of action demanded by social conditions" (Spencer, 1879, § 67, 186).

By living in society, humans would understand that aggressive acts were more easily productive of pain than pleasure (see Spencer, 1879, § 6, 18). They would abstain from such actions. In Spencer's eyes, evolution was an arrow tending towards the reconciliation of the individuals in society. The most evolved conduct, the limit of evolution, he described as follows:

> Evolution becomes the highest possible when the conduct simultaneously achieves the greatest totality of life in self, in offspring and in fellow men; so here we see that the conduct called good rises to the conduct conceived as best, when it fulfils all three classes of ends at the same time (Spencer, 1879, § 8, 25-26).

The evolution of the moral conduct, being subordinated to the same laws of evolution in general, turned out to be an equilibration of the forces within society: the more evolved the conduct, the greater the balance of external and internal energies would be. "The man who thus reaches the limit of evolution",

Spencer argued, "exists in a society congruous with his nature – is a man among men similarly constituted, who are severally in harmony with that social environment which they have formed" (Spencer, 1879, § 28, 73).

The highest form of evolution then entailed a reconciliation between altruism and egoism. As we read in *Data of Ethics*, "the individual will not have to balance between self-regarding impulses and other-regarding impulses" (Spencer, 1879, § 97, 255-256). This would be a condition of a wide-spread happiness, where even self-sacrifice would be gladly chosen and would provide an altruistic pleasure. The occasions of drawing pleasure from living together would be multiplied, given that everyone would take sympathetic gratification from the pleasure of others. In such a condition, "as the altruistic gratification is egoistically expressed, egoism and altruism coalesce" (Spencer, 1892-1893, Vol. I, Appendix, 292). "Eventually, then", as Spencer explained,

> along with the approximately-complete adaptation of man to the social state, along with the evolution of a society complete in its adjustments, […] which must come with the highest type of human life, there will come also a state in which egoism and altruism are so conciliated that the one merges in the other (Spencer, 1892-1893, Vol. I, Appendix, 300).

Let us now consider further the condition of possibility of such a result, namely the teleological nature of evolution.

The teleological character of evolution

As we have seen, Spencer was persuaded that with the advancement of civilization egoism and altruism would become the same. Where did he draw this conclusion from? What was the condition of possibility in his system for such a statement? In order to answer these questions, it is necessary to focus on the features of Spencer's evolutionary thought. My contention here is the following: Spencer found a basis for this statement in the teleological character of

evolution[60]. Spencer clearly explained that evolution had a teleological character in his paper "Progress: Its Law and Cause" (1857). Here we read as follows: "progress is not an accident, not a thing within human control, but a beneficent necessity" (Spencer, [1857] 1891, Vol. I, 60). In Spencer's eyes, the course of evolution was caused by the laws of nature. It is not surprising then that he considered the evolution towards progress as a *necessity*: it was as necessary as the effects of any other natural law.

According to Spencer's well-known definition, as he gave it in *First Principles*,

> Evolution is an integration of matter and concomitant dissipation of motion; during which the matter passes from a relatively indefinite, incoherent homogeneity to a relatively definite, coherent heterogeneity; and during which the retained motion undergoes a parallel transformation (Spencer, [1862] 1887, 396).

Michael Taylor has rightly pointed out that Spencer thought of evolution in the terms of his contemporary physics (see M. Taylor, 1992, 75-76). For our purposes here, it is important to notice that Spencer conferred on evolution the same necessity as physical law.

Evolution wasn't only necessary, it was also oriented towards an end, *i.e.* a definite and coherent heterogeneity. Mark Francis has argued against this thesis, holding that Spencer had abandoned the teleological interpretation of evolution. There are, however, rival interpretations. Taylor for instance has argued that one of the reasons why Spencer's evolutionary theory was at odds with Darwin's lay in Spencer's interpretation of evolution as goal-directed. Whereas, Gray has held that over the years Spencer had lost his faith in the progressive movement of evolution (see Gray, 1996, 24-25). Gray's contention is buttressed by Spencer's decision to remove from the new edition of *First Principles* the famous passage where he described happiness as the ultimate result of evolution (see Gray, 1996, 24-25). Nonetheless, this teleological feature was

[60] For a clarification of the term 'teleology' in Spencer's system, see M. Taylor, 2007, 69.

still strong in Spencer's mature thought. Taylor has highlighted this persistence in Spencer's theory, in regard to his moral thought[61]. Indeed, in *Data of Ethics*, morality was thought to conform to "certain principles which, in the nature of things, causally determine welfare" (Spencer, 1879, § 60, 162). This progression towards a general increase of happiness through the course of evolution characterized biological evolution as well. In the *Principles of Biology*, Spencer claimed that, at the limit evolution, creatures would avoid harming each other, taking the species to a state of harmonic coexistence (Spencer, [1864-1867] 1898-1899, Vol. I, § 120, 438-439).

In Spencer's eyes, every form of evolution was goal-directed, at the biological as well as at sociological and moral level. A passage from Spencer's "Education" (1861) elaborates this idea:

> By accumulated experiences the man of Science acquires a thorough belief in the unchanging relations of phenomena – in the invariable connexion of cause and consequence – in the necessity of good or evil results. Instead of the rewards and punishments of traditional belief, which people vaguely hope they may gain, or escape, in spite of their disobedience; he finds that there are rewards and punishments in the ordained constitution of things; and that the evil results of disobedience are inevitable. He sees that in conforming to them, the process of things is ever towards a greater perfection and a higher happiness (Spencer, [1861] 1911, 41-42).

Evolution would take all creatures through increasing degrees of perfection. It would result in the highest possible happiness. Even if this ultimate point may be relegated to a supposedly ideal time, perhaps never to be reached, the path of evolution was so directed.

What are the implications of this account? First of all, since evolution resulted from the natural laws regulating the whole nature, it was *spontaneous* and *necessary*. Its course wasn't a straight line towards the end, as there was a

[61] Michael Taylor, in his most recent study, has interpreted Spencer's philosophy in the light of the tension between the positivist and deistic thought. The teleological feature of Spencer's evolution would thus proceed from the implicit deistic framework he assumed. For this thesis, see M. Taylor, 2007, 7-8.

rhythmic oscillation between regression and progress[62]. However, the process was irrevocable. Moreover, evolution was a natural development, requiring thus no conscious action on the part of individuals. It wasn't individuals that determined the direction of evolution, but rather evolution that determined the nature of individuals. Consequently, the above mentioned outcomes, including the overlapping of altruism and egoism or the development of sympathetic feelings, would become *natural*.

Given this framework, it isn't surprising that Spencer was so dismissive of social engineering (see M. Taylor, 1992, 50, 132; 2007, 96-102). For him evolution would have naturally taken us to a happy and coherent society. Political regulation would have been nothing but a hindrance in these conditions, as Spencer explained at various times (see, especially, Spencer, [1871] 1891, Vol. III). As a consequence of this, Spencer's thought married organicism and individualism, despite the alleged impossibility of such a union (see M. Taylor, 1992, 50). By means of evolution, individuals would have achieved their complete fulfilment, in a harmonious society where no sacrifice would be demanded of anyone. Spencer fancied a society of spontaneous cooperation, naturally developing through generations.

Spencer's fallacy

Let us now address the main conclusion of this paper, namely the nature of Spencer's fallacy. We have seen that Spencer's evolution was oriented towards an ultimate end. Reaching its very limit, evolution would have turned moral prescriptions into spontaneous attitudes. As we read in *Data of Ethics*, "the sense of duty and moral obligation is transitory, and will diminish as fast as moralization increases" (Spencer, 1879, § 46, 127). The recursive performance of duty, Spencer argued, made duty pleasurable (see Spencer, 1879, § 46, 127-

[62] Spencer elucidated this character of evolution at length in the *First Principles*; see Spencer, 1862, for instance 334, even if the concept is explained in more than one chapter (see chap. 11-13).

128). All the coercive and restrictive elements of moral conduct as we know it would thus fade away. As he writes:

> With complete adaptation to the social state, that element in the moral consciousness which is expressed by the word obligation, will disappear. The higher actions required for the harmonious carrying on of life, will be as such matters of course as are lower actions which the simple desires prompt (Spencer, 1879, § 46, 128-129).

Indeed Spencer clarified that "Ethics has for its subject-matter, that form which universal conduct assumes during the last stages of its evolution" (Spencer, *Data*, § 7, 20). In the concluding part of *Data of Ethics*, Spencer so depicted Absolute Ethics, namely the moral behaviour of the perfect human in the perfect state of evolution (see Spencer, 1879, § 99-106, 258-280). Absolute Ethics didn't imply any suffering (see Spencer, 1879, § 101, 261). Its actions would provide pleasure alone, and therefore didn't imply any prescription. What was the main character of Absolute Ethics, though? It was its social congruity: the ideal human would be so well-adapted to their social environment that there would be a "correspondence between all the promptings of his nature and all the requirements of his life as carried on in society" (Spencer, 1879, § 104, 275). The attainment of this correspondence was secured by three principles, the core of Absolute Ethics: justice, negative beneficence and positive beneficence.

Justice was, as we have remarked, the most refined of all altruistic feelings, as Spencer explained in *Justice* (1891), which he conceived as the fourth part of the *Principles of Ethics*. It had a positive and a negative sense. According to the first, "each individual ought to receive the benefits and the evils of his own nature and consequent conduct" (Spencer, 1891, § 12, 17)[63]. The negative sense related to the law of equal freedom, stating that "each can be allowed to act only under the restraint imposed by the presence of others having like claims to act" (Spencer, 1891, § 27, 46). For moral conduct to suit properly the perfect human in the perfect society, justice had to come along with negative

[63] Spencer presented the duplicity of justice also in § 27, 46.

and positive beneficence. Negative beneficence prescribed individuals to avoid inflicting pain or unhappiness on their fellow-beings, whereas the positive beneficence made people capable of rejoicing in the happiness of others (see Spencer, [1851] 1868, 83-84).

Having explained the main features of Spencer's ethics, we can draw some conclusions. What Spencer described as the actual ethics of humans at the highest state of evolution was avowedly a moral criterion for his own society as well, so much so that his negative justice echoed Mill's principle of negative freedom. A quick look at the list of rights enumerated in *Justice* is enough to ascertain that Spencer's Absolute Ethics was emblematic of Victorian moral thought. Indeed Spencer included the rights of free exchange and contract, of free belief, speech and publication, and of free movement. Spencer contented that these rights would have been spontaneously observed in the highest state of evolution. This was the moral code of his own time, that is, the moral rules which still had to be *prescribed* to individuals.

Consequently, I would like to restate Moore's well-known criticism of Spencer. According to Moore, Spencer fell into a naturalistic fallacy. Spencer was inclined to use the expression 'more evolved' as equivalent to 'higher', *i.e.* 'better' (see Moore, [1903] 1993, 99). Spencer thought that evolution showed us the natural course of our development. However, according to Moore, Spencer did not only believe that we were developing in such a way, but also that we *ought to* be developing in this way (see Moore, [1903] 1993, 97). Moore has argued that Spencer replaced the good with a natural object – the results of evolution – and ethics with a natural science – the evolutionary theory. Therefore, as Moore has held, Spencer fell into a naturalistic fallacy, since he believed that evolution was good simply because it was natural[64].

Moore, I argued, misjudged Spencer's fallacy. Spencer did not commit a naturalistic fallacy thus understood. He didn't draw an 'ought' from an 'is'. Rather, he made the opposite move. He had a picture of what humans ought to be and what the social body ought to be. In order to imagine this perfect person in

[64] For Moore's elaboration of the naturalistic fallacy, see Moore, (1903) 1993, 89-93.

a perfect society he couldn't but take inspiration from the moral prescriptions of *his own* society. Thus he assumed that in the long run we would become what we ought to be. Spencer depicted a perfect human consistent with his contemporary moral code and postulated that evolution would create such a human. Hence, he didn't draw an 'ought' from an 'is', but an 'is' from an 'ought', falling into what I would call a *prescriptive fallacy*. Spencer did not draw his idea of the good from a consideration of the course of evolution, but he did draw his idea of evolution from the moral prescriptions of Victorian age. Such a fallacy primarily depends on Spencer's tendency to mix facts and values, a view that many scholars have noticed[65]. We shall now see how Spencer's position, problematic as it was, was absorbed in the theoretical framework of Jevons.

The Spencerian influence on Jevons

As I have already remarked, Jevons expressed his agreement with Spencer's account at various times[66]. For instance, Jevons endorsed Spencer's defi-

[65] This ambiguous overlapping between facts and values has already been pointed out by some scholars (see M. Taylor, 1992, 205-206; 2007, 123; Wiltshire, 1978, 192-193). Weinstein counters this argument, stating that Spencer's conception of evolution is merely descriptive, excluding any value-laden implication (see Weinstein, 1998, 150-151). Gray claimed that the problem of the overlapping between facts and values was solved by Spencer's account of evolution as oriented towards Absolute Ethics (see Gray, 1996, 194). I would rather argue the opposite: due to this overlapping of facts and values, Spencer assumed that evolution tended to produce a naturalization of ethical behaviour.

[66] Mosselmans has already addressed this topic, that is, Jevons's debt to Spencer (see Mosselmans, 2007, 76-77). In particular, Mosselmans has argued that Jevons relied on Spencer in showing that there was no conflict between science and religion. Jevons's concern for bridging science and religion has been crucial in the first chapter. Mosselmans's argument is surely insightful and correct: Spencer's thought played a role in Jevons's struggle to reconcile religion and science. However, Mosselmans has

nition of evolution as a course towards growing complexity[67]. A clear example of Jevons's endorsement of evolution as Spencer conceived it can be found in *The State in Relation to Labour*. Jevons favoured the choice of appointing governmental officers who could provide private citizens with technical knowledge. These figures were but an example of the subdivision of labour. The subdivision of labour, in turn, "is but a case of Mr. Herbert Spencer doctrine of evolution" (Jevons, [1882] 1910), 44), since it involved a passage from incoherent homogeneity to a coherent heterogeneity, in accordance with Spencer's definition of evolution. Moreover, Jevons agreed with Spencer in considering that evolution increased the amount of happiness: "Evolution is a striving ever towards the better and the happier. There may be almost infinite powers against us, but at least there is a deep-laid scheme working towards goodness and happiness" (Jevons, 1890, 293). In this regard, Jevons highlighted the similarity between Spencer's and Paley's account, displaying once more his own endorsement of natural theology (see Jevons, 1890, 293).

Another feature of Spencer's thought which Jevons admired was the idea of the human mind and character as shaped by the environment through use-inheritance. According to Jevons, such an idea discarded the erroneous conception of the human being as a *tabula rasa*. Jevons claimed that this idea was inconsistent from the biological point of view. The cultural differences among human beings proved that they were shaped by their environment. Generation after generation, individuals developed their biological structure, which Jevons and Spencer interpreted as the result of the Lamarckian use-inheritance. In their view, these characteristics disproved the depiction of the individual as a *tabula rasa*. As Jevons wrote in *Utilitarianism*, "if the moral, not to speak of the physical characteristics of the lower animals, are so distinct, why should there not be moral and mental differences among ourselves, descending, as we obviously

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not underlined the influence of Spencer's ethics on Jevons's conception of the relationship between the individual and society, missing thus a crucial point in this matter.

[67] Bowman has not failed to highlight this point (see Bowman, 1989, 1124).

do, from different stocks with different physical characteristics?" (Jevons, 1890, 292)[68].

However, as I have already argued, Jevons's interest in Spencer's philosophy went beyond a simple appreciation. Jevons saw in Spencer's thought a way to solve the problem embedded in the utilitarian tradition, namely the problem of how to reconcile self-interested individuals with the greatest happiness of the greatest number. The answer lay in the spontaneous development of the moral sense over the course of evolution (see Jevons, 1875, 504). As we read in *Utilitarianism*, "the moral sense doctrine, so rudely treated by Bentham, is no longer incapable of reconciliation with the greatest happiness principle, only it now becomes a moving and developable moral sense" (Jevons, 1890, 291). Spencer, highlighted Jevons, explained that moral sense was developing through the different stages of evolution. Moreover, the moral sense differed according to the idiosyncrasies of customs and individuals. And yet, "the best is ascertained by *eventual success*" (Jevons, 1890, 291). Evolution would eventually produce a perfect moral sense, *i.e.* the Spencerian Absolute Ethics. As we know, this was perfectly adapted moral behaviour, capable of producing the minimisation of pain and the greatest happiness of the greatest number. For both Jevons and Spencer, the solution that the utilitarian philosophers had longed for was found in the spontaneous course of nature.

In sum, Jevons married Spencer's theory of morals, according to which the moral sense developed naturally over the course of evolution. Moreover, Spencer's theory touched on a very delicate point in Jevons's reflection: the relation between 'is' and 'ought'. As I have explained, the relation between 'is' and 'ought', description and prescription, was a delicate point for Jevons, as well as a long-lasting problem, based on his Unitarian allegiance and his endorsement of a deterministic account of human nature. Jevons did not acquire the problem of the relationship between 'is' and 'ought' through Spencer, but Spencer pro-

[68] Jevons expressed the same conclusions in another paper, published in *Nature*: see Jevons, 1875, 504. As Michael White has pointed out, Spencer's conception buttressed Jevons's tendency to think in terms of races (see M. White, 1993, 82).

vided Jevons with a solution to the problem related to ‘is’ and ‘ought’: how should prescriptions be understood in a theoretical framework based on a deterministic theory of morals, as Jevons’s one was? Once Jevons embraced Spencer’s position, the solution came quite easily. Prescriptions were needed only until nature intervened, turning the moral prescription into spontaneous behaviour. What was once ‘ought’ would eventually be absorbed into the realm of ‘is’.

As we have seen, Jevons and Spencer shared the same view, according to which evolution was oriented towards happiness and the good. Such a movement would eventually produce a change in the moral behaviour of the human species, turning moral prescriptions into a natural behaviour. Thus, it is worth noticing that Jevons fell into the same fallacy as Spencer, since this fallacy was the solution Jevons found to the problematic relation of ‘is’ and ‘ought’. They both considered that in the long run the ‘ought’ would become part of a new human nature. What I called the ‘prescriptive fallacy’ consisted in projecting a fantastic future ‘is’, from what in the Victorian age was the ‘ought’. This was the case for Spencer, as I have contented. As for Jevons, he accepted this fallacy, which ensured that every prescribed behaviour will become natural, providing a solution to the contradictory coexistence of determinism and moral reform in Jevons’s thought.

Now, what is the cause of this fallacy and what are its consequences? In Spencer’s case, its cause is to be found in the conjunction of political individualism, moral individualism and liberalism. Given that these elements played an important role in Jevons’s thought as well, we can easily comprehend Jevons’s fascination for Spencer’s account. As we have seen, Spencer denied that the individual had to sacrifice his own welfare for the good of society. Moreover, in Spencer’s eyes the individual was an egoistic one. Given these premises, how could a pacific society composed by self-interested individuals be imagined? For other philosophers, Bentham for instance, the answer lay in social engineering: the legislator was in charge of orienting individual behaviour. However, Spencer’s allegiance to liberalism made him sceptical about social engineering.

Thus, how to attain social harmony while dismissing any political intervention aimed at that end? Spencer solution to this conundrum was to postulate that the natural course of evolution would itself create these conditions. However, one could ask if Spencer's thesis wasn't a way to escape the problem by denying it. Is it enough to postulate that the passage from the moral prescriptions to their actual application would happen spontaneously? This problem was exacerbated by the fact that Spencer admitted that this passage would take place in a fantastic future, *i.e.* in the final stage of evolution. Thus, Spencer and Jevons were inclined to dismiss too easily the problem of how to create a harmonious society, delegating this task to the beneficent course of nature.

CHAPTER 3

THE LANGUAGE AND HOPES OF A POLITICAL ECONOMIST

Jevons's economic theory

3.1. The individual as the centre of economic theory

In 1935, on the occasion of the centenary of Jevons's birth, the economist Benjamin Higgins published a paper in *The Manchester School* in order to celebrate the work of the great Victorian polymath. Higgins took into account Jevons's *Theory of Political Economy*, explaining its novelty with respect to the classical school. Higgins used the expression "psychological attack" (Higgins, 1935, 103) to characterize the shift that occurred between the classical school and marginalist theory, focusing on Jevons in particular but mentioning Menger and Walras too as exponents of this turn. According to Higgins, Jevons's new conception of economics had a different starting point, *i.e.* providing a psychological foundation for economic investigation. Jevons found such a psychological foundation in the Benthamite calculus of pleasures and pains. Jevons elaborated an economic theory, conceived as an elucidation of the mechanics of human interest (see Jevons, 1871, 24). Consequently, Higgins held that the subjective approach was the hallmark of the novelty of Jevons's economic theory, even more than introducing mathematics into political economy (see Higgins, 1953, 103-105).

Many other eminent economists and scholars have argued that what first and foremost distinguished Jevons's economic theory from the classical economists was this change of emphasis. Lionel Robbins, in a paper read before the Manchester Statistical Society in 1936, stated that Jevons put "the individual – the economic subject – in the centre of the analytical picture" (Robbins, 1936,

5). Such a change of focus, according to Robbins, implied giving a new relevance to the demand side in economic theory and consequently providing a new theory of value as determined by subjective evaluations. Robert Collison Black, the great historian of the economic thought, made similar remarks. The marginalists carried out a reconstruction of political economy. This reconstruction, which will contribute to shape modern economics, could be seen "as involving a shift from mainly macroeconomic to mainly microeconomic studies" (R. D. C. Black, 1972b, 365). In this new microeconomic account, the economizing behaviour of the individual played a pre-eminent role, never to return to the backstage of economic theory[1].

Mark Blaug, the historian of economic ideas, asked the following question: "a change of emphasis as drastic as the marginal revolution […] must surely have been associated with changes in the institutional structure of society and with the emergence of new practical problems?" (Blaug, [1962] 1985, 4). In his *Economic Theory in Retrospect*, Blaug presented his subject matter from a point of view internal to the discipline, and so leaving aside the social and practical question he raises (see Blaug, [1962] 1985, Introduction). In his turn, Robert Collison Black also took into account the question Blaug had raised, and provided an answer along the lines of Blaug. Black argued that, in Jevons's case, such radical changes in the structure of society are not easily found and, more importantly, that it would be unnecessary to look for them. "For", continued Black, "a thought system which is based upon concepts by postulation is much more likely to be impervious to extraneous influences than one which is based on concept by intuition" (R. D. C. Black, 1972b, 373). As Black has remarked, Jevons did create a system based upon axiomatic premises.

[1] See R. D. C. Black, 1972b, 372, where we read as follows: "Few economists today would question that the concept of economizing behavior is an essential part of the core of their subject, but with the classical economists this was not so". For other appreciations of the shift from Classical political economy to marginalism in terms of a stress of the individual's role, see: Winch, 1972, 327-328; De Marchi, 1972, 354; R. D. C. Black, 1972c, 5.

My perspective here is different from both Black's and Blaug's. The question I would like to ask is: what pushed Jevons to change the focus of political economy and accordingly to look at individual behaviour as the fulcrum of his studies? I do not intend to shine a light on this problem by investigating the historical conditions of Jevons's time, thus assuming what Mark Blaug called a relativistic approach (see Blaug, [1962] 1985, 2). Although I do not deny the interest and value of this kind of research, it would demand a different work and a different point of view. I do not agree with Black's view either: that Jevons's system is likely to be closed to external influences. A theory founded on axiomatic premises is nonetheless liable to influences from other spheres of thought, in so far as such premises take root in more general – and perhaps unacknowledged – beliefs. Consequently, here I would like to explain Jevons's economic theories on the basis of his broader system of thought, and in particular of the anthropological premises of his thought, in relation to his conception of society and human nature.

Indeed I have already answered this question implicitly: let us now answer it explicitly. As I have explained in the second chapter, Jevons's view of society and humans was *individualistic*. Human mental faculties were the driving force behind progress and history. For Jevons, humans were moved by self-interest, and by seeking pleasure and avoiding pain. Hence, Jevons could be numbered among the supporters of moral individualism. Jevons's moral individualism had a counterpart in his conception of society. Having entered society, individuals remained, for the most part, independent of each other. According to this account, individuals are ontologically fundamental, whereas society was not. The latter was rather a sum of numbers one, *i.e.* individuals. Given Jevons's tendency to reduce society to individuals, it is not surprising that he conceived political economy as centred on the study of individual choices and behaviour. Thus Jevons's economic theory faithfully mirrored his picture of human being and society. I shall now focus on three aspects of Jevons's economic theory, in order to make its individualistic foundation apparent. First, I examine his theory of value and utility. Then I take into account the theory of commercial fluctuations. Lastly, I concentrate on his theory of labour.

Jevons's theory of value

While presenting his theory of exchange in *The Theory of Political Economy* Jevons started by warning against the ambiguous and unscientific use of the word 'value' (see Jevons, 1871, 81). People commonly use this term to denote an alleged intrinsic quality of some objects. For example, they may state that gold have an intrinsic value. However, in Jevons's mind, they were mistaken in considering value to be a quality pertaining of the object itself. "If there is any fact certain about value", argued Jevons, "it is, that it means not an object at all, but a quality, attribute, or rather a *circumstance* of an object" (Jevons, 1871, 81-82, emphasis added). Jevons considered value to be determined by circumstances, that is, a *relational quality* (Jevons, 1871, 82).

Jevons clarified what these circumstances were: the value of a thing was given by "the circumstance of its exchanging in a certain ratio for some other substance" (Jevons, 1871, 82). The value of an exchanged commodity was determined by the circumstances in which the exchange took place. Jevons described a situation involving two people, one possessing only corn and the other only beef. In such a situation, they might be inclined to make an exchange. In Jevons's eyes, the reason why they might undertake this exchange was simple: they found it *useful*. "It is certain that", he explained, "under these circumstances, a portion of the corn may be given in exchange for a portion of the beef with a considerable increase of utility" (Jevons, 1871, 96). Such exchange would continue as far as the people involved found it useful. As Jevons held, "exchange will thus go on till each party has obtained all the benefit that is possible, and loss of utility would result if more were exchanged" (Jevons, 1871, 96-97).

Even on the basis of such a concise account one can easily see that Jevons approached economic matters from the subject's point of view. Subjective evaluations were the very bedrock of his economic thought. His focus was the individual's behaviour, or what in modern terms we would call 'maximizing behaviour'. Jevons explicitly stated that this was his scope. He wrote that his

theory “is entirely based on a calculus of pleasure and pain; and the object of Economy is to maximise happiness by purchasing pleasure, as it were, at the lowest cost of pain” (Jevons, 1871, 27). This inquiry required an understanding of the psychological laws governing pleasure and pain, since in Jevons’s mind political economy rested “upon the laws of human enjoyment” (Jevons, 1871, 47). I have already pointed out that the notion of value was connected to the concept of utility; and, as we shall see, with the concept of the final degree of utility in particular. Now I shall show how Jevons related utility to the sentiments of pleasure and pain, and consequently how his theory of value rested on the laws of human enjoyment.

According to Jevons, the word ‘utility’ denoted an “abstract quality thereby any object serves our purposes” (Jevons, 1871, 45). Thus, “whatever can produce pleasure or prevent pain *may* possess utility” (Jevons, 1871, 45). Moreover, a ‘commodity’, in Jevons’s eyes, was anything possessing utility (see Jevons, 1871, 45). We can therefore appreciate the relevance of this notion to political economy. Political economy “must be founded upon a full and accurate investigation of the condition of utility” (Jevons, 1871, 46), since the notion of utility is an expression of the sentiments of pleasure and pain.

Now, it is not difficult to see why the economic subject was the pivot of Jevons’s theory. Utility is subjective: a thing could only be useful *to* someone. Jevons made this point clear, stating that “utility, though a quality of things, is *no inherent quality*” (Jevons, 1871, 52). “It might be more accurately described, perhaps”, he continued, “as a *circumstance of things* arising out of their relation to *man’s requirements*” (Jevons, 1871, 52, second emphasis added). According to Jevons, what happened to be useful changed depending on the situation. The more one is in need of something, the more it will be useful to him. A very thirsty person would find water very useful. Furthermore, Jevons drew an important conclusion from this reasoning: not all portions of the same commodity possessed the same utility (Jevons, 1871, 52). Jevons took water as an example:

> Water, for instance, may be roughly described as the most useful of all substances. A quart of water per day has the high utility of saving a person from dying in a most distressing manner. Several gallons a day may possess much utility for such purposes as cooking and washing; but after an adequate supply is secured for these uses, any additional quantity is a matter of indifference. All that we can say, then, is, that water, up to a certain quantity, is indispensable; that further quantities will have various degrees of utility; but that beyond a certain point the utility appears to cease (Jevons, 1871, 52-53).

Jevons's concluded that "*utility is not proportional to commodity:* the very same articles vary in utility according as we already possess more or less of the same article" (Jevons, 1871, 53).

It is probably not by chance that Jevons took water as an example. Indeed his approach gave him a new perspective on the renowned diamond-water paradox, also known as the paradox of value. This paradox, going back as far as Adam Smith at least (Adam Smith, [1776] 1937, 28), could be expressed in the following terms: how is it possible that water, the most useful of things, has almost no value, whereas some luxurious but superfluous good such as diamonds are enormously expensive? Considering the nature of utility enabled Jevons to show that this paradox was illusory. An object didn't possess utility by itself: utility depended on the circumstances. One of the circumstances determining the utility of a commodity was its quantity. Economising behaviour is required only as far as the resources are scarce. If we have much more than we need, the problem of economising does not arise.

This logical thread led Jevons to another fundamental idea: the concept of diminishing marginal utility. This was one of Jevons's fundamental contributions to economic theory, though the credit for it had been shared with Carl Menger and Léon Walras. Hence the name of this school of thought – a school whose theories and works emerged independently of one another: marginalism. I will present this ground-breaking theory with reference to Jevons's *Theory of Political Economy*.

Here Jevons described the law of the variation of utility. Utility was a quantity of two dimensions, "one dimension consisting in the quantity of the commodity, and another in the intensity of the effect produced upon the con-

sumer" (Jevons, 1871, 56). As it is well known, Jevons used mathematical language to express the relation between the quantity of a commodity and its utility, stating that the intensity of utility (or u) was a function of its quantity (or x) (see Jevons, 1871, 57). Jevons distinguished between the total utility provided by a commodity and the utility belonging to each portion of it (see Jevons, 1871, 54). He elucidated the concept of degree of utility, namely the variation of utility's intensity (Δu) associated with a small increment of the commodity's quantity (Δx). The degree of utility would be represented by the fraction $\frac{\Delta u}{\Delta x}$, being thus the "*differential coefficient of u considered as a function of x*" (Jevons, 1871, 61).

However, what really aroused Jevons's interest was the *final degree of utility*, namely the degree of utility associated with the last increment of the quantity of a commodity (see Jevons, 1871, 61). Jevons didn't hesitate to stress the importance of this concept. In his own words, "the variation of the function expressing the final degree of utility is the all-important point in all economical problems" (Jevons, 1871, 62). He enunciated the law of its variation:

> We may state, as a general law, that *it [utility] varies with the quantity of commodity, and ultimately decreases as that quantity decreases*. No commodity can be named which we continue to desire with the same force, whatever be the quantity already in use or possession. All our appetites are capable of *satisfaction* or *satiety*, sooner or later (Jevons, 1871, 62).

Going back to the diamond-water paradox, Jevons used the concept of diminishing marginal utility to explain why we did not attach much value to water:

> We cannot live a day without water, and yet in ordinary circumstances we set no value on it. Why is this? Simply because we usually have so much of it that its final degree of utility is reduced nearly to zero (Jevons, 1871, 62).

Therefore, if we want to determine the value of a commodity, we are to look to its final degree of utility.

The subjective character of Jevons's position has been made quite apparent through the exposition of his theory of utility. However, this could be all the more evident if we take into account what he wrote concerning the measurement of feelings. This was a problematic point in Jevons's theory, especially considering that one of the two dimensions of utility was intensity. How could we possibly provide a measure for the intensity of the pleasure or pain experienced by the individual?

Jevons was aware of this difficulty. He observed that providing a measure of a unit of pleasure was not an easy task (see Jevons, 1871, 19). However, from his point of view it wasn't necessary to measure these units. He rather relied on what he called a 'direct measurement'. According to Jevons, the individual was the seat of such direct measurements. As he stated, "the mind of an individual is the balance which makes its own comparisons and is the final judge of quantities of feeling" (Jevons, 1871, 19). The individual mind is capable of weighing the experienced feelings, comparing pleasures with pains, and deciding how to act in accordance with these estimations. Hence, the human mind could be seen as a 'balance' (a scale) of feelings.

Thus, Jevons appealed to *introspection* in order to overcome the difficulty of providing measures of the experienced feelings at the individual level. The estimation of feelings took place in the subject's mind. We must rely on these estimations for considering subjective feelings. As we read in the *Theory*, "pleasures, in short, are, for the time being, as the mind estimates them; so that we cannot make a choice, or manifest the will in any way, without indicating thereby an excess of pleasure in some direction" (Jevons, 1871, 19).

Moreover, the problem of measuring the subjective feelings was of secondary importance for the actual functioning of political economy. As Jevons explained,

> though the theory presumes to investigate the condition of a mind, and bases upon this investigation the whole of Political Economy, practically it is an aggregate of individuals which will be treated (Jevons, 1871, 21).

Providing an exact measure of the unit of pleasure and pain at level of the individual mind may by difficult or even unconceivable, but it is, more importantly, unnecessary. Even though, as Jevons stated, economic laws are the same at the individual and at the aggregate level, political economists observe the operating of these laws only at the levels of aggregates. The actions resulting from individual behaviour have the appearance of caprice, and "are beyond the analysis and prediction of science" (Jevons, 1871, 22), while the interfering causes are balanced at the level of the aggregates.

By situating their analysis at the aggregates' level, economists could use the measuring tools which, in Jevons's eyes, would make political economy veritably scientific. Jevons's stress on the measuring process was at odds with other methodological approaches, such as Mill's or Cairnes's. For Jevons, Mill's method, based on the introspective inquiry revealing the basic laws of political economy, was unscientific. In Jevons's eyes, scientific inquiry was meant to provide quantitative measurements, at least in those domains which were themselves quantitative, and to correct measuring errors by means of averages (see Maas, 2005, 172-174).

Jevons, who stressed the importance of measurement and scientific experimentation, was far from taking on Mill's introspective method. Nonetheless, introspection played a role in Jevons's economic theory. Such a role needs to be considered in accordance with the level where Jevons's analysis situates itself. At the level of aggregates, introspection didn't enter economic inquiry, since at that level the amount of data made it possible to identify the general laws through averages or mean values. However, the laws of political economy were the same for the aggregate as well as for the individual. Moreover, they were *founded* at the individual level. The behaviour of aggregates was, in Jevons's eyes, no different from the individual's, inasmuch as they were governed by the same laws. These laws could only be observed at the aggregate level, but they were the condition of the *individual* mind. Therefore, at the level of the individual, we are at a loss as to how identify those laws, and we could only rely on the immediate comprehension that the individual's mind has on itself. Hence, introspection, albeit refused as a specific scientific method, has a role to

play in Jevons's thought, providing a foundation of political economy at the level of individuals.

Jevons rooted his theory in the psychological faculties, notably in the mental capacity of measuring feelings within the individual's mind. Margaret Schabas has stressed this point very clearly, stating that in Jevons's account "economic phenomena were […] reducible to mental states and ultimately to the laws of psychology" (Schabas, 1984, 142). Sandra Peart has also noted that much of Jevons's economic theory was founded on introspection. According to Peart, not only did Jevons's theory of value rely on introspective data (see Peart, 1996, 66), but it also depended on introspection for some of its other significant claims, such as that human desires are rapidly satiated (see Peart, 1996, 71). According to Peart, introspection played a foundational role in Jevons's methodology too (see Peart, 1996, 77). There are rival interpretations, though. Harro Maas, echoing White (see M. White, 1994a), has argued that Jevons dissociated himself from the introspective method, and consequently from John Stuart Mill's account (see Maas, 2005, 152-154 and 174-175).

As I have already noted, I take it that Peart is right in describing Jevons's recourse to psychological data in terms of introspection. Jevons was satisfied with treating mental processes to be self-evident, and didn't provide further justification for how they functioned. The human mind may be inscrutable to others' eyes, as Jevons asserted (see Jevons, 1871, 21), but it did have a grasp on itself. As I have shown in the first chapter, in his logical writings, Jevons held that mental processes were self-evident. Hence, it is not surprising that he grounded his economic theory on introspection.

Commercial crises as a mental phenomenon

Let us now focus on Jevons's interpretation of commercial crises. I consider this topic in the light of the present subject matter, emphasising the role played by individual behaviour and psychological processes. Peart has elaborated an attentive analysis of this aspect of Jevons's work, comparing it with that of others, especially of John Mills, who had become President of the Man-

chester Statistical Society after Jevons (see Peart, 1996, 41-63). John Mills had suggested that the causes of commercial crises were to be found in the human mind. Thus the cyclical appearance of crises depended on the alteration in the mood of investors, their speculative manias, their surplus of energy. In Mills's mind, these characteristics were but a natural tendency of English businessmen (see Peart, 1996, 44-45).

On the one hand, Jevons was inspired by Mills analysis. On the other, he was unsatisfied with his explanation, which in Jevons's opinion failed to recognise an additional cause of commercial crises. Jevons found this cause in the variations of solar activity connected to sunspots, which influenced the harvest and consequently commercial flows. Jevons argued that in India there were recurring famines, at intervals of ten or eleven years, caused by the variations of solar activity. In their turn, these famines raised the price of food and resulted in lowering the demand for British exports, thus bringing about a commercial crisis in Britain[2].

Jevons's hypothesis of a connection between commercial crises and sunspots elicited much criticism (see MacLennan, 1972, 64; S. M. Stigler, 1982, 362-364; Aldrich, 1987, 241-247). Nevertheless, his remarks concerning the psychological features of commercial crises are important for the present study. Since 1863, when he first examined the phenomenon of commercial fluctuations in *A Serious Fall in the Value of Gold Ascertained*, Jevons had underlined the relevance of private initiative in these events. Whenever investors had a large amount capital at their disposal, they sought a proper way to invest it. These investments were followed by a rise in prices. However, the gains weren't always up to expectations. The quantity of prior investment was so

[2] In this regard, see the paper "The Solar Period and the Price of Corn", first published in 1875 (Jevons, 1884, 194-205), where Jevons first mentioned the sunspots; also see the paper "The Periodicity of Commercial Crises and its Physical Explanation, with Postscript", published in 1878 and the completed with the postscript in 1882 (Jevons, 1884, 206-220), where the argument concerning the relationship between the Indian famines and commercial crises can also be found; then see "Commercial Crises and Sun-Spots", published between 1878 and 1879 (Jevons, 1884, 221-243).

great, that it led to a lack of capital. The situation could be worsened by some other factors, like a bad harvest. Consequently, the commodities could not be sold for the expected price. Merchants might be constrained to sell at loss, and so face ruin. Eventually, as Jevons stated, "comes the panic and the collapse of credit" (Jevons, 1884, 30).

Jevons described the businessman's demeanour with psychological and emotional vocabulary, as we can see from the following passage from *A Serious Fall*:

> When capital is abundant its owners look out *anxiously* for some mode of profitable employment. Any new discovery or fresh employment for money is *eagerly* taken up. *Hope* of gain is a most *contagious emotion* among business men, and presently hundreds set themselves to carry out this new discovery upon a most extended scale. […] Further description is needless: it is well known that nothing is so difficult to restrain with prudent bounds as these *manias* for speculative investment (Jevons, 1884, 28-29, emphases added).

In this passage a considerable emphasis is put on psychological elements. Indeed the individual's promptings and choices played a fundamental role in commercial crises. The process, albeit far from being the only cause, was triggered by the investor's anxiety to employ his capital in excess. Moreover, businessmen were open to be influenced by other investors, and not only by their choices: they felt each other's feelings – feelings which spread among them and reached a point where they cannot be controlled anymore. This led to a mania, together with reckless behaviour.

In *The Solar Period and the Price of Corn* (1875), Jevons credited Mills with understanding that commercial fluctuations were "really mental in their nature, depending upon variation of despondency, hopefulness, excitement, disappointment and panic" (Jevons, 1884, 203). However, notwithstanding the mental nature of the phenomenon, these waves of moods must be triggered by something. Jevons suggested that their cause wasn't endogenous, but rather exogenous. In Jevons's opinion, their main cause was the condition of harvests.

The interaction between the triggering factors of crises, where some were exogenous and others endogenous to the human mind, was complex. "It may be", as Jevons argued,

> that the commercial classes of the English nation, as at present constituted, form a body, suited by mental and other conditions, to go through a complete oscillation in a period nearly corresponding to that of the sun-spots. In such conditions a comparatively slight variation of the prices of food, repeated in a similar manner, at corresponding points of the oscillation, would suffice to produce violent effects. […] If, then, the English money market is naturally fitted to swing or roll in periods of ten or eleven years, comparatively small variations in the goodness of harvests repeated at like interval would suffice in produce those alternations of depression, activity, excitement and collapse which undoubtedly recur in well-marked succession (Jevons, 1884, 203).

The triggering event may be external, but its fuel was the condition of the human mind. Jevons suggested that these conditions could be of various kinds, and yet, among these kinds, he only mentioned *mental* conditions, as if these were the sole relevant category. His reasoning shows thus the cruciality of psychological factors in commercial crises. Moreover, the scale of the external cause didn't matter, since the crucial element was the ground where it took root, *i.e.* the individual mind. The latter had its own laws and it reacted on their basis. Consequently, the slightest variation may produce the most violent effect. It was needed a *casus belli* (the exogenous factor), but then the subject was responsible for determining the strength of the effect.

This interpretation of Jevons's remarks on commercial fluctuations evidently puts the emphasis on the individual. Indeed this conclusion was buttressed by Jevons himself. In a letter published in *The Times*, on the 19th of April 1879, he argued that the extent of commercial mania wasn't necessarily proportionate to its triggering cause (see Jevons, 1972-1981, Vol. V, 48). Jevons suggested that this event was, in his own words, "the match which fires the inflammable spirits of the speculative classes" (Jevons, 1972-1981, Vol. V, 48). Jevons explained the relation commercial mania and its external cause as follows:

> The history of many bubbles shows that there is no proportion between the stimulating cause and the height of folly to which the inflation of credit and prices may be carried. A mania is, in short, a kind of explosion of commercial folly followed by the natural collapse. The difficulty is to explain why this collapse so often comes at intervals of ten or eleven years, and I feel sure the explanation will be found in the cessation of demand from India and China occasioned by the failure of harvests there, ultimately due to changes of solar activity (Jevons, 1972-1981, Vol. V, 48).

Whatever the extent of the external circumstances may be, what did make a difference was the psychological features of the businessmen, whose spirits were 'inflammable'.

As Peart has pointed out, Jevons's analysis of commercial fluctuations implied understanding the economic agents' capacity of foreseeing – or failing to foresee – these variations. Peart has observed that Jevons's economic agent was constantly mistaken in his predictions: "merchants, bankers and producers are myopic, since they are not able to foresee and plan for the course of the agricultural cycle. In fact throughout the cycle investors' expectations are persistently incorrect" (Peart, 1996, 54). Peart has also remarked that in Jevons's account the deficiency of foresight crossed the boundaries of social classes. Making intertemporal decisions was a difficult task for anyone, for the labourer as much as for the capitalist.

Labour: an individual effort and choice

I now turn to Jevons's theory of labour, elucidating how Jevons's subjectivism shaped this theory too. According to Jevons's definition, "labour is the painful exertion which we undergo to ward off pains of greater amount, or to procure pleasures which leave a balance in our favour" (Jevons, 1871, 162). Such definition clearly describes labour in the terms of a Benthamian calculus of pleasures and pains. Thus Jevons's subjectivist approach to the theory of labour turns out to be quite apparent: the all-important element is the pain perceived by the individual while attending this effort (Jevons, 1871, 191-192). While presenting his theory, Jevons explained that labour had two dimensions:

duration and intensity. One could work for a given time, but the effort through this time could be more or less intense. However, Jevons chose to focus on the subjective element of intensity rather than on duration, which could be easily expressed in objective terms. The difference between these two dimensions and the subjectivist feature of intensity has been highlighted by Margaret Schabas, who has asserted that "although the duration of labor may be readily measured, the intensity, as in the case of positive utility, can only be known subjectively" (Schabas, 1990, 45).

The refusal to take the duration as the crucial element defining labour was also a mark of Jevons's difference with respect to classical economic thought, especially David Ricardo's theory. Ricardo had founded his theory of labour on duration. Jevons took Ricardo's point of view into consideration and clearly expressed his disagreement with him:

> Labour is in itself of unequal value. Ricardo, by a violent assumption, founded his theory of value on quantities of labour considered as one uniform thing. He was aware that labour differs infinitely in quality and efficiency, so that each kind is more or less scarce, and is consequently paid at a higher or lower rate of wages. He regarded these differences as disturbing circumstances which would have to be allowed for; but his theory rests on the assumed equality of labour. […] I hold it to be impossible to compare *à priori* the productive powers of a navvy, a carpenter, an iron-puddler, a schoolmaster, and a barrister (Jevons, 1871, 160).

In Jevons's eyes, Ricardo's account had an 'objectivist' flaw: it reduced labour to its quantitative element, *i.e.* its duration, regardless of its qualitative character. In contrast, Jevons conceived labour as essentially variable (see Jevons, 1871, 160). Consequently, the value of labour could not be uniformly determined on the basis of duration.

As stated above, Jevons's theory of labour was consistent with his view of economy as a calculus of pleasures and pains. Therefore, he looked at labour as a subjective experience: "the discussion", as George Stigler has remarked, "is entirely in the terms of an individual and, primarily, his labor in one occupation" (G. Stigler, 1941, 29). Jevons focused on the individual's motivations and

perceptions: “labour, I should say, is *any painful exertion of body or mind undergone with the view to future good*” (Jevons, 1871, 164). The individual engaged in the effort of working by reason of the future good that could repay it.

In Jevons’s mind, labour was a matter of individual choice. “When a labourer is inclined to stop”, explained Jevons, “he clearly feels something that is irksome, and our theory will only involve the point where the exertion has become so painful as to nearly balance all other considerations” (Jevons, 1871, 164). When one is working, one is comparing the advantages and disadvantages of one’s efforts. In line with his utility theory, Jevons stated that his theory of labour concerned the turning points, the moment where the decision to stop was taken. In terms of his utility theory, the states were represented by the final degrees of utility. At each moment, the labourer implicitly wondered whether the gain drawn from the work was worth the effort or not. Jevons’s question was the following: at what point will the worker decide to stop? He provided an answer in the *Theory*:

> A free labourer endures the irksomeness of work because the pleasure he receives, or the pain he wards off by means of the produce, exceeds the pain of exertion. When labour itself is a worse evil than what it saves him from, there can be no motive for further exertion, and he ceases. Therefore he will cease to labour just at that point when the pain exactly equals for a moment the corresponding pleasure acquired (Jevons, 1871, 172-173).

Jevons’s theory of labour mirrored his conception of society as a sum of individuals, where each labourer was alone face to face with the choice of working or not. Many scholars have stressed that Jevons’s labour theory was unsatisfactory, since it did not entail a study of the wages’ distribution. As George Stigler has noticed, Jevons considered

> the factors determining the supply of labor in an economy, but in the absence of a general investigation of the interrelations of costs and value no light is shed on the problem of the laborer’s reward in an enterprise economy (G. Stigler, 1941, 29).

Robert Collison Black has made a similar remark, stating that what Jevons's analysis "affords is not a theory of wages, but a theory of cost of production in terms of disutility" (R. D. C. Black, 1970, 19)[3]. Ugo Pagano has also tackled the same problem by putting a particular emphasis on Jevons's subjectivism:

> Labour is considered by Jevons as a 'subjective feeling'. Therefore, only the 'subjects' (*i.e.*, the workers) can decide how much to work, how to organise and how to allocate their labour, for the very reason that they are the only ones who can know anything about their own subjective feelings (Pagano, 1985, 80-81).

Motohiro Okada, who has investigated Jevons's theory of labour, treated this topic at length. Okada has argued that "Jevons makes no reference to demand for labour or the employer […]. Hence, it may safely be said that the model is not so much of an enterprise economy as of a Crusonian life" (Okada, 2012, 26). According to Okada, the hallmark – and uniqueness – of Jevons's theory of labour turns out to be its subjectivism. The classical and neoclassical schools are alike in that they both strive to understand how the market determined work conditions, and, with them, wages. "The wage fund theory of the former", as Okada has explained,

> represented it in the terms of determination of the wage level by the proportion of the aggregate of the capitalists' advance on means of living to the labour population. Yet, this theory failed to take into consideration the labour supply and the worker's motivation for it at a micro level. Jevons cast light on this neglected issue (Okada, 2012, 27).

Jevons's individualistic account of society as divisible into his basic units, namely individuals, worked its way through his theory of labour as much as in his economic theory in general.

[3] Disutility was the opposite of utility, *i.e.* the quality possessed by an object which gives pain. As such, from the mathematical point of view, it corresponded to a negative quantity. For the definition of this concept, see Jevons, [1871] 1879, 62-63.

3.2. Mathematics and the world

As we have seen, marginalism entailed a change of point of view, putting the individual in the centre of the picture. However, it also implemented another relevant shift in the domain of political economy: Jevons and Walras applied mathematics to economics. In this section I tackle a set of questions deriving from this shift. First, I show how Jevons had always believed that mathematics was the soundest instrument to treat economic concepts. Then, I examine Jevons's justifications in support of the use of mathematics in the context of political economy. After stressing briefly that Jevons still conceived mathematics to be founded on logic, I examine some issues related to the conditions of possibility of the application of mathematics to political economy in the context of Jevons's epistemology. Then, I come to the centre of my analysis, where Jevons's conception of what he called 'the series of reality' will be examined through the concept of metaphor. It is worth noticing that I have no pretension of pursuing a novel study of the notion of metaphor. My purpose is quite different: I refer to the interactive theory of metaphor in order to display the consequences of applying mathematics to political economy in Jevons's thought. My primary reference is Deirdre McCloskey's study of metaphors in the economic context. Lastly, I argue that Jevons's view about the mathematical nature of the described object – economic issues – depended on the language he applied.

Jevons's commitment to mathematical economics

Since his youth, Jevons had been persuaded that mathematics was to be found at the basis of every scientific discipline (see Jevons, 1972-1981, Vol. I, 109). While still in Australia, Jevons began to think that political economy had to be mathematical. On the 28th of February 1858, he illustrated to his sister Henrietta his conception of the relationship between mathematics and economics. "You will perceive", wrote Jevons,

> that *Economy*, scientifically speaking, is a very contracted science; it is in fact a sort of vague mathematics which calculates the causes and effects of man's industry, and shows how it may best be applied (Jevons, 1972-1981, Vol. II, 321).

Political economy was, in the eyes of the young Stanley, a mathematics applied to the study of man's industry.

Jevons envisioned a clearer shape to this 'vague mathematics' two years later. In a letter dated 1st June 1860, Jevons confided to his brother Herbert the very core of what would become his economic theory:

> During the last session I have worked a great deal at Pol. Economy; in the last few months I have fortunately struck out what I have no doubt is *the true theory of Economy* so thorough-going and consistent, that I cannot now read other books on the subject without indignation. While the theory is entirely mathematical in principle, I show at the same time how the data of calculation are so complicated as to be for the present hopeless. Nevertheless I obtain from the mathematical principles all the chief laws at which Pol. Econ^ts^ have previously arrived only arranged in a series of Definitions Axioms and Theorems almost as rigorous and connected as if they were so many geometrical problems. One of the most important axioms is that as the quantity of any commodity, for instance plain food, which a man has to consume increases, so the utility or benefit derived from the last portion used decreases in degree. […] And I assume that on an average the *ratio of utility* is some continuous mathematical function of the quantity of commodity (Jevons, 1972-1981, Vol. II, 410).

This passage is very famous, and the scholarly study on Jevons has seen in it the germ of utility theory and of the law of decreasing marginal utility (see, for instance, La Nauze, 1953). Jevons pictured his theory as a system of axioms, from which the basic economic laws could be drawn. Not long after, Jevons expressed the same idea in another letter to Herbert. Indeed, on the 28th November 1860, he stated that his theory of political economy assumed "the form of a complicated mathematical problem, from which all the common laws with due limitations flow" (Jevons, 1972-1981, Vol. II, 422).

In the following years Jevons became more and more persuaded that mathematics and economics belonged together. On the 28th February 1879 he shared this view with Sidgwick:

> I have for some time past been inquiring into the history of the mathematical treatment of Economics, and the truth gradually dawns upon me that the mathematical method is as old as the science of Economics itself (Jevons, 1972-1981, Vol. V, 24).

Jevons devoted considerable attention to this subject. In the years between the publication of the first (1871) and the second edition (1879) of the *Theory*, Jevons discovered that the attempts of applying mathematics to political economy had been far more abundant than he thought. As Jevons explained in the preface to the second edition of the *Theory*, he made an exhaustive list of all the works in which mathematics had been fruitfully wedded to political economy (see Jevons, [1871] 1879, XX-XXI)[4]. On the basis of such list, Jevons eventually concluded that "the notion that there is any novelty or originality in the application of mathematical method or symbols must be dismissed altogether" (Jevons, [1871] 1879, XLVI-XLVII).

Notwithstanding the number of these attempts, Jevons pointed out that this path was far from being mainstream. He also admitted that the purpose of his list was to make such works known. As a matter of fact, Jevons made considerable efforts to foster the idea that economics had to be a mathematical discipline. Together with Walras, he was committed to spreading the knowledge of their works, so that mathematical economy would be recognised[5]. By this list, Jevons aimed at showing that applying mathematics to political economy was

[4] Here Jevons specified that the list had been included in the second edition of the *Theory*, as an appendix.

[5] Jevons's eagerness to spread his theory clearly emerges in some letters to D'Aulnis and Walras. D'Aulnis de Bourouil was a young student of law, at the University of Leyden. He held Walras's and Jevons's theory in high esteem. As a matter of fact, it was D'Aulnis who first put in contact the two marginalists (see Jevons, 1972-1981, Vol. IV, 45, where Walras explained that he wrote to Jevons under D'Aulnis's suggestion). Concerning Jevons's endeavours to diffuse his mathematical theory, see Jevons, 1972-1981, Vol. IV, 62 and 72-74, for the correspondence with D'Aulnis in regard to this topic; see also Jevons, 1972-1981, Vol. IV, 67-68, where Walras expressed to Jevons his doubts concerning the possibilities of disseminating their theories.

perfectly reasonable. Making this point was significant, given that Jevons faced harsh criticism for choosing to apply mathematics to this subject matter[6]. First and foremost, he had to convince his readers that the path he had chosen was the right one. As for him, his conviction never seemed to waver.

The conditions of possibility

My inquiry is not focused on the reception of Jevons's mathematical theory by his contemporaries, nor on his efforts to persuade them of its soundness. My investigation starts by examining the foundations of Jevons's account and the consequences of his decision to apply mathematics to political economy. Let us consider the first point, namely the foundations of Jevons's account. My question is: how did Jevons justify, from a theoretical point of view, the choice of applying mathematics to political economy? This question could also be formulated in the following terms: what were the conditions of possibility which founded Jevons's application of mathematics to political economy?

Jevons provided a justification for his mathematical theory in his main works on this subject matter. He presented his mathematical theory of economy for the first time in 1862, at the Section F of the British Association for the Advancement of Science[7]. This short paper already conveyed what would become, nine years later, the core of his *Theory*. There, Jevons began by elucidating why political economy needed to be expressed in a mathematical language. "The following paper", he explained,

[6] For a detailed account of the responses to Jevons's theory, see Schabas, 1990, chap. 6.

[7] This paper had been printed in the *Journal of the Statistical Society of London* in 1866, under the title "A Brief Account of a General Mathematical Theory of Political Economy". Moreover, it is included in the fifth edition of Jevons's *Theory of Political Economy*.

> briefly describes the nature of a Theory of Economy which will reduce the main problem of this science to a mathematical form. Economy, indeed, being concerned with quantities, has always of necessity been mathematical in its subject, but the strict and general statement, and the easy comprehension of its quantitative laws has been prevented by a neglect of those powerful methods of expression which have been applied to most other sciences with so much success (Jevons, 1866, 282).

Jevons restated this point once again, in a paper read to the Manchester Statistical Society in 1864. This paper was concerned with Walras's theory, which, as it is well-known, was also mathematical and displayed various similarities with Jevons's. In order to buttress at once his own theory and Walras's, Jevons asserted that "the laws of political economy must be mathematical for the most part, because they deal with quantities and the relations of quantities" (Jevons, 1874, 480).

However, the work where this justification had been better articulated was, naturally enough, the *Theory of Political Economy*. Here Jevons dedicated a paragraph to an explanation of the mathematical character of political economy. "It seems perfectly clear", he stated, "that Economy, if it is to be a science at all, must be a mathematical science" (Jevons, 1871, 3). Jevons argued that the so-called moral and physical sciences were united by a common method – an argument which would be crucial in the *Principles*. As I have shown in the first chapter, in the *Principles of Science* Jevons encouraged taking the physical sciences as a paradigm, due to their extraordinary accomplishments: "the physical sciences may therefore be properly made the practice-ground of the reasoning powers, because they furnish us with a great body of precise and successful investigations" (Jevons, [1874] 1877, XXVII-XXVIII)[8]. Jevons provided thus a first justification in the *Theory* for his willingness to apply mathematics to political economy. If we wish to make political economy truly scientific, we had to embrace the method of the hard sciences – which was a mathematical one.

[8] This issue has already been investigated in the first chapter.

Notwithstanding the significance of such a methodological argument, in the *Theory* Jevons's main point in favour of mathematical economy was another. These statements were much like those he had already made in 1862:

> our science [political economy] must be mathematical, simply because it deals with quantities. Wherever the things treated are capable of being *more or less* in magnitude, there the laws and relations must be mathematical in nature (Jevons, 1871, 4).

Jevons clarified that mathematics wasn't just a language in which we may choose to express economic laws. Rather, these laws were *in themselves* mathematical. According to him, given their quantitative character, "the laws [of political economy] *are* mathematical: Economists cannot deprive them of their nature by denying them the name; they might as well try to alter red light by calling it blue" (Jevons, 1871, 4-5).

The dismissal of mathematics by political economists entailed a misjudgement of the nature of economic laws. As we shall see in third section of the present chapter, this refusal of mathematics, like any other attempt to discard the natural laws, was, for Jevons, pointless. We could only find ourselves impoverishing our comprehension, without escaping the natural mathematical character of our subject matter:

> If […] in Political Economy we have to deal with quantities and complicated relations of quantities, we must reason mathematically; we do not render the science less mathematical by avoiding the symbols of algebra, – we merely refuse to employ, in a very imperfect science, much needing every kind of assistance, that apparatus of signs which is found indispensable in other sciences (Jevons, 1871, 6).

Jevons was positive that all the pivotal concepts of political economy – like labour, money, capital, as well as pleasure and pain – were quantitative notions. The basic notions and laws of political economy had a mathematical nature. Jevons appealed to a powerful ally in defence of his theory – *i.e.* nature.

"It is logic which rules number"

In Jevons's eyes, mathematical language wasn't only a means of expression: it was the language of the economic laws themselves. It was their *natural* language. Jevons's statement turns out to have an ontological implication. Mathematics wasn't the chosen language because it was more suitable to express economic relations than other languages. It was rather the *only* suitable language, since it was 'spoken' by nature itself. Hence, any other way of expressing the economic laws wouldn't be as faithful to the world. Jevons's argument was thus founded in an *isomorphism* between the world and mathematical language. We could – and must – use mathematics in political economy, due to the natural character of the objects involved in economic reasoning.

This wasn't the only occasion in which the term 'isomorphism' was used to describe the relation between things and signs in Jevons's thought. In the first chapter, I have argued that Jevons's Logical Alphabet could represent natural phenomena thanks to an isomorphism between the world and the laws of logic. Logic mirrored the world because it shared its structure, being the laws at once of thought and of things.

It is worth mentioning here that Jevons's belief that the economic laws were mathematical didn't contradict his depiction of the world as regulated by the laws of logic. Jevons left no doubt concerning the hierarchy of logic and mathematics (see Jevons, 1890, 3-6). Indeed, in the *Principles of Science*, Jevons wrote that

> in no region of thought can a reasoner cast himself free from the prior conditions of logical correctness. The mathematician is only strong and true as long as he is logical, and if number rules the world, it is logic which rules number (Jevons, [1874] 1877, 154).

This sentence, which Margaret Schabas has put in the centre of her study (see Schabas, 1990, especially chap. 4 and 5), shows perfectly well how mathematics depended on logic for truth and reliability. Without the guidance of logic, mathematics would be lost: "in fact we no sooner leave the simple logical conditions of number, than we find ourselves involved in a mazy and mysterious science of symbols" (Jevons, [1874] 1877, 154).

Jevons emphasised this point in the *Theory of Political Economy*. Here he expressed the pre-eminence of logic over mathematics:

> There can be but two classes of sciences – those which are simply logical, and those which, besides being logical, are also mathematical. If there be any science which determines merely whether a thing be or be not – whether an event will happen, or will not happen – it must be a purely logical science; but if the thing may be greater or less, or the event may happen sooner or later, nearer or farther, then quantitative notions enter, and the science must be mathematical in nature, by whatever name we call it (Jevons, 1871, 8).

A scientific discipline could be mathematical, in addition to logical. However, the logical nature of every science – and ultimately of everything there is – didn't come into question. Consequently, Jevons's view of the world as an array of combinations wasn't at odds with his conception of mathematics as the natural language of quantitative phenomena. Mathematics had to answer to logic. Hence, quantitative phenomena couldn't but be encompassed in the combinatorial order of the world, since the order of combinations was the order of logic itself.

The series of signs and things: neither interchangeable, nor parallel

According to Jevons, political economy had to be mathematical due to the mathematical nature of its basic notions. It surely was, at the same time, a logical science, just like any other. However, a proper scientific treatment of economic concepts and laws required using mathematical language, in the absence of which the object's nature would be misrepresented. Now, Jevons's claim that the economic laws had a mathematical nature raises some questions. These questions are akin to those asked in the first chapter, concerning the epistemological foundation of Jevons's theory. On what basis could Jevons argue that economy was regulated by natural laws? Moreover, on what basis could he hold that these laws were inherently mathematical?

The first question has already been answered indirectly in the first chapter. Jevons's God was the guarantor of the stability and regularity of nature. The

very existence of a benevolent Creator ensured that the world was created according to His plan, that it was governed by laws as flawless as their master. In the infinite universe depicted by Jevons, God was the anchor of humans. Without Him, the finite human intellect would be lost. However, even if God could guarantee the existence of such laws, defining the essential characteristics of these laws was a more delicate matter. In the first chapter, I have illustrated at length Jevons's epistemology and conception of the universe. In his eyes, nature was a ballot-box. We could see what comes out of it – *i.e.* the events which actually happen – but we could not look into the box itself. Hence, the inherent nature of phenomena would never be disclosed to the human intellect.

Given this view, how could Jevons possibly assert that the economic laws were mathematical in themselves? Wouldn't that imply the possibility of taking a glimpse into the depths of the ballot-box? This wasn't the only occasion on which Jevons made claims about the inherent nature of phenomena. For instance, he took the liberty of defining the laws of thought – which regulated the human mind as well as nature. However, in identifying the laws of thought, Jevons could rely on the self-evidence of the mind to itself. By virtue of such self-evidence, the agent could be allowed to make ontological statements concerning his or her mind. In contrast, what could justify Jevons's assertion about the nature of economic laws? How could he identify an isomorphism between mathematics and economic laws without suggesting that the nature of the latter was known?

In order to investigate this issue, we have to take into account a passage from the *Principles of Science*:

> I need hardly dwell upon the question whether logic treats of language, notions, or things. As reasonably might we debate whether a mathematician treats of symbols, quantities, or things. A mathematician certainly does treat of symbols, but only as the instruments whereby to facilitate his reasoning concerning quantities; and as the axioms and rules of mathematical science must be verified in concrete objects in order that the calculations founded upon them may have any validity or utility, it follows that the ultimate objects of mathematical science are the things themselves. In like manner I conceive that the logician treats of language so far as it is essential for the embodiment and exhibition of

> thought. Even if reasoning can take place in the inner consciousness of man without the use of any signs, which is doubtful, at any rate it cannot become the subject of discussion until by some system of material signs it is manifested to other persons. The logician then uses words and symbols as instruments of reasoning, and leaves the nature and peculiarities of language to the grammarian. But signs again must correspond to the thoughts and things expressed, in order that they shall serve their intended purpose. We may therefore say that logic treats ultimately of thoughts and things, and immediately of the signs which stand for them. Signs, thoughts, and exterior objects may be regarded as parallel and analogous series of phenomena, and to treat any one of the three series is equivalent to treating either of the other series (Jevons, [1874] 1877, 8-9).

After considering Jevons's explanation of the series of reality, the question I have asked above could be reformulated in the following terms: on the basis on what series did Jevons decide that mathematics was the natural language of economics? Jevons did provide an implicit answer while justifying his choice of applying mathematics to political economy. He argued that political economy necessarily required the use of mathematical language due to its own quantitative nature. In his eyes, mathematics was the only one in which the economic objects could be properly expressed – being the only language suited to their nature. Jevons was implying that his reasoning started from the series of things and then was expressed in mathematical language, reaching thus the series of signs.

As I have highlighted, Jevons claimed that mathematical signs displayed the very nature of economic laws and concepts, thus being the only natural language of political economy. On closer inspection, this statement depends on a basic assumption: the interchangeability of the series of things and the one of signs. For mathematical language to properly express the nature of economic laws and notions, we have to admit that treating of mathematical signs is no different from treating of the economic objects themselves. In other terms, we have to admit that we can indifferently treat of the things (economic objects) and of the signs (the mathematical language). Hence, we have to admit the interchangeability of the series of things and of signs.

Jevons did argue that the two series were interchangeable. And yet the interchangeability of the two series depends on another condition. This condition relates to the relationship between signs and things. For the two series to be interchangeable, we have to admit that our signs are a faithful mirror of things. Therefore, it is crucial to ask whether Jevons believed in the faithfulness of signs or not. I have already touched on this point in the first chapter, where I have elucidated Jevons's view of the sign at length. As I stated there, in Jevons's mind the symbols were surely not the things themselves, even though their use was based on a similarity of nature with the things denoted by them. This similarity enabled the speaker to acknowledge the existence of analogies between things and signs. The whole system of expression was founded on such analogies. Nevertheless, signs were not all-powerful. Their grasp on things was lessened by the infiniteness of nature: indeed "there is no branch of science in which our symbols can cope with the complexity of Nature" (Jevons, [1874] 1877, 216), as Jevons observed.

On the basis of these considerations, we couldn't but conclude that Jevons did not believe that signs were faithful mirrors of things. As a consequence of this, the condition on which the interchangeability of the series of things and signs lay is not fulfilled. In the absence of this condition, the series of things and the series of signs could not be considered as interchangeable. Ruling out the interchangeability of the two series has enormous consequences for Jevons's theory, since it denies him the possibility of claiming that mathematics could express the very nature of economic laws. Jevons's account of the relationship between signs and things prevents him from claiming that *any* sign could show the inner nature of the denoted thing. No sign could exhaust the complexity of nature. Therefore, no sign, even a mathematical one, could perfectly express the nature of economic relationships.

Our signs may be crippled, imperfect; and yet, we cannot dispense with them. As Jevons explained in the passage concerning the series of reality, the only thing that could allow knowledge to be communicated was language. We may have all the same inner impressions, but, until such impressions were touched by linguistic symbols, they could not be communicated. That was why

we could not dispense with signs. Jevons seems thus to walk on thin ice: on the hand, he couldn't admit that his signs were suited to express the inherent nature of things; on the other, for us to have an interpersonal knowledge of things, we couldn't but rely on these imperfect and dim signs.

Everything we know of the series of things and thoughts was meant to pass through the filter of linguistic symbols. And this filter was far from being neutral. Signs provided a representation of the world, not the world itself. Not that I intend to deny that Jevons's epistemological system made knowledge of reality unattainable. Signs may be faint images, but they still had some gnoseological significance in Jevons's eyes, by virtue of the analogies binding them with things. My contention, as I shall explain, is rather that Jevons neglected the consequences which expressing an object in a given system of signs had on the representation we can give of the object itself.

As we have seen, Jevons had the pretension that the mathematical signs could reveal the essence of economic objects and laws. However, this would be possible only provided that the series of reality were endowed with two fundamental characters: the series of things and signs had to be interchangeable and parallel. On the contrary, we have to admit that Jevons's account of signs denied the series both of these characters.

First, the series could not be interchangeable, because signs were not the exact copy of things. Moreover, if we accept such an account, no sign could be *literal*. No sign could exhaust the nature of the denoted object. Used literally, words denote precisely and unambiguously the object to which they refer. Jevons's account, however, does not admit this unambiguous system of reference. Therefore, no sign could be literal.

Of course we may be content with considering a word as 'literal' when it is conventionally believed to be such, and in this sense words could surely be literal for Jevons as well. Nonetheless, this view of literality would not be consistent with Jevons's epistemology. In his logical works, as we have seen in the first chapter[9], there was an effort to describe the world *as it is*. Therefore, in

[9] See first chapter, the section "*ars combinatoria*".

reference to Jevons's view, the term 'literal' would have a stronger sense than 'conventional'. It would rather call to mind the intention of grasping the essential characters of the denoted things. It is this kind of literality which is unattainable, because of the deprived nature of signs.

Second, the series were not parallel. The task of signs was notably to express our knowledge of things. Were they a faithful mirror of things, they could really provide a perfect representation of them. But this was not the case. Due to their finite nature, signs could only represent things in accordance with their own inherent characters, influencing the image of the denoted object. Hence, the series of reality were neither interchangeable nor parallel, despite what Jevons argued.

Speaking in metaphors

In this section, I cast further light on these statements using the concept of *metaphor*, paying particular attention to Deirdre McCloskey's analysis of metaphors in the context of economic theory. The most common definition of metaphor's functioning is the following one: metaphor entails a process "by means of which one thing is made to stand in for another thing" (Punter, 2007, 2). This definition is in line with the one suggested by Aristotle in the *Poetics,* where we read that a metaphor "consists in giving the thing a name that belongs to something else; the transference being either from genus to species, or from species to genus, or from species to species, or on grounds of analogy" (Aristotle, 1946, Vol. XI, 345-346 [1457b, 7-11]). Rather than referring to the object with what Aristotle calls the 'ordinary' word, a metaphor evokes another object which could reasonably stand for the original object. Thus, metaphors do not use the language in a 'literal' way: metaphors are supposed to break the codes of conventional language[10].

[10] The idea that metaphors use language in a non-literal way is commonly associated with the concept of metaphor. See, for example, M. Black, 1962; Searle, (1979) 1993; Camp, 2007, Vol. III, 21. In contrast, some scholars have put into question the differ-

Metaphorical language contrasts with the ordinary code of literality. Therefore, looking at Jevons's application of mathematics to political economy in the light of metaphorical language is particularly appropriate, given that in his epistemological system no sign could be literal. We may ask ourselves a fundamental question: is it acceptable to use the notion of metaphor to represent a system of language, like Jevons's one, in which no literality is possible? Provided that the metaphorical language consists in breaking the code of literality, a reference to metaphor where literality is lacking would be nonsensical.

However, I suggest that in Jevons's epistemology there was still a notion of literality, in the form of a *nostalgia for things*. I have used this expression in the first chapter, where I argued that Jevons was unwilling to abandon the idea that language could grasp things. Jevons's nostalgia for things could be considered, from the linguistic point of view, as a *nostalgia for literality*. Jevons's account of signs downgraded them to the rank of allusions. And yet, if signs were imperfect, it was because Jevons was still attached to the idea that signs should be perfect – because he had a nostalgia for things and literal signs. Jevons's signs were prevented from being literal, and thus literality for him became an unattainable ideal of perfection. Consequently, I argue that the concept of metaphor is an appropriate notion with which to explore Jevons's economic thought.

Thanks to the notion of metaphor, I can now provide an answer to the question asked at the beginning of this section: on the basis of what series did Jevons claim that mathematical language was the only language suited to political economy? I argue that Jevons did not draw this conclusion from the series of things, but from the series of signs. It was the nature of mathematical signs which prompted him to consider that the represented object had a mathematical nature. However, Jevons did not realise that moving from the series of things to that of signs also entailed a movement in the opposite direction. The representation of the natural object is not independent of the nature of the signs used to

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ence between literal and metaphorical language: see JSadock, (1979) 1993; Rumelhart, (1979) 1993.

express it. Thus, I contend that it was the quantitative character of the mathematical language which led Jevons to look at the represented object – economic basic notions and laws – in accordance with this language.

Let us now consider the concept of *metaphor*[11], first from an etymological point of view. The term 'metaphor' derives from two Greek words: the preposition '*meta*' and the verb '*phero*'. *Meta* could be translated with 'through' and *phero* with 'bringing'. Using a metaphor would thus mean to take something – a word, a concept, or an entire subject – through a process of transformation. The metaphor aims at taking its object from one context to another, assuming that this would help to elucidate the original notion. The represented object is seen in the light of the metaphorical one. As Max Black has remarked in his seminal study of metaphors, "the new context (the 'frame' of the metaphor […]) imposes extension of meaning upon the focal word" (M. Black, 1962, 39). Metaphors, in accordance with the word's etymon, shift the object from one context to another. In Black's terms, metaphors create an interaction between the focal word and the metaphorical frame (see M. Black, 1962, 38-44)[12].

By applying mathematics to political economy, Jevons reasoned *metaphorically*: the use of mathematical symbols takes the represented object, *i.e.* economic notions, to a new level of expression, with the assumption that on such level the object could be better understood. This contention is buttressed by Jevons's conception of the series of reality, where things must be taken to the level of signs for them to be expressible to others. Every inner knowledge of the world required a symbolic expression, that is, to pass from the series of things to that of signs. It follows that in the context of Jevons's thought every

[11] I shall follow in the footsteps of Deirdre McCloskey, who has tackled the problem of the use of metaphors in the context of economic theory (see McCloskey, [1985] 1998, 40-51).

[12] Here Black has presented his well-known theory of interaction, according to which a metaphor makes two different systems of commonplaces interact. For a criticism of Black's theory, see Davidson, 1978; Fogelin, (1988) 2011, chap. 5 in particular.

language is metaphorical. Moving from the series of things to the series of signs could be properly seen as using a metaphor.

Moreover, the idea that using a mathematical language in the context of economics is using a metaphor is in line with Deirdre McCloskey's analysis. In the *Rhetoric of Economics*, she has claimed that economists cannot dispose of metaphors. As she has argued,

> the most important example of economic rhetoric […] is metaphor. Economists calls them 'models'. To say that markets can be represented by supply and demand 'curves' is no less a metaphor than to say that the west wind is "the breath of autumn's being" (McCloskey, [1985] 1998, 40).

So mathematical reasoning isn't devoid of metaphors either. McCloskey didn't fail to emphasise the metaphors dwelling in mathematical economics too:

> Mathematical theorizing in economics is metaphorical, and literary. Consider, for example, a relatively simple case, the theory of production functions. Its vocabulary is intrinsically metaphorical. 'Aggregate capital' involves an analogy of 'capital' (itself analogical) with something – sand, bricks, shmoos – that can be 'added' in a meaningful way; so does 'aggregate labor', with the additional peculiarity that the thing added is no thing, but hours of conscientious attentiveness. The very idea of a 'production function' involves the astonishing analogy of the subject (the fabrication of things, about which it is appropriate to think in terms of ingenuity, discipline, and planning) with the modifier (a mathematical function, about which it is appropriate to think in terms of height, shape, and single-valuedness) (McCloskey, [1985] 1998, 44).

McCloskey has shown that mathematical economics used a metaphorical language, just as non-mathematical reasoning does. The expression 'aggregate labour' suggests that the production hours of various individuals can be reasonably added to one another and be considered as a single entity. This is the metaphor's power: the properties of the object situated at the metaphoric level cast light on the represented object. However, McCloskey's has not only sug-

gested that economists *may* use metaphors[13]. According to her, we shouldn't take metaphors to enter the economic domain only when economists use them to illustrate some specific concepts, like Gary Becker did by comparing children to durable-goods (McCloskey, [1985] 1998, 43). McCloskey has argued that we have to dispose of the very idea that behind the metaphors there is a plain language, describing the things in a literal sense. Metaphors are not mere ornaments which distract from an alleged plain description of reality. In her own words, "the very idea of 'removing' an 'ornament' to 'reveal' a 'plain' meaning is itself a metaphor […]. Perhaps thinking is metaphorical. Perhaps to remove metaphor is to remove thought" (McCloskey, [1985] 1998, 41).

Such account is consistent with the conclusions I have drawn from Jevons's description of the series of reality. Once admitted that signs didn't provide a faithful representation of the denoted things, Jevons had to relinquish the idea that any system of language could be literal. He did believe that we had an immediate knowledge of the world: we can trust our perceptive knowledge. However, our basic experience of reality would be silent if it wasn't for language and its signs: things could not speak for themselves. Hence, every form of symbolic expression couldn't but put our knowledge of the world through a transformation. Thus, every symbolic expression would be metaphorical, as McCloskey has suggested.

These reflections display another aspect of the relationship between things and their linguistic expression. As I have highlighted, no sign could be literal given Jevons's assumptions. Consequently, we have to admit that mathematical economics is no more metaphorical than any other treatment of economic issues. A representation of the same subject matter in the terms of natural language would be equally metaphorical, since it involves the same movement from the series of things to that of signs. If no linguistic expression is literal,

[13] McCloskey's view broadens the concept of metaphor considerably. In this regard, her position contrasts with those studies which identify metaphors in the economic theory with the use of an explicitly metaphorical language. For instance, cf. Morgan, 2012.

every speech is metaphorical. However, it does not follow that every system of signs is the same. On the contrary, since no linguistic system is literal, the choice of which to apply would be all the more important. Thinking of every discipline in the light of metaphors shows how each kind of sign has its specific features and power. Jevons was aware that the choice of a particular system of symbolic expression marked a difference in the study of the subject matter. He argued that mathematics was suited to express economic concepts because they both had a quantitative nature. In the next section, I examine some passages of the *Theory* making use of the notion of metaphor. Then, I investigate the relationship between mathematics and political economy in Jevons's thought.

The power of selection

Let us focus on the consequences of applying mathematics to political economy in accordance with the concept of metaphor. If mathematical language is metaphoric, how do the features of the metaphor affect the representation of economic issues? This question could be answered by appealing to McCloskey's analysis, which is inspired by the work of Owen Barfield. According to McCloskey, when a metaphor is particularly apt to describe an object, it could lead us to think that it is the only suitable way to represent the object. As McCloskey has explained,

> What is successful in economic metaphor is what is successful in poetry, and the success is analyzable in similar terms. Concerning the best metaphors in the best poetry, comparing thee to a summer's day or comparing A to B, argued Owen Barfield, "We feel that B, which is actually said, ought to be necessary, even inevitable in some way. It ought to be in some sense the best, if not the only way, of expressing A satisfactorily. The mind should dwell on it as well as on A and thus the two should be somehow inevitably fused together into one simple meaning" […]. If the modifier B (a summer's day, a refrigerator, a piece of capital) were trite […] it would become, as it were, detached from A, a mechanical and unilluminating correspondence. If essential, though, it fuses with A to become a master metaphor of the science, the idea of 'human capital', the idea of 'equilibrium', the idea of 'entry and exit', the

> idea of 'competition'. The metaphor, said a poet, is the "consummation of identity" (McCloskey, [1985] 1998, 43).

An effective metaphor has the power of *selecting* the essential properties of the object to which the metaphor applies[14]. Thus, it could result in consummating its identity: the metaphorical object is identified with the represented one. This process gives us the impression that we can speak of the two objects in the same terms. The represented object *becomes* the metaphorical one.

The metaphor's power of selecting the essential characteristics of the represented object can be observed through Jevons's application of mathematics to political economy. I will elucidate the effect of the power of metaphor in Jevons's mathematical economics, with reference to his *Theory of Political Economy*. In this work, Jevons attempted to express the feelings of pleasure and pain experienced by individuals in mathematical terms. In order to do so, Jevons took these feelings to be *magnitudes* (see Jevons, 1871, 33). These magnitudes were thus constituted: "a feeling, whether of pleasure or of pain, may be regarded as having essentially two dimensions" (Jevons, 1871, 34), these dimensions being duration and intensity. After specifying the nature of these feelings, Jevons presented an analogy which has a foundational character for his mathematization of pleasures and pains. In his own words, "pleasure and pain […] are magnitudes possessing two dimensions, just as an area or superficies possesses the two dimensions of length and breadth" (Jevons, 1871, 35).

This analogy is the ground on which the mathematical metaphor takes root. As for the mathematical tool suited to represent feelings, it was the differ-

[14] Max Black has stressed this mechanism of metaphor too; see M. Black, 1962, 39, where we read as follows: "in its metaphorical use a word or expression must connote only a *selection* from the characteristics connoted in its literal uses"; see M. Black, 1962, 44-45, where Black has observed that "the metaphor selects, emphasizes, suppresses, and organizes features of the principal subject by implying statements about it that normally apply to the subsidiary subject".

ential calculus[15]. Its suitability was justified on the basis of an inherent quality of these feelings, naming their incessant variation. Consequently, provided that pleasure and pain are in continuous variation, Jevons held that the differential calculus was the appropriate tool to treat these feelings mathematically (see Jevons, 1871, 35-36). In the *Theory*, Jevons constructed a graph composed of small rectangles, where each rectangle's base stands for an interval of time (a minute) and their height measures intensity:

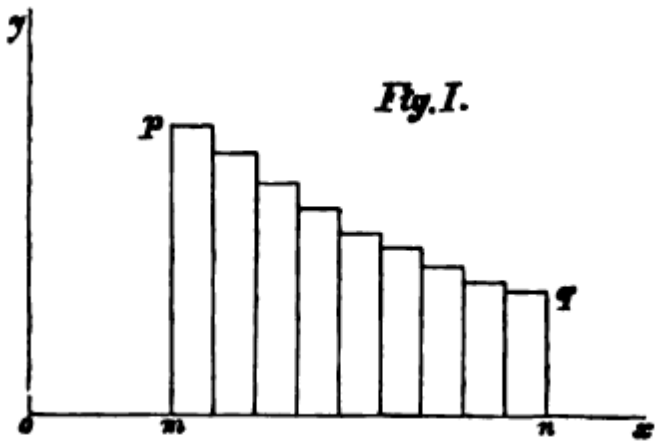

Figure 6: Fig. I from the *Theory of Political Economy* (Jevons, 1871, 36).

Jevons elucidated this graph as follows:

> Along the line ox we measure *time*, and along a parallel to the perpendicular line oy we measure *intensity*. Each of the rectangles between pm and qn represents the feeling of one minute, or of any other small portion of time assumed. The aggregate quantity of feeling generated during the time *mn* will then be represented by the aggregate area of the rectangles between pm and qn. In this case the intensity of the feeling is supposed to be gradually declining (Jevons, 1871, 36).

[15] Neil De Marchi and Robert Collison Black have stated that the differential calculus was the 'obvious' tool for elaborating a study of maximizing behaviour; see R. D. C. Black, 1972c, 5; De Marchi, 1972, 357. I will take this statement into account in the last part of this section.

Nevertheless, this is not the final result of Jevons's metaphor. Indeed Jevons assumed that feelings vary by "sudden steps and regular intervals" (Jevons, 1871, 36-37). "To avoid all error", he continued, "we may imagine the intervals of time infinitely short; that is, we must treat the intensity as constantly and continuously varying" (Jevons, 1871, 37). Jevons thus took advantage of the way of reasoning typical of differential calculus to construct this graph:

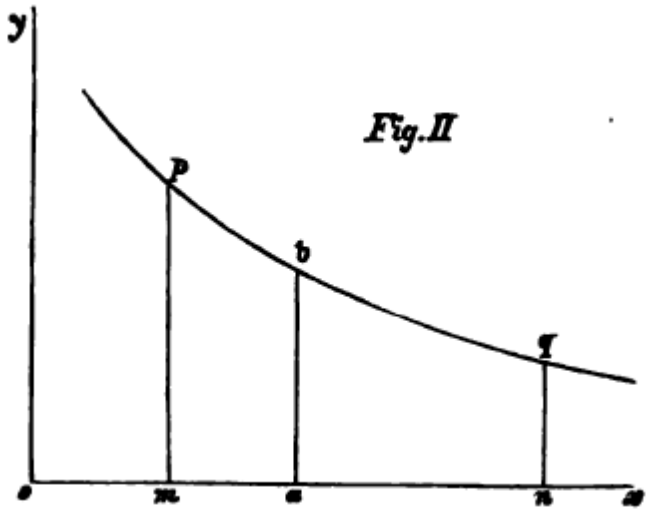

Figure 7: Fig. II from the *Theory of Political Economy* (Jevons, 1871, 37).

Jevons provided an explanation of this graph:

> Thus the proper representation of the variation of feeling is found in a curve of more or less simple character. In Fig. II the height of each point of the curve pq, above the horizontal line ox, indicates the intensity of feeling in an indivisible moment of time; and the whole quantity of feeling generated in the time *mn* is measured by the area of the curve between the lines pm, qn, mn, and pq. The feeling belonging to any other time, ma, will be measured by the space $mabp$, cut off by the perpendicular line ab (Jevons, 1871, 37-38).

This curve represented the variation of the intensity of feeling over time. These considerations were also at the basis of Jevons's theory of utility. The variation of utility's degrees with respect to the quantity of a commodity was represented as a continuous curve too, with the degree of utility on the vertical

axis and the quantity of commodity on the horizontal axis, as Jevons showed by means of this figure:

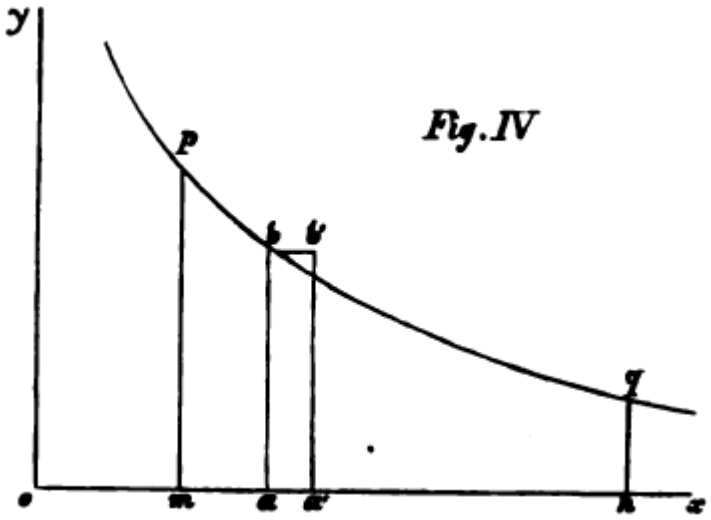

Figure 8: Fig. IV from the *Theory of Political Economy* (Jevons, 1871, 58).

As Jevons wrote in explanation to this graph,

> when the quantity oa has been consumed, the degree of utility corresponds to the length of the line ab; for if we take a very little more food, aa', its utility will be the product of $aa'$and ab very nearly, and more nearly the less is the magnitude of aa'. The degree of utility is thus properly measured by the height of a very narrow rectangle corresponding to a very small quantity of food, which theoretically ought to be infinitely small (Jevons, 1871, 58).

Jevons constructed a metaphorical object to represent the experience of pleasure and pain. How does this metaphor act on the represented object through its power of selection? At the beginning of his mathematical treatment of pleasure and pain, Jevons stated that these phenomena were considered as magnitudes. His whole reasoning is founded on the assumption that feelings can be properly seen as magnitudes. This statement displays the metaphor's power of selecting the essential features of the represented object. In this case, the essential characters are the *quantitative* ones. The graph aims at determin-

ing and displaying the variation of feeling, *i.e.* at defining whether at a given moment this feeling is more or less intense than at the previous or following moment. Thus, by means of Jevons's function, the object can be studied in some ways. We can ask how the intensity of feeling varies over time or with respect to the object consumed, namely what degree of feeling or utility is associated with a moment or a unit of a commodity. This is the power of selection: we can ask *some* questions, but not any possible question. We are directed to focus on the features selected by the metaphor.

In order to offer a further clarification of the power of selection, let us take into consideration the represented object, *i.e.* the feeling. As I have highlighted above, Jevons considered the feeling as a magnitude. This statement defines the point of view assumed in looking at the object, thus selecting its essential characters. This is certainly not the only way to look at the object. For instance, we could be inclined to consider the feeling from a religious point of view. From this perspective, the relevant characteristics of the feeling may be its origin. A feeling can be bestowed on humans by God. Another relevant feature could be the feeling's purpose: human beings had been endowed with pleasure so that they can develop sympathetic inclinations towards their fellow-beings. Another example of a different account of feeling could be a relational one. From this point of view, a feeling of pleasure or of pain may be profitably considered in the terms of the social relations which had elicited it.

Each way of representing the given object depicts it under a different light. Each system of expression can be seen as a metaphorical way of representing the object. The object can be described in potentially infinite ways: pleasure is a function of time; pleasure is the instrument that God gave us to live in harmony with our fellow-beings; pleasure is the result of a healthy relation with other people in the social context. Each level of expression, namely each metaphor we use, selects its relevant characteristics. It is unlikely that in a religious context the most relevant aspect of a feeling would be its variation over time, or its quantity with respect to the object which causes pleasure. Rather, we may be willing to consider how we could honour God's gift through our behaviour.

The original object is the same, but the metaphors are countless. Every metaphor opens certain possibilities while precluding others.

There is another important illustration of the possibilities of looking at the same object in terms of different linguistic systems. Such an example is to be found in the context of the marginal revolution itself. As it is well-known, the triad of marginalists includes an economist who willingly refused to use mathematics in his theory: Carl Menger. Menger's starting point was very close to Walras's and Jevons's: he focused on maximizing behaviour and the concept of utility. However, Menger did not believe that mathematics was a suitable tool in his theory. Menger's argument in favour of the dismissal of mathematics is consistent with the description of metaphor's power of selection. As he explained in a letter to Walras (see Walras, 1965, Vol. I, 768-770; Vol. II, 2-6), Menger was concerned with seeking the basic causes of economic phenomena. In his mind, such a task would never be accomplished in a mathematical framework. What was required to achieve this purpose, was rather, as William Jaffé has described it, "a method of process analysis tracing the complex phenomena of the social economy to the underlying atomistic forces at work" (Jaffé, 1976, 521)[16]. Thus, Menger did not use mathematical language to represent the economic laws. Menger's metaphors are different from Jevons's and consequently they select different essential characteristics of the object at issue.

Each level on which the object is taken by the metaphor displays certain characteristics of the object, excluding others. As I have argued, Jevons's metaphors displayed the quantitative character of feelings. I do not intend to deny that a feeling could be properly considered as a quantitative phenomenon. On the contrary, Jevons's metaphors were suited to elucidate this aspect of the nature of this phenomenon. The problem lies in the consummation of identity. As

[16] Jaffé's paper has come to the attention of several scholars. Their responses have been published in the same edition of the *American Journal of Economics and Sociology*, and they all aim at reconsidering the relationship between the three founders of marginalism. In this regard, see: Peart, 1998; Hébert, 1998; Fontaine, 1998; Comim, 1998.

Deirdre McCloskey has underlined, some metaphors are so powerful that they consume the identity of the represented object. Thus the metaphorical object substitutes the represented one, making us believe that there is only *one* object – the metaphorical. When the identity of the metaphorical object is seen as exhausting the identity of the represented one, we may be inclined to think that speaking of the metaphorical or of the represented object *makes no difference*. In terms of Jevons's series of reality, the relationship between the series of things and that of signs becomes exclusive: an object becomes expressible by a single system of signs.

Nevertheless, an object is always liable to be represented in several ways. No metaphor could show every possible feature of the object. If this were the case, the metaphor would be the object itself, and there would be no distance between the series of things and that of signs. Consequently, we have to admit that a metaphor always excludes other relevant characteristics, and could never exhaust the nature of the object.

A powerful metaphor could make us fall into a trap: thinking that it is the only appropriate way of representing the object, suggesting that it completely displays its nature. Jevons seems to have fallen into this trap: he claimed that mathematical language was not just one suitable language among others, but the only suitable language to express economic issues. Its exclusivity was due to the nature of the object, which in his mind was in itself mathematical. However, as Jevons himself admitted, no sign can offer us the things themselves. Consequently, we should be willing to multiply the metaphors instead of limiting our possibilities of linguistic expression. By stating that mathematical language is the only one apt to describe economic objects, Jevons turns out to be seduced by the power of his own metaphor.

The power of redefinition

The power of consummating the identity of an object is not the only one pertaining to metaphorical language. Let us explore another power that we could attribute to metaphor: the power of redefinition. As I have argued, in ac-

cordance with McCloskey's analysis, a metaphor is able to select some characteristics of an object, making all its other features irrelevant. However, a metaphor could also *redefine* the object's identity. This is a different process from the one of selection, since selection works by subtraction, whereas redefinition works by addition. Through the power of selection, some of the object's essential qualities are highlighted, at the exclusion of others: the metaphor deprives – subtracts – the other qualities of the object. In contrast, by means of the power of redefinition, new essential features are added to the denoted object. A persuasive metaphor could prompt us to attribute the characteristics of the metaphorical object to the represented one, even though such qualities didn't seem to belong to the represented object at first. Thus the original object would be seen in light of the metaphorical object.

This process of redefinition of the represented object can be discerned in Jevons's mathematization of feelings and utility. The crucial concept where this mechanism shows itself is connected to Jevons's assertion that feelings and utility are in *continuous variation*. For a continuous curve to be envisioned, the quantity expressed by the independent variable has to be subject to continuous variation. Moreover, such variable needs to show a continuous variation with respect to the independent variable for the curve to have a simple and regular character.

In the passages I have quoted from the *Theory*, Jevons seemed to assume that the feelings of pleasure and pain, as well as utility, varied in such a way. He implied that these feelings could be reasonably represented as a variable having a continuous variation with respect to the independent variable. We can easily understand how important this assumption was for Jevons's analysis. Were utility and feelings not thus constituted, we couldn't differentiate the utility function. Thus, for Jevons it was essential to assume that he could represent the variation of feelings and of utility through a continuous curve, to widen the range of the mathematical tools at his disposal.

Jevons took for granted that the feelings which entered the mathematization process had these characteristics. He never justified this assumption on the basis of a psychological study or any other analysis of the nature of these ob-

jects. He was content with stating that feelings and utility were in continuous variation. In the introduction to the *Theory*, Jevons wrote as follows:

> Finding that the quantities with which we have to deal are subject to continuous variation, I do not hesitate to use the appropriate branch of mathematical science, involving though it does the fearless consideration of infinitely small quantities. The theory consists in applying the differential calculus to the familiar notions of wealth, utility, value, demand, supply, capital, interest, labour, and all the other notions belonging to the daily operations of industry (Jevons, 1871, 4).

Jevons claimed that the quantities considered are subject to a continuous variation, but he did not explain how he came to such a conclusion. His statement cannot be considered as resulting from a study of the object. It has rather the appearance of an axiom, a necessary assumption to elaborate a mathematical theory of utility and feelings. If anything, the source of Jevons's conviction may be introspection, even though he never argued in this way.

As a matter of fact, it would be perfectly acceptable to assume axiomatically that feelings and utility have a continuous character. But Jevons did not take this path. Instead, he attributed these characteristics to the object itself, without justifying his statement on the basis of prior analyses. In order to understand Jevons's position, a consideration of metaphor's power of redefinition is required. Jevons didn't state that his theory treated the feelings and utility *as if* they were continuous quantities. He implied that they *were* continuous in themselves, thus attributing to them the same nature as the mathematical object used to represent them. My contention is: Jevons was inclined to look at feelings and utility in terms of continuous quantities because of the mathematical tool he used. The mathematical metaphor he had chosen prompted him to look at the represented object in the metaphor's light. In this way, he ended by attributing a characteristic typical of the metaphorical object to the represented one, thus adding a property to the represented object.

Such phenomenon calls to mind Black's notion of *catachresis*. According to Black, metaphors might fill a gap in the literal language. Where something does not have a corresponding term acknowledged as referring to it literally, a

metaphor can introduce a new form of expression. In Black's terms, "so viewed, metaphor is a species of *catachresis*, which I shall define as the use of a word in some new sense in order to remedy a gap in the vocabulary; catachresis is the putting of new senses into old words" (M. Black, 1962, 32-33). However, the process of catachresis might continue, yielding further results: "if a catachresis serves a genuine need, the new sense introduced will quickly become part of the literal sense" (M. Black, 1962, 33). The redefinition of identity could be conceived as an ultimate result of the catachresis. When the metaphorical framework is transferred to the literal sense of the object, the represented object can assume new characters, which at a first glance did not pertain to the representation of the object.

Moreover, focusing on the metaphor's power of redefinition sheds light on Jevons's account of the relationship between the series of reality. As I have stated, Jevons saw the feelings of pleasure and pain, as well as utility, in the light of the differential calculus. I have argued above that Jevons underestimated the effects of a given system of language on the denoted things. He did not acknowledge that moving from the series of things to that of signs also implied a movement in the opposite direction. The object's representation is not independent of the signs used to express it. My argument concerning the power of redefinition can be seen as an example of such back-and-forth movement. Jevons's statement about the mathematical nature of economic laws and objects could be interpreted as resulting from the metaphor's power of redefinition.

I have also highlighted that Jevons's epistemology wouldn't allow him to make a statement concerning the essential characteristics of phenomena. However, if we take into consideration the metaphor's power of redefinition, the fact that Jevons attributed a mathematical nature to economic phenomena takes on a different meaning. It is not surprising that Jevons considering economic laws and concepts to have a mathematical character in themselves: this results from applying mathematics to political economy. Mathematical language, which in Jevons's eyes was quantitative, projected quantitative characteristics on the represented object, in accordance with the metaphor's power of redefinition. I argue that Jevons's account of economic phenomena as inherently quan-

titative was not born out of the series of things, but came from the series of signs. Jevons's metaphors showed him the world in the light of quantity.

Robert Collison Black and Neil De Marchi have argued that the differential calculus was the obvious tool for Jevons's purposes[17]. Notwithstanding the appropriateness of such a tool to analyse maximizing individual's behaviour, a question could be asked: in whose eyes is this tool so obvious? If an object is always liable to be represented in several ways, as I have remarked, the 'obvious' tools could be several as well. Moreover, their use might seem obvious depending on the features we are willing to emphasize. After a given metaphor has selected the essential characteristics of the object, and after the power of redefinition has exercised itself on the represented object, what we consider obvious regarding such object may change. The represented object metamorphoses into the metaphorical one, so that we might be unable to consider it in the light of another metaphor. This could be why this tool was obvious in the eyes of Black and De Marchi, so accustomed as they were to consider the differential calculus to be the only suitable instrument to treat that subject matter. The credit goes to Jevons's metaphor: it is such a persuasive metaphor that its powers of selection and redefinition has operated in an admirable way.

Above I have asked the following question: how could Jevons state that economic laws had a mathematical nature? This question finds an answer now, thanks to the inquiry concerning metaphor's power of redefinition. It wasn't the study of the economic notions which prompted Jevons to argue that economic laws had a mathematical nature. Indeed the series of things was not the basis of this idea. Jevons has always considered mathematics to be the most appropriate language for political economy. Thus mathematical language projected its form on the represented object. This is the case with the above mentioned curve, where the study of variation became crucial because of its relevance for the differential calculus.

Jevons justified his choice of applying mathematics to political economy by appealing to the very nature of the subject matter. He relied on an alleged

[17] See the n. 15 in the third chapter.

isomorphism between the world and the mathematical language. However, such isomorphism turns out to be a result of the metaphor's power of selection and redefinition. The world presented itself under a mathematical form to Jevons's eyes, since mathematics was the lens through which he observed the world. Jevons's mathematical metaphors selected the relevant aspects of the denoted object and then redefined their identity in accordance with these characteristics.

If the mathematical character of political economy is a projection of mathematical language, another question arises: why did Jevons choose to apply mathematics to political economy in the first place? In order to answer this, a reconsideration of the justifications which Jevons gave for his choice is needed. As we have seen, Jevons was eager to extend the methodology of the natural sciences to the social sciences as well. When we have before our eyes the remarkable successes of the natural science, argued Jevons, how could we be inclined to seek another method for less successful domains? Roy Weintraub, in his illuminating work on the history of mathematics in political economy, has elucidated how strong the attraction of mathematics was to social scientists. As he has stated, "by the late nineteenth century the linking of mathematics to economics was seen as a means of establishing economics as a science" (Weintraub, 2002, 167).

Weintraub's statement displays a remarkable continuity with Jevons's own argument in favour of the extension of the natural sciences' method to political economy. In the mind of a Victorian such as Jevons, a science, to be such, had to be mathematical. For the Victorians, mathematics was the queen of sciences. It is then not surprising that Jevons considered mathematical language as the optimal tool, thanks to which political economy, as well as other social sciences, could eventually become established scientific disciplines[18].

[18] With regard to the pre-eminent role of mathematics in the context of Victorian science, see Pickstone, 2005, 46-47. Jevons's willingness to apply mathematics to political economy could obviously be traced back to some authors who influenced him during his studies, rather than to his cultural background. Robert Collison Black has very

Jevons was positive that mathematics was the most powerful tool in the struggle for making social sciences scientific. However, I do not deny that Jevons was also persuaded that economic laws and notions were inherently mathematical. Jevons's conviction of the mathematical character of political economy had deep roots, resulting from the power of selection and redefinition of the metaphors he used. Mathematical metaphors charmed Jevons, pushing him to treat mathematics as the only language suited to political economy.

This does not however imply that Jevons's choice to apply mathematics to political economy was incongruous. The application of mathematics to political economy is apt, since, if we draw a conclusion from Jevons's view of sign, every linguistic expression is metaphorical. No sign is exhaustive of the object it represents, and nevertheless we cannot dispose of signs. Therefore, the solution to the ambiguity of signs does not lie in using a literal system of expression instead of a metaphorical one. What marks a difference between a proper and an incongruous use of signs is the awareness in handling them. Things need signs to be expressed and discussed, but we must always remember that no sign is literal, and therefore no sign could exhaust the nature of the denoted thing. Such an awareness opens to the plurality of symbolic expressions, rather than reducing the complexity of the represented thing to one system of signs.

Jevons saw the risks involved in seeing political economy from a single point of view, using a single methodology. In *The Future of Political Economy*, he stood up against what he called 'the fallacy of exclusiveness'. The one who falls under the fallacy of exclusiveness argues, "more or less consciously, that because a certain thing is true or useful, therefore other things are not true or not useful" (Jevons, 1905, 165). Jevons explained that it was this fallacy which

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persuasively argued that Augustus De Morgan had a profound influence on Jevons in this regard. Jevons did not only take from De Morgan the indispensables instruments of calculus. He also benefited from De Morgan's treatment of probability and knowledge of logic (see R. D. C. Black, 1972a, 127-134). In his turn, Harro Maas has claimed that Jevons's idea of constructing a mathematical function of pleasure and pain went back to Richard Jennings (see Maas, 2005, 172).

prompted some economists to treat the historical study of political economy as worthless (see Jevons, 1905, 166). Thus, in this text as well as in others[19], Jevons defended the necessity of studying political economy from several points of view. In turn, this implied the use of several linguistic systems to investigate political economy, since the historical school did not use mathematics.

However, Jevons himself seemed to fall into the fallacy of exclusiveness when he stated that mathematics was the only appropriate language to develop an economic theory. As he wrote in the *Future of Political Economy*, there were some basic and general laws of political economy (Jevons, 1905, 167-168). And these laws, according to the *Theory*, were inherently mathematical, so that any symbolic system other than mathematics would misrepresent them. Were Jevons really committed to avoiding the fallacy of exclusiveness, he would have had to remember the finiteness of signs and admit that other linguistic system could be fit to express the economic laws. Jevons's inclination to reduce the expressive possibilities of signs to mathematics resulted from what I have called the nostalgia for literality. The pursuit of the perfect sign, namely of a sign which could express the very nature of things, prompted Jevons to worship mathematics and to forget its metaphorical character.

3.3. A dual nature

After analysing the reasons for, and consequences of, applying mathematics to political economy, I focus on Jevons's economic agent. This investigation will entail once again a reference to the relationship between prescription and description in Jevons's thought.

As we have seen, Jevons's thought is rich with speculations concerning the nature of humans, and in particular their mental faculties. Let us now reconstruct Jevons's view of human nature as I presented it in the second chapter, before proceeding with an analysis of his economic subject. I have already

[19] See, for example, Jevons, 1872-1981, Vol. VII, 100, where Jevons discussed Luigi Cossa's work and praised the advantages of the historical method.

treated this topic at length in the second chapter, so that we only need to recall the main features of Jevons's portrait of the human being. First, some of Jevons's statements concerning human nature display his commitment to a deterministic philosophy of morals: he described the human being as a "complicated piece of machinery" (Jevons, 1972-1981, Vol. I, 133), bound by self-interest and the pursuit of pleasure. Such a description stressed the deterministic and endogenous character of the forces regulating human action. According to him, humans were forced by their inner nature to follow their self-interest, avoid pain, and look for pleasure. Jevons thus suggested that humans couldn't but comply with the demands of such impulses.

However, not all Jevons's statements went in the same direction. In contrast with this account, he asserted that the human being was no automaton. Some mental faculties revealed the direct intervention of the Primary Cause, namely God. By virtue of these faculties, such as geniality or reason, human beings were enabled to break the course of history. That was why the human mind would always remain unfathomable to scientific investigation. Furthermore, these faculties endowed the subject with the possibility to mould his own nature, giving latitude for self-improvement. Even the thrust towards self-improvement had, in Jevons's mind, a divine origin, since humans felt an inner call inviting them to nurture higher sentiments and do good deeds. As I have argued in the second chapter, these divine attributes created the necessary conditions to choose between good and evil, to follow the right path – the path that *ought* to be taken. Were humans deprived of these faculties, they would be machines, and for Jevons this was not the case.

Not only were human beings shaped by endogenous forces, but also by exogenous factors. I have already shown that Spencer had a considerable influence on Jevons's thought. Indeed Jevons gave Spencer the credit for discarding the depiction of human mind as a *tabula rasa*. Individuals were shaped by their environment, just like the 'lower animals'. Moreover, these modifications in the body and mind of human beings weren't limited to the individual. They were passed down, generation by generation, informing thus the character of individuals in accordance with their social group.

Jevons expressed his view of human nature through many writings, private and unpublished as well as in his published works. Here I focus on the economic agent as described in *The Theory of Political Economy*, addressing three relevant topics: the individual's mind depicted as a balance of feelings; the idea that human feelings were hierarchically ordered; and the axioms of the human mind which constituted the foundation of Jevons's economic theory.

The balance of feelings

I have already taken into account the first topic, the individual's power of measuring his feelings, in the first section of this chapter. However, this description needs to be completed and connected with Jevons's picture of the economic agent. As I have noted, for Jevons the subject was endowed with the capacity to inspect his own mind: he was transparent to himself. This capacity turned out to be very important for Jevons's economic theory. As we know, his political economy was founded on the individual's calculus of pleasure and pain, in accordance with the utilitarian moral theory. Moreover, Jevons was positive that the individual's mind was closed to scrutiny of others. Jevons excluded the possibility of inspecting the depths of human thought: "far be it from me to say", he clarified, "that we ever shall have the means of measuring directly the feelings of the human heart" (Jevons, 1871, 13).

However, fortunately for them, economists weren't constrained to follow the thread of the individual's reasoning. Though private, this calculus had visible effects. The feelings perceived by the subject may be invisible, but "it is the amount of these feelings which is continually prompting us to buying and selling, borrowing and lending, labouring and resting, producing and consuming" (Jevons, 1871, 13). Furthermore, not only were these effects manifest, but they were also quantifiable. It was not on the basis of the feelings themselves, but of their quantitative effects that an observation and measurement of these feelings could be accomplished (see Jevons, 1871, 14). According to Jevons, just as we can observe the effects of gravity on the motion of a pendulum, so we can find visible signs expressing the unfathomable feelings of the mind: "the will is our

pendulum, and its oscillations are minutely registered in all the price lists of the markets" (Jevons, 1871, 14).

I have already highlighted the relevance of introspection for Jevons's economic theory. Let us now add a few remarks, to better appreciate its pivotal role. In Jevons's eyes, the feelings of the mind were manifested by the individual's behaviour in the market. Thus, the price at which one is willing to purchase a product indicated the pleasure that is expected to be drawn from this act of exchange. In this situation, the decision on how to act would be based on one's own pleasure and pain. Therefore, the pivotal role of introspection is easy to see. Were humans incapable of correctly observing their own feelings, the prices standing for them could not amount to their reliable expression. This is why Jevons couldn't but hold that "the mind of an individual is the balance which makes its own comparison and is the final judge of quantities feelings" (Jevons, 1871, 19).

The hierarchy of feelings

I now focus on the second feature of Jevons's economic agent, analysing what he called the hierarchy of feelings. In accordance with utilitarian philosophy, Jevons considered humans as governed by two supreme masters, *i.e.* pleasure and pain. And yet not all pleasures and pains were the same[20]. "Motives and feelings", wrote Jevons, "are certainly of the same kind to the extent

[20] This issue is related to Jevons's criticism of Mill's argument concerning the qualitative character of pleasures. In contrast with Mill, Jevons held that pleasures could only be distinguished quantitatively, in accordance with Bentham's account. NathHowever, in his paper *Utilitarianism*, Jevons also stated that he wasn't denying the moral superiority of certain pleasures over others (Jevons, 1890, 285), in a quite contradictory manner with respect to his own observations. In Jevons's treatment of the hierarchy of feelings, it is this last statement – that certain pleasures are endowed of moral superiority – which prevailed. On this topic, see Jevons, 1890, 274-285. For a discussion of the same topic, see: Peart, 1996, 131-134; M. White, 1994b, 431-432; Sigot, 2002, 270-275.

that we are able to weigh them against each other; but they are, nevertheless, almost incomparable in power and authority" (Jevons, 1871, 31-32). Therefore, according to Jevons, the motives were hierarchically ordered. As Jevons admitted,

> the feelings of which a man is capable are of various grades. He is always subject to mere physical pleasure or pain, necessarily arising from his bodily wants and susceptibilities. He is capable also of mental and moral feelings of several degrees of elevation (Jevons, 1871, 29).

At the lowest stage, we can find the self-oriented motives, like the impulse towards self-preservation and the satisfaction of his own desires. One step above, we find the inclination to take care of one's family, even at the price of renouncing one's own good. At a still higher level, Jevons put the duty to secure the safety of the nation.

We can thus appreciate the ambiguity of Jevons's view in describing the so-called hierarchy of feelings. On the one hand, Jevons suggested that these motives were natural inclinations of the individual: they were *feelings*, namely an amount of pleasure or pain perceived, causing the individual to act accordingly. On the other hand, Jevons spoke of these feelings in terms of *duty*. In Jevons's words, "it is a man's duty, as it is his natural inclination, to earn sufficient food and whatever else may best satisfy his proper and moderate desires" (Jevons, 1871, 30). Likewise, it is one's duty to renounce the satisfaction of one's desires whenever a higher motive intervenes, such as when they are faced with the needs of one's family or nation.

The ambiguity was profound indeed, since Jevons spoke of the higher motives too in terms of feelings (see Jevons, 1871, 31). According to him, acting in view of the nation's good gave the individual a higher pleasure than minding his own good exclusively. However, Jevons's language suggested that choosing between these pleasures wasn't only a matter of deciding which feeling was the strongest. "If the claims of a family or of friends fall upon him", as Jevons explained, "it may become desirable that he [the subject] *should* deny his own desires and even his physical needs their customary gratification" (Jevons,

1871, 30, emphasis added). The subject had to do what ought to be done, following the rules of morality.

Therefore, we can conclude that perceived feelings did not overwhelm the individual. Jevons envisaged the possibility that one could deny the prompting towards pleasure in order to answer the call of a higher duty. This ambiguity in presenting the hierarchy of feelings calls to mind a topic which I have examined at various times, namely the tension between 'is' and 'ought', description and prescription. As I have argued in the second chapter, there was much latitude for prescription in Jevons's thought. Humans could overcome their egoistic feelings and pursue a higher good. They were not controlled by a tyrannical nature. Instead, they were ready to do what they *ought*.

After analysing these passages of the *Theory*, a question may arise: what did the hierarchy of feelings have to do with economics? Jevons answered this question, explaining why he presented this subject matter in his main work on political economy:

> My present purpose is accomplished in pointing out this hierarchy of feeling, and assigning a proper place to the pleasures and pains with which Economy deals. It is the lowest rank of feelings which we here treat. The calculus of Utility aims at supplying the ordinary wants of man at the least cost of labour. Each labourer, in the absence of other motives, is supposed to devote his energy to the accumulation of wealth. A higher calculus of moral right and wrong would be needed to show how he may best employ that wealth for the good of others as well as himself. But when that higher calculus gives no prohibition, we need the lower calculus to gain us the utmost good in matters of moral indifference (Jevons, 1871, 32).

Thus, Jevons defined the scope of political economy. He confined it to the lowest stage of feelings: the economic calculus only takes into account the self-oriented pleasures and wants. However, these motives were far from being immoral. By following the desire for acquiring wealth and supplying their wants, one was accomplishing the duty towards themselves, as pointed out above. The lowest rank of feelings was not synonymous with immorality, but, if anything, with *amorality*. It was perfectly acceptable behaviour so long as the demand for a higher calculus of moral right and wrong did not arise.

The axioms of the human mind

These considerations concerning self-interest are deeply connected with another characteristic of Jevons's economic agent. Jevons established three axioms on which economic analysis was founded. Jevons thought, in accordance with his logic, that political economy had to proceed deductively (see Jevons, 1871, 23)[21]. Political economy had to be founded on basic assumptions. These assumptions had an anthropological character, since they identified fundamental features of the human mind: "a few of the simplest principles or axioms concerning the nature of the human mind must be taken as its first starting-point" (Jevons, 1871, 24).

Even though Jevons did not claim that the three axioms he mentioned were the only ones that could be found, he numbered only three: "every person will choose the greater apparent good; […] human wants are more or less quickly satiated; […] prolonged labour becomes more and more painful" (Jevons, 1871, 24). According to Jevons, these axioms were the foundation of his economic theory, which, as we know, he described as "a mechanics of self-interest" (Jevons, 1871, 24). Starting from these axioms, it is possible to develop a complete deductive mathematical theory and to deduce the economic laws of supply and demand, the concept of value, and the laws regulating labour and production (see Jevons, 1871, 24). Jevons suggested that, in absence of a prior knowledge of the key features of the human mind, no political economy is possible.

Jevons's economic agent presented the following characteristics: he was transparent to himself and consequently able to weigh his own feelings; he knew when he ought to apply a self-interested calculus and when he ought to count on higher moral principles instead; he was pushed, by his own nature to acquire the greatest possible good for himself. These features are obviously re-

[21] Concerning Jevons's deductive method in the context of his economic theory, see: Mays, 1962, 233-236; Schabas, 1990, chap. 5 especially.

lated to Jevons's image of human nature. My purpose here is to look at this picture from the point of view of the tension between 'is' and 'ought'.

A perfectly wise economic agent

As I have argued, Jevons's economic agent was transparent to himself. We know that this faculty didn't pertain to the economic subject exclusively. Instead, in Jevons's eyes, it was typical of the human mind in general, by virtue of the self-evidence of the laws of thought. As I have argued in the first chapter, humans had an immediate grasp on their own mind. They had a comprehension of how their reasoning proceeded. This understanding gave them a fortress of certainty in a world where their knowledge was only probable[22]. Thus it is not surprising that in Jevons's eyes our weighing of feelings, in the economic context, was provided with the same self-evidence.

However, together with its self-evidence, the process of weighing the feelings inherited the paradoxes of Jevons's logic too. As stated above, these paradoxes were related to the tension between description and prescription. How did Jevons conceive the capacity of weighing one's feelings? Was it a description of the mind's actual functioning or rather a prescriptive ideal? Indeed, while depicting the process of weighing the feelings within the individual's mind, Jevons didn't seem to raise any doubt concerning the reality of this process. He wrote that "the mind of an individual *is* the balance which makes its own comparisons and *is* the final judge of quantities of feelings" (Jevons, 1871, 19, emphasis added). The use of the indicative verbal mood suggests that this was no advice on how to behave properly, but rather a description of a *real* mental faculty.

The matter was more complicated, though. Several passages of the *Theory* show that Jevons questioned the consumer's choices or doubted their sound-

[22] In this regard, see the first chapter, section 1.2., 1.3. and 1.4.

ness[23]. To a certain extent, the individual will always be erratic. This was why Jevons stated that, although the economic laws were the same both at the individual and national level, in practice we can only observe them at the level of the aggregates of individuals (see Jevons, 1871, 21-22). "It is quite impossible", as Jevons argued,

> to detect the operation of general laws of this kind in the actions of one or a few individuals. The motives and conditions are so numerous and complicated, that the resulting actions have the appearance of caprice, and are beyond the analysis and prediction of science (Jevons, 1871, 22).

The individual is the ground where several desires, impulses, and motives meet. The mental act of weighing the feelings could be compromised by an intervening cause. This would result in a distortion of consumer decisions:

> With every increase in the price of such a commodity as sugar, we ought, theoretically speaking, to find every person reducing his consumption by a small amount, and according to some regular law. In reality, many persons would make no change at all; a few, probably, would go to the extent of dispensing with the use of sugar altogether while its cost was excessive (Jevons, 1871, 22).

The economic agent was supposed to maximize utility by means of a clear and sound balancing of the pleasures involved in the choice. And yet, as we can see from this quotation, Jevons allowed that the consumer judgements might contradict the laws of economy and thus fail to maximize utility. Hence, the laws of economy could only be true on the aggregate, where the deviation from the law balanced out (see Jevons, 1871, 22-23). In *The State in Relation to Labour*, Jevons held that people could reason well or ill, but they usually reasoned ill (see Jevons, [1882] 1910, 19). The economic agent was no less prone to reasoning errors.

[23] This point has already been discussed by some scholars. See: Peart, 1996, 207-210; M. White, 1994b, 439-441.

The balance of feelings was liable to the influence of intervening causes which might prevent the individual from properly weighing their own feelings. Furthermore, in Jevons's opinion, in some circumstances the mind was led to systematic errors. This is the case with intertemporal decision-making, when the use of a commodity had to be distributed over a given lapse of time. According to Jevons's example, the commodity might be perishable, so that the subject also needed to estimate the probability of it going wasted. In principle, the agent should be able to calculate this probability and act accordingly. In Jevons's theory, the higher the probability of the commodity expiring, the less should we postpone its use.

This should be the most rational distribution, but the subject may be unable to reason correctly. A present and a remote event produced very different impressions on the mind. Considering a remote event affected the calculus negatively (see Jevons, 1871, 74-75). Thus Jevons clearly acknowledged that he wasn't describing the actual behaviour of the agent, but rather the best way to make a decision concerning a remote event:

> The distribution of commodity described is that which should be made and would be made by a being of perfect good sense and foresight. To secure a maximum of benefit in life, all future events, all future pleasures or pains, should act upon us with the same force as if they were present, allowance being made for their uncertainty. […] But no human mind is constituted in this perfect way: a future feeling is always less influential than a present one (Jevons, 1871, 76).

As remarked above, Jevons mistrusted in particular the labouring classes' capacity of making wise decisions for the future. He believed that they lacked thrift and providence, which they could learn by taking the middle classes as an example[24].

The picture has certainly become more complex. At first, Jevons suggested that the individual was capable of weighing their feelings correctly. In contrast with this idea, he then observed that their calculations were not always correct.

[24] In this regard, see the second chapter, "The commitment to social reform" and "Social reform as moral reform".

He didn't hesitate to make some suggestions as to how these calculations should be done too, counterposing the figure of a perfectly wise economic agent to the unwise and improvident one. Consequently, when presenting the individual's mind as a balance of feelings, Jevons passed from the territory of description to the one of prescription. What at first seemed a description of the actual functioning of the human mind was in fact an indication of how the economic agent ought to behave[25].

The laws of economy as natural laws

Let us now focus on the axioms of the human mind that Jevons enumerated. As we have seen, the depiction of the individual as self-interested and maximising his own good characterised Jevons's economic theory as well as his conception of the human nature. Consistent with his theory of morals, for Jevons those axioms expressed some of the key features of the human being, and he put them at the foundations of the economic theory. Hence, if we asked whether these axioms were connected to the domain of 'is' or the domain of 'ought', the answer would come quite naturally: Jevons believed that the axioms described how humans actually are. Indeed, for him these axioms were known by the means of induction, extrapolating the general rule from observation. In the *Theory*, Jevons wrote: "in the science of Economy we treat men not as they ought to be, but as they are" (Jevons, 1871, 45-46). Here Jevons wanted to prevent moral judgements being applied to the concept of utility: the theory of economics was interested in tracing the laws of utility aside from the moral acceptability of desires.

The above mentioned passage suggested that the economic theory wasn't concerned with defining a correct code of behaviour. It aimed at inferring the laws of economy, starting from the axioms of the human mind. Such axioms applied to human beings in general. Moreover, the laws based on them would

[25] In regard to this issue, see Peart, 1996, 209-210 in particular, where the topic is put in connection with Jevons's writings on policy.

also be highly general. Jevons underlined this character in *The Future of Political Economy* (1876):

> The laws of political economy treat of the relations between human wants and the available natural objects and human labour by which they may be satisfied. These laws are so simple in their foundation that they would apply, more or less completely, to all human beings of whom we have any knowledge (Jevons, 1905, 196).

In Jevons's eyes these laws were universally true, concerning every society at every time.

The conclusion followed naturally: that the laws of economy took root in human nature itself. In Jevons's own words, "the first principles of political economy are so widely true and applicable that they may be considered universally true as regards human nature" (Jevons, 1905, 197). Their functioning may be subjected to the influence of intervening causes, or causes external to economic reasoning. Yet, the laws were always the same: it was with these basic and universal laws that political economy was concerned. Economic theory "consists of those general laws which are so simple in nature, and so deeply grounded in the constitution of man and the outer world, that they remain the same throughout all those ages which are within our consideration" (Jevons, 1905, 198).

The laws of economy were grounded in human nature. Consequently, in order to investigate the relation between prescription and description in Jevons's economic theory, an examination of his conception of economic law is needed. As I have stated in the first chapter, Jevons believed that the laws of nature were necessary and flawless[26]. Could the same be argued for the laws of political economy? Were they *laws of nature*, as perfect and binding as the laws governing matter? Jevons's statements leave little doubt in this regard. In his works on economics, he often made clear that he considered the laws of economy to be natural laws. In *The Coal Question*, for instance, Jevons wrote a chapter entitled *On the Natural Law of Social Growth*, in which he analysed

[26] See the first chapter, section 1.4.

the growth of population. Basing his views on Malthus's theory of population, Jevons held that the population tended to increase in a uniform geometrical ratio, stating that "the law is as true and necessary as a mathematical law" (Jevons, [1865] 1906, 193). He wrote *The Coal Question* in 1865, when he still was a young man striving to find his place in the domain of political economy. He held to the conviction that the laws of economy were natural laws throughout his career as a professor of political economy. Indeed, similar remarks could also be found in the *Theory of Political Economy*. Here Jevons wrote that, to attain an exact conception of value, we had "to trace out carefully the *natural laws* of the variation of utility" (Jevons, 1871, 2)[27].

Jevons developed this topic at length in a lecture given at Owens College in 1866. As I have already remarked in the second chapter, it was the opening session of the Cobden lectures – a course of lectures instituted with the aim of spreading the knowledge of political economy through the labouring classes (see Jevons, 1972-1981, Vol. I, 207-208; Vol II, 132-138)[28]. Jevons started with a reminder of the importance of knowing oneself. Moreover, a lack of understanding of the natural laws on which we depend would cause great evil:

> A mistake as to our own nature and powers leads pretty surely to failure and ruin. It is indispensable that in every thing we do we should obey the natural laws under which we are placed, and we cannot be sure we obey them unless we know them (Jevons, 1972-1981, Vol. VII, 39).

Jevons used this argument to touch on quite a delicate point, namely the trade unions' struggle for a rise in wages. In Jevons's opinion, trade unions were not *per se* to blame. On the contrary, any form of cooperation and association had to be encouraged. What Jevons reproached them for was the attempt to increase wages, which went against the laws of economics regulating wages.

Trade unions committed a crime against nature, as Jevons stated quite clearly:

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[27] For a similar statement, see also Jevons, 1871, 13.

[28] I have addressed this topic in the second chapter, in the section "The improvement of character".

> When they pass from these matters in which an employer should consult the welfare of his men collectively, to regulate or raise the rate of wages, to enforce equality of work and wages, they bring their own and others' welfare into peril; and what I want you especially to see is, that, with the increasing intelligence and habit of co-operation among labourers, there is the more urgent need of a knowledge of economy, that they may restrain their power within natural laws – that they may, in short, know themselves (Jevons, 1972-1981, 49).

Trade unions' intervention was valuable, unless they intended to regulate wages. For Jevons, this effort was useless and – more importantly – harmful to workers as well as to employers. The trade unions' attempts would only create social conflict, blocking production and progress[29]. They couldn't succeed in raising wages, because wages were governed by a greater power: nature itself. This was just a meaningless rebellion against the laws of nature, resulting from a misapprehension of the nature of humans – of what they can do and cannot do. In Jevons's eyes, no violation of the laws of economy was ultimately possible. We could try to oppose them, but it was pointless to do so, and it would only inflict pain on ourselves and others. As Jevons concluded,

> advancing intelligence and freedom may but lead our operatives into loss and disaster unless they are furnished with appropriate knowledge of natural laws which they cannot escape from, and must ultimately obey. Men think that by the repealing of human laws they become free to act as they like. They must learn that there are natural laws even of human nature which they cannot break, but against which they can easily, through ignorance, throw themselves to their own destruction (Jevons, 1972-1981, Vol. VII, 50-51).

Jevons's account of the economic laws as laws of nature seems to suggest that, in such context, prescription had no legitimate place. Jevons state that one must obey the laws of nature. However, by prescribing to follow the laws, he didn't imply that these laws could be broken. Knowing and obeying them was profitable, for opposing them was futile, and as pointless as it was harmful.

[29] For Jevons's argument concerning the futility of strikes, see Jevons, 1972-1981, Vol. VII, 49-50; (1882) 1910, 96-101.

These laws being necessary, human beings couldn't but follow them. Hence, wasn't it better to adjust one's behaviour to them from the beginning?

Opposing the laws or not

As we have seen, Jevons was utterly persuaded that the laws of economy were natural laws, as inescapable as the laws regulating matter. However, another difficulty arises from this account, laying further emphasis on the opposition between 'is' and 'ought'. The laws of economy, *qua* laws of nature, are a set of rules to which humans were subject. Moreover, these laws took root in the natural constitution of human beings: obeying them was the same as obeying one's own nature. However, as I have argued in the second chapter, Jevons still preserved the difference between matter and spirit: humans were no mere automatons, but *dual creatures* – creatures of both matter and spirit. Given the duality of their nature, what kind of relation did human beings have with the laws of economy? As we shall see, this question casts further light on the dichotomy between 'is' and 'ought'.

Jevons was positive that humans couldn't escape the natural laws of economics. Every attempt to break them was fated to failure. However, when he urged us to follow these natural laws, Jevons accounted for the particular position that humans had vis-à-vis these laws: human beings could oppose them *or not*. Opposing them would be pointless, since the natural laws always prevailed in the end. However, human behaviour produced an effect on the economic mechanism, if only in that human actions could disturb the laws' functioning, hindering the progress of society and causing much pain. This is where prescription enters the domain of economic theory, in the form of a warning against the dangers of opposing the natural laws of economy. Indeed Jevons, in his lecture at Owens College, was eager to persuade his audience that the laws of nature *ought to* be followed. Hence, humans had the possibility of opposing them.

Jevons also stressed the importance of favouring the course of the economic laws in other texts. For instance, when analysing fluctuations in the money

market, he suggested that crises could be avoided by studying the functioning of the market. In such a way, "we should learn to discriminate what is usual and normal in the changes of the Bank accounts, from what is irregular and abnormal" (Jevons, 1884, 181). The language that Jevons used puts us into the dimension of prescription. He stated that we *should* comprehend the conditions of the money market in order to prevent the crises. Whenever the balance of market was shaken by the intervention of some external causes, such as excessive investments or unexpected changes of supply and demand, we ought to comply with the natural order more than ever. In Jevons's own words, "in such matters of high uncertainty it is desirable to trust as little to discretion and to commit as much to the operation of the natural laws as possible" (Jevons, 1884, 181).

As Jevons concluded, "under the present system the English currency is governed by the natural laws of supply and demand of a metallic currency, and not by merely artificial regulations" (Jevons, 1884, 181). The individuals' vagaries negatively affected the natural mechanisms of the market, engendering abnormal and critical conditions. So did attempts of imposing an artificial regulation on the money market, since artificial regulations opposed the natural laws of the market. That was why individuals ought to know the natural laws of currency. Only in this way could crises be avoided.

This passage clearly shows that, in Jevons's mind, humans could oppose their own artificial rules to the natural laws of economy. They were no machines, and consequently they were able to go against their nature and the nature of the market. Due to this possibility, knowing the laws of economy and choosing to comply with them was all the more essential.

It is worth noticing that, on the one hand, the duality of human nature was a liability, but, on the other, it was an asset. Humans could disturb the natural equilibrium or favour it. In his paper *Married Women in Factories*, Jevons stated that human beings might make good use of their understanding of the natural laws by aiding its course. Here he explained that we could limit the negative effects of industrialisation on society by administering the conditions of work in factories. Industrialisation was indeed a result of evolution, a sign of pro-

gress. However, once we understood the laws of this process, we could take some decisions to mitigate its destructive social effects, provided that our action didn't hinder the course of nature. As we read in *Married Women in Factories*,

> [the Factory Laws] were absolutely necessary to guard the population against the dangers of a novel state of things, as to which evolution had not had time to work out its spontaneous cure. No doubt, in the course of generations, the manufacturing population would become fitted to its environment, but only through suffering and death illimitable. We can help evolution by the aid of its own highest and latest product – science (Jevons, 1883, 177).

The economic laws could be fostered in many ways, for instance by implementing them whenever they were neglected. This was the case with the opposition between employers and workers. In such a situation, the terms of the conflict were not economic, but rather political. The labourers were ready to discard their own economic advantage to fight against social injustice. The laws of economics did not apply in that scenario: as Jevons wrote, "pecuniary losses are of little account to those who are prepared to endure starvation rather than submit to what they esteem be 'injustice'" (Jevons, [1882] 1910, 159). "It is obvious, then", continued Jevons, "that a trade dispute, especially when it has reached the acute phase of a strike, has little or nothing to do with economics" (Jevons, [1882] 1910, 159).

For his part, Jevons advocated that in similar circumstances a mediator – or, as he wrote, 'conciliator' – ought to intervene, being an impartial figure who could resolve an otherwise unresolvable conflict. What this mediator did was make the voice of economics heard when it went unheeded:

> In many cases the work of such conciliators will consist in little more than inquiring into the real facts of the case, and impartially and authoritatively making them known to both parties. If either party than confesses to misapprehension, it is clear that the conciliator *imports rather than ousts political economy*. He acts the part of an economic and statistical inquirer (Jevons, [1882] 1910, 159-160, emphasis added).

Hence, their comprehension of the natural laws of economics allowed mediators to speak in their name, and to apply them whenever they were needed.

The hierarchy of feelings and the 'ought'

Humans could cause their own ruin as well as their own salvation. They were subject to the natural laws, and among them to the laws of economy, but were nonetheless able to acknowledge their subjection. Hence, they could make profitable use of the situation in which they found themselves. Upon closer inspection, the peculiar position of the human being within nature turns out to be founded on a *religious* argument. I have already argued that, in Jevons's epistemology, God guaranteed nature's stability and our own faculty to investigate nature. The understanding of economic laws, on which economic theory itself was based, was no exception: as any other branch of knowledge, it demanded a divine guarantor.

Jevons explicitly highlighted these religious foundations in his lecture at Owens College:

> We have been endowed at our creation with powers of observation and reasoning which seem capable of penetrating by degrees all the secrets of nature. When we are suffering under or are threatened with any evil we should not content ourselves with hoping or praying for its removal only, but we should set in action all our faculties, and by first acquiring and then diffusing all the knowledge we can gain of its nature and causes, we should place in the hands of men the means of averting it. It is not our own power we use, it is the Divine power of knowledge (Jevons, 1972-1981, Vol. VII, 40).

In the second chapter I argued that some human faculties exceeded the natural order. This capacity of exceeding the boundaries of nature did not enable humans to break the natural laws, but it did enable them to understand them and act in accordance with such understanding.

By virtue of this divine power – knowledge – human beings could acquire a satisfactory comprehension of the natural laws of economics. A knowledge of these laws and of their own nature was also essential to discriminate the situa-

tions where these laws should be applied and those were they should not. As shown above, Jevons clearly defined the boundaries of political economy when he described the hierarchy of feelings. I have already pointed out that his illustration of the latter entailed an ambiguity between 'is' and 'ought': the subject had to know their own feelings and decide whether the situation demanded the use of a higher calculus or not.

What I would like to highlight now is that the pivotal element of the hierarchy of feelings is not the 'is', but the 'ought'. Human beings were certainly subjected to an array of impulses. They were a part of nature themselves and thus they inhabited the realm of 'is': their feelings were what they were, and as such they had to take them into account. However, the Creator gifted humans with intellect. The gift of reason enabled them to recognize the superiority of certain motives over others. As they could choose whether to comply with the laws of nature or not, they could also choose a higher duty over a lower one: they could choose to do what *ought* to be done. Hence the pivotal function of the 'ought' in the hierarchy of feelings: being able to deny the lower feelings their proper satisfaction and follow the demands of the 'ought', human beings could move up and down the hierarchy of feelings.

The interaction between 'is' and 'ought' in the hierarchy of feelings also casts new light on the relationship between political economy and morality in Jevons' thought. As we have seen, by classifying feelings by rank, Jevons strove to find a proper place for morality and political economy at once, preventing them from meddling with one another (see Sigot, 2002, 273-275). It would be inexact, though, to conclude that morality was entirely expelled by the domain of economics. Rather, morality had the privilege of standing at the borders of economic calculus. Morality was endowed with an enormous power: the power of determining whether a matter entered the scope of economics or demanded a higher calculus. We decide whether a subject matter had to be investigated from an economic point of view based on the kind of motives involved. The desire for wealth, the inclination to seek pleasure, or one's own good – these are all feelings belonging to the lower rank. According to Jevons, whenever the individual acted with only these feelings in mind, his decisions

could be properly treated in the context of political economy. However, if a higher calculus – a moral calculus – was needed, the subject ought to relinquish his own satisfaction to follow moral duty.

An economic theory caught between 'is' and 'ought'

As Jevons held, human beings had to know their nature in order to know what their options were. They could follow their nature or not, could oppose the natural laws or not, could reason well or not. The options were available because of the duality of human nature. Humans were creatures of matter and spirit, that is, of both 'is' and 'ought'. Hence, they should not ignore their constitution and the forces binding them. However, after acquiring a knowledge of their own nature and of natural laws, they had the privilege – and the responsibility – of *choosing*.

Therefore, there was still a place for free will in Jevons's thought, given that in the absence of the latter any prescription would be absurd. We cannot order a stone not to fall when we drop it, but we can instruct humans to know themselves and to choose properly. They had to choose which allocation of utility was the best for their future, which criteria to apply in each situation, or what was the most appropriate behaviour when dealing with natural laws. The possibility of relinquishing the 'is' in favour of the 'ought' was a result of the place humans had in the order of creation: the only creatures endowed with reason, humans had both the burden and honour of choice. Thus, Jevons's religious beliefs entered the domain of economics by means of his conception of the human nature.

Jevons asserted that political economy was concerned with the individual as it was, and not as it ought to be. However, in the light of the previous considerations, we can conclude that this statement is only partly true. In the context of economic theory, Jevons treated the basic characteristics of the human mind, *i.e.* the axioms of his theory, as well as the representation of the laws of economy *qua* natural laws, as if they pertained to the sphere of the 'is'. From that point of view, they were what they were, and the only thing we could do

was to cope with them in the best possible way. Nonetheless, Jevons was far from excluding prescription from his economic theory. As a matter of fact, he didn't hesitate to picture the perfect rational agent: an agent capable of weighing his feelings and of applying his knowledge of economic laws in the proper way and situation. As Jevons himself admitted, such a perfectly rational agent wasn't real. Instead, he was the beacon towards correct behaviour, the guiding light of the 'ought'.

These considerations call into question the problem of value judgements in the context of economic theory. The question whether Jevons's economic theory was value-laden or not have already given rise to considerable attention among scholars. This issue has been expressed in terms of the relationship between Jevons's economic theory and his economic policy. Robert Collison Black has argued that in the *Theory* Jevons developed a system of positive economy, from which policy recommendations were excluded. As Black has asserted, "it was an exercise in what today would be called positive economics, concerned to analyze and not to prescribe, to bring light rather than bear fruit" (R. D. C. Black, 1970, 37-38)[30]. Michael White has challenged this view. According to him, the *Theory* could not be considered a work in positive economics, since it involved normative statements. Moreover, White has argued that the opposition between positive and normative economics is anachronistic when applied to Jevons's theory. What defined the domain of scientific economics, as Jevons conceived it, wasn't the absence of normative statements, but rather the nature of the feelings involved (see M. White, 1994b, 430-433).

However, in the present study my focus is not on the distinction between economic theory and policy measures. What I have referred to in terms of

[30] Pelin Sekerler Richiardi and Nathalie Sigot held a similar thesis, based on Jevons's distinction between pure economic theory (positive economics, in Black's terms) and practical economics (normative economics). Pure economic theory, or positive economics, was deprived of value judgements, while practical economics was concerned with social reform and consequently produced policy recommendations and normative statements (see Richiardi, Sigot 2013).

'ought' doesn't correspond with the normative statements of policy. The matter is quite different and could be expressed in the following terms: did Jevons's economic theory entail recommendations concerning how people ought to behave? Did Jevons provide, in his economic theory, a model of right behaviour, or was his theory a mere description of actual behaviour? As I have argued, Jevons did provide such a model, for example the model of a perfectly rational agent. He also warned people against the danger of opposing the laws of political economy, thus *prescribing* them not to do so. From this point of view, Jevons's economic theory was far from being devoid of normative statements: he was concerned with what people ought to do.

Hence, the 'ought' claimed a space which went beyond his works on policy, including the theoretical domain too. From the perspective of modern economic theory this would look like an inexcusable ambiguity, and a failure to distinguish positive and normative economics. However, if we want to understand Jevons's thought, rather than judge it uncharitably, we have to ask ourselves the following question: why did his thought display such an ambiguity? Why was he inclined to grant a place for both prescription and description within his economic theory?

My contention here is: Jevons wished for an economic theory which could at once explain reality and modify it. On the one hand, he wanted his economic theory to be scientific, being thus able to account for human behaviour as well as for the functioning of economic laws. On the other hand, providing a science of economics shouldn't imply imprisoning human beings into a deterministic structure. This was not acceptable for Jevons, whose concerns included moral and social reform. Therefore, his economic theory did not exclude normative statements. As I have argued in the second chapter, humans received from their Creator both the longing and the opportunity for self-improvement. The path towards the enhancement of moral and intellectual faculties was shown by the social sciences (see Jevons, 1883, 196). The economist, *qua* social scientist, had a *political* and *educative* role towards his fellow citizens.

The most perfect of all societies

It is thus not surprising that, in Jevons's eyes, the economist had to address especially those people who most needed such an education, *i.e.* the labouring class. It is no coincidence that Jevons insisted so much that the laws of nature must be obeyed at Owens College, in his opening address as Cobden lecturer. As I have already explained, these classes had been expressly instituted with the purpose of educating labourers. By focusing on the necessity of obeying the economic laws, Jevons was fulfilling his obligation to society, by educating those who in his eyes were its most improvident and unwise members. Like the Unitarian reformers in Manchester and Boston[31], Jevons believed that the middle-class was the most virtuous of all: the economist had to take this class as a model and persuade the recalcitrant classes that this model was the best one[32].

In pursuing this task, the economist had to take into account the nature of the people addressed. As I have already explained, Jevons considered that humans weren't only shaped by their endogenous impulses, but were also affected by the external environment. The features resulting from environmental influence were inherited through the generations, in accordance with the Lamarckian concept of use-inheritance.

As we know, Spencer interpreted the development of moral faculties in terms of Lamarckian use-inheritance, and Jevons endorsed Spencer's position. White has shown that in the *Theory of Political Economy* Jevons used the Victorian language of character and race while discussing the propensity to work of diverse individuals (M. White, 1994b, 437). According to Jevons,

> a man of lower race, a negro for instance, enjoys possession less, and loathes labour more; his exertions, therefore, soon stop. A poor savage would be content to gather the almost gratuitous fruits of nature, if they were sufficient to give sustenance (Jevons, 1871, 177-178).

[31] See the second chapter, the section "The commitment to social reform".

[32] Concerning the role of middle-class as a model of behaviour, see Mosselmans, 2007.

Considering that the economic laws could be meaningfully applied only to aggregates, and not to the real individual, Jevons needed a way to make these laws significant for individuals as well. As White has argued, the language of character was the bridge that enabled Jevons to apply his economic theory to actual individuals (M. White, 1994b, 440)[33]. In Jevons's mind, the economist could not ignore the constitution of the different social groups if he wanted his prescriptions to be effective.

While recognising that the earth hosted human beings of a variety of kinds, Jevons nonetheless asserted the superiority of some over others. As we have seen by analysing Spencer's thought, evolution was teleologically oriented towards higher and higher forms of civilisation. Likewise, Jevons believed that the course of evolution had produced a gap between different social groups. As Jevons stated in "A Deduction from Darwin's Theory", the highest forms of civilisation were those dwelling in temperate climates, such as the Europeans (see Jevons, 1869, 231). "It is no doubt true", asserted Jevons, "that man displays his utmost vigour and perfection, both in body and in mind, in the regions intermediate between extreme heat and extreme cold" (Jevons, 1869, 231). These civilisations exceeded the others in their physical and intellectual faculties. There were different characters even within the highest forms of civilisation. Jevons often reproached the Irish people for their intemperance[34]. As argued above, he addressed a similar reproach to labourers. The English middle class was for Jevons the symbol of the success of evolution, the highest level of civilisation ever attained.

In the second chapter, I have argued that Spencer fell into a prescriptive fallacy – the fallacy of deducing the 'is' from the 'ought'. Spencer believed

[33] Bert Mosselmans has agreed with White, showing also the influence of Adolphe Quetelet's concept of '*homme moyen*' in Jevons (see Mosselmans, 2007, chap. 3 and 35 in particular).

[34] With respect to this subject matter, see M. White, 1993. White's paper has aroused Terence Hutchison's criticism, triggering a discussion which continued over several papers. In this regard, see: Hutchison, 1994a,; M. White, 1994c; Hutchison, 1994b.

that what people ought to do would become, thanks to evolution, their spontaneous behaviour. In turn, Jevons endorsed Spencer's position while discussing the development of our moral faculties. Jevons fell thus into the same fallacy as Spencer.

It is worth noticing that this fallacy can be found in Jevons's economic theory too. He fell into the prescriptive fallacy while elucidating the basic laws of political economy. As we know, Jevons took the laws of property as an example of these primary laws of human nature and economics:

> The laws of property are very different in different countries and states of society. They seem to be in a very rudimentary state among the Eskimo. […] If one Eskimo man has two boats and another has none, the latter has a right to borrow one of the two boats; and it is further said that it is not the custom among the Eskimo to return borrowed articles. Now this is, of course, a very different state of things from what obtains among us. Nevertheless we can trace in this transaction of the borrowed boat the simple principles which are at the basis of economy (Jevons, 1905, 196).

Thus Jevons suggested that the same laws which characterised the economics of his society could also be observed in allegedly less developed societies. These laws may take an incomplete form in such populations. Nevertheless, this inchoate stage was just the starting point of a process which would result in the same economic laws of Jevons's society. "One boat", continued Jevons,

> is very useful, if not essential, to an Eskimo; a second boat is much less useful to a man who has already one boat, but it is highly useful if passed into the hands of a boatless neighbour. The elements of value are present here as in the most complicated operations of our corn or stock exchanges economy (Jevons, 1905, 196-197).

Jevons was positive that those societies, which in his eyes were 'primitive', displayed in an elementary form the same laws he identified in his economic theory. However, we know that for Jevons evolution was hierarchical: the most perfect example of human society was his own society. This is where the prescriptive fallacy can be discovered. Jevons believed his society to be the most developed and its economic system the most complex and refined. Con-

sequently, he conceived human nature in general in accordance with the social structure which in his mind was the most desirable. Hence, Jevons urged everyone to follow what he considered to be the code of proper behaviour, taking such behaviour to be a description of the ultimate nature of humans in general. As Mazlish has observed, "men are being *told* how they should be in the guise of a mere description of how they are" (Mazlish, 1986, 141). Jevons, like Spencer before him, fell into the prescriptive fallacy, disguising the 'ought' as the 'is'.

According to Jevons, evolution would eventually attain its higher stage, which was embodied in English society, and, within it, by the middle class. Given these considerations, it is not surprising that Jevons suggested taking the middle class as a model of behaviour. He *prescribed* imitating the middle class, so that habits of temperance and providence could be developed within the other classes too. Moreover, Jevons argued that economic laws were grounded in human nature. Oppose the principles of political economy would be oppose one's own nature – which, in Jevons's eyes, was a futile opposition. Therefore, Jevons's prescription of imitating the middle classes couldn't go unheeded, since those economic laws, which the middle classes symbolised, were embedded in the very nature of human beings. The prescriptive fallacy granted thus that Jevons's urgings had a sound basis.

The dual nature of Jevons's theory

As I have argued in the second chapter, both Spencer and Jevons conceived the evolution of moral qualities as a natural process. Egoistic and self-interested behaviour would metamorphose into altruistic behaviour. The course of evolution would lead the population to develop a more refined character. However, notwithstanding Jevons's faith in the course of evolution, in his economic theory there still was latitude for prescription. Evolution will perhaps spontaneously produce higher forms of disposition, but in the meantime economists had to do whatever they could to aid its course. Similarly, even if in Jevons's mind the laws of political economy characterized human nature, he

nonetheless encouraged to obey them. The social scientist's task was to show how to follow the laws of political economy, so that the economic system could reach its perfect stage of development.

Jevons's economic theory thus had a dual nature too, just like the individual as he conceived him. On the one hand, this theory pertained to the 'is': a science able to explain human constitution. On the other hand, it pertained to the 'ought': it showed people how they should behave and improve themselves. As I have illustrated, at some points these two spheres overlap. The economic laws guiding human nature were shaped by what Jevons found profitable, for his society as well as humanity as a whole. Jevons conceived the economic agent's faculty of weighing his feelings as a normative statement and a description at once. These ambiguities rested on the dual nature of Jevons's theory indeed – a theory which claimed at once the right to describe reality and to shape it. The endeavour of describing reality as it is was concomitant with providing an image of what it ought to be. The spheres of description and prescriptions shows thus not only their opposition, but their connection as well: a comprehension of reality is essential to conceive how we could possibly ameliorate it. In this way, Jevons followed in the footsteps of Jeremy Bentham, who held that "*to mould men to any purpose, they must be known*" (Bentham, [1815] 1983, 57).

CONCLUSION

While I was reading Jevons's journal, I once found some passages in which quite a different atmosphere could be found, compared with the previous pages. The reason why this passage produces this kind of effect – a bewilderment mixed with curiosity, the impression of being in presence of something requiring a keener attention – is due to the journal's timeline. Indeed these two entries (Jevons, 1972-1981, Vol. I, 98-101)[1] had been written in 1862, but they deal with an earlier period, precisely eight years earlier. Here Jevons goes back to this moment of his life, and even farther in his memories, telling us of his childhood.

Through this autobiographical inquiry, Jevons reveals something related to his personality and his then hopes. He writes that, while still a child, his uncle gave him some bookbinding tools. "I am yet partial to bookbinding", he explains,

> & shall some time perhaps begin it again. I used to think I should like to be a bookbinder or book seller. It seemed to me a most delightful trade, & I wished or thought of nothing better. More lately I thought I should be a minister – It seemed so serious, & useful, a profession and I entered but little into the merits of religion, & the duties of a minister. Every one dissuaded me from the notion – & before I had arrived at any age to require a real decision science had claimed me (Jevons, 1972-1981, Vol. I, 99).

This is just a small extract from this fascinating entry. Yet, it has a striking power: in just a few lines, it gives the reader a glimpse of Jevons's character. We can imagine him observing the bindings of books, with the same intensity

[1] The problem of collocating the entry in the edition of Jevons's papers is treated by the editors on the same page.

that he will later give to his logical machines. We can also imagine him meditating on his future, considering what place all his different concerns and talents should have in his life. In the present work, my intention has been to pay justice to the personality that we can glimpse here. I have looked at Jevons not only as the great scientist and thinker that he was, but also as a man living in his time, leading a life full of different and perhaps contradictory concerns.

The first chapter focuses on Jevons's religious beliefs, in relation to his logic and epistemology. It starts with a historical investigation of the relationship between science and religion in the Victorian age. The progress of scientific knowledge seemed to imply a rejection of every religious faith. It is not surprising, thus, that Jevons was concerned with reconciling science and religion, trying to prove that they were not in opposition. The historical inquiry of the first chapter shows that Jevons's concern for reconciling science and religion – what I have called the 'bridge-making concern' – is typical of his times.

As I explain in the first chapter, Jevons believed that all branches of science were rooted in a common ground: logic. All sciences had to rely on logic to produce knowledge. An extreme specialisation of the separate branches of knowledge only resulted in a loss of consistency and insight. In Jevons's eyes, logic was indeed the foundation of all knowledge, since the laws of logic were the same as the laws of thought. Jevons thus embraced logical psychologism: he identified the laws of logic with mental faculties. Such an analysis of Jevons's logic investigates this topic from the point of view of the anthropological foundations of his thought: describing the laws of logic, Jevons gave an account of the conditions of possibility of human knowledge.

The investigation of Jevons's logical psychologism led me to consider the so-called 'is-ought question': the tension between the prescriptive and descriptive perspectives. In Jevons's view, logic expressed the natural functioning of the human mind. Hence, his purpose was to describe the laws of logic from a scientific, unbiased point of view. However, Jevons also thought that logic could correct the faults of ordinary reasoning, so taking on a prescriptive role. Therefore, his account of logic showed a remarkable ambiguity between his

scientific attitude and his commitment to establishing a code of proper reasoning.

As I have argued, Jevons's ambiguity concerning the character of logic rested on something profounder than negligence – and I believe that it shouldn't be treated as such. He wavered between a simple, natural logic – a logic which could be eligible for no prescription – and a logic capable of correcting the mistakes of ordinary reasoning. He seemed to wish that his logic could be both of these things, even if this meant contradicting himself. Why such an attachment to a self-contradictory account of logic? It is surely possible that Jevons did not acknowledge the contradictory character of his position. However, my contention is different: Jevons wanted his logic to be self-evident enough to serve as a proper foundation of human knowledge, while still being able to use it as a guide for ordinary reasoning. He also had good reason to think that logic is founded in the laws of thought. As we have seen, Jevons's idea was informed by George Boole, who argued so in his work, *The Laws of Logic*. Moreover, the natural and spontaneous character of logic, that is, its identity with mental faculties, ensured that human knowledge had a sound basis.

After considering the nature of Jevons's logic, I focus on his reflections on the scientific method. Here I argue that his account of probability and natural laws had a theological foundation. In Jevons's mind, the ontological gulf between the infinite Creator's mind and His human creation confined human knowledge to finiteness. Therefore, in Jevons's eyes human knowledge was never certain, but only probable. By showing the religious basis of Jevons's thought about probability, which had thus far been neglected, this study takes the literature in a new direction and pursues the investigation of the anthropological foundations of his thought.

As I have explained in the Introduction, Jevons's views on probability have been addressed in many contributions, but they haven't been related to his religious beliefs. Highlighting the religious character of his scientific reflections is of the utmost importance, since it helps depict an in-depth portrait of Jevons. Like many Victorians, Jevons was at once a godly man and a scientist.

Moreover, he strove to bring science and religion together. Hence, these different aspects of his life have to be seen as intertwined. It is such entanglement which I underlined in the first chapter.

In the last section of the first chapter I compare Jevons's logic with the tradition of the *ars combinatoria*, arguing that he could rightfully be numbered among the thinkers in this tradition. By means of this inquiry, several relevant features of Jevons's thought can be noted. First, it provides further proof of the importance of religion in his thought. In Jevons's eyes, natural phenomena were articulated in a series of combinations and permutations, in accordance with the natural laws – and these laws were nothing but the order that God gave to nature. Hence, Jevons's conception of the universe was informed by his faith in God as the supreme and benevolent contriver of nature. Second, the study of Jevons's logic in terms of the art of combinations underscored logic's ontological nature. For him, logic defined the rules with which not only our reasoning, but the world itself had to comply. Third, the comparison with the theorizers of the *ars combinatoria* helps outline Jevons's conception of the relationship between signs and things. In his opinion, signs were finite, just like human knowledge. As such, they could never exhaust the complexity of universe, which was infinite. Jevons's account of the nature of signs is useful in order to tackle the problem of the use of mathematics in political economy, as I show in the third chapter.

The second chapter focuses on Jevons's moral and political thought. I start by again considering Jevons's religious beliefs, but under a different perspective, *i.e.* with reference to Unitarianism. Here I present the main features of nineteen-century Unitarianism, with particular attention to the debate between the so-called 'new' and 'old school'. The purpose of this study is to outline the historical background of Jevons's religious confession. This historical inquiry accounts for the context in which Jevons lived and the positions which he confronted. In order to deliver this, a detailed outline of Unitarianism as it was articulated in the nineteenth century was essential.

This study helps understand two features of Jevons's work and life which were related to his Unitarian background: his commitment to social reform and

his ideas about free will. These two topics are also seen in terms of the main thesis of my analysis, *i.e.* as the anthropological views founding Jevons's reflections on social reform and his work at large. Jevons's engagement in social reform bears the traces of his education as a Unitarian, in addition to being connected to his acquaintances in the Unitarian circles in Manchester. Jevons's ideas concerning free will were also connected with his Unitarian background through the figure of James Martineau. Jevons's position displays a strong similarity to Martineau's. It is reasonable to think that his personal acquaintance with the Unitarian minister made Jevons inclined to meditate on the same topics as Martineau.

Moreover, Jevons's ideas concerning free will elicited further investigation of the 'is-ought question'. He believed that social reform had to be founded on the reform of individual moral habits. A subject deprived of free will would be prevented from pursuing such moral reform. However, several of his statements suggest that he had a deterministic conception of human behaviour. If humans were inescapably bound by their natural impulses, no prescription could be meaningfully addressed to them, and no moral reform would be practicable. Thus, Jevons had to guarantee that there still was space for free will – and thus for moral prescription – in his account of human nature. This space was provided by those human faculties with which God endowed human beings, especially by reason. By virtue of these faculties, humans could never utterly be at the mercy of their natural impulses.

I then focus on Jevons's political thought, paying particular attention to his conception of society and its relation to the individuals composing it. Such an inquiry of Jevons's political thought also requires focusing on his representation of human nature in relation to society, consistent with my attention for the anthropological foundations of his thought. Jevons considered individuals to be the driving force of social progress. Individuals, as he depicted them, were also primarily concerned with their own welfare, consistent with the utilitarian theory of morals. Thus, a question arises: how could a society of such self-interested individuals be a harmonious one? I tackle this question by comparing Jevons's position with two relevant utilitarian philosophers: Jeremy Ben-

tham and John Stuart Mill. This study provides insight of the tradition from which Jevons's thought came. It also reveals that he inherited a conundrum from this tradition: how to envision a society guaranteeing at once the common good and its members' welfare?

In the last section of the second chapter, I argue that Jevons found an answer to this problem in the philosophy of Herbert Spencer. Spencer had claimed that mental and moral faculties were the result of the process of human evolution. According to Spencer, humans would spontaneously develop altruistic feelings in the course of evolution. Jevons was a supporter of Spencer's position; indeed Jevons's endorsement of Spencer's theory of moral faculties contributed to Jevons's political thought. Jevons found here a solution to the conflict between individual desire and the need to secure the welfare of society. The final stage of evolution would cause a spontaneous metamorphosis of egoistic feelings into altruistic feelings. Both Spencer and Jevons considered that eventually the welfare of the individual and of the community would overlap. What in their own times was a prescribed behaviour – namely altruistic action – would become second nature to us.

Thus, the analysis of Spencer's thought and the comparison with Jevons brings once again the 'is-ought question' to attention: Jevons and Spencer believed that prescriptions (the injunctions of 'ought') will not be needed at the highest stage of development of humankind. At such level, what we ought to do was simply what men are naturally inclined to do. Here I argue that this reasoning implies a fallacy, which I called 'the prescriptive fallacy'. Spencer and Jevons drew their representation of the human nature at the highest stage of evolution from what in their times was the prescribed moral behaviour. They conceived of humans at the highest stage of evolution in accordance with the Victorian moral code, projecting their idea of the 'ought' on the (future) 'is'. However, assuming this perspective did not allow them to solve the problem of conflicting interests within society. They only argued that nature would spontaneously lead humans to the highest stage of evolution, that is, to spontaneously comply with the 'ought'. Both Spencer and Jevons were loath to impose some compulsory behaviour on individuals. Thus, they delegated this task to

nature, claiming that the evolution would, in the long run, spontaneously produce the sorts of altruistic behaviour they endorsed.

In the third chapter, I consider Jevons's economic theory. I argue that Jevons's economic theory has to be linked with the other spheres of his thought, and specifically to the anthropological foundations of his investigation, to be properly understood. His conception of society and of human nature informed his way of thinking of the economic agent. Hence, in the first part of the third chapter, I show how Jevons's theory of value, of labour, and his views on commercial crises were based on his moral individualism. His theory, as it has been noted, puts the individual in the centre of the picture. This emphasis on the economic agent's behaviour mirrored his individualistic account of society, so vindicating the importance of an approach addressing the problem of the anthropological foundations.

In the second section of the third chapter, I address the topic of the mathematics in Jevons's economic works. My contention is: Jevons's application of mathematics to economics has to be seen in the light of his representation of the finiteness of human knowledge. I argue that Jevons's translation of economic issues into mathematics could be compared to the use of a metaphoric language. This thesis is based on Jevons's view of human knowledge as finite, which prevented any system of language from exhausting the complexity of the natural objects. Due to the ambiguity of signs, in Jevons's account no sign could be literal. Since metaphorical language is a non-literal system of expression, the study of Jevons's mathematical economics in the light of the notion of metaphor turns out to be productive.

In the last section of the third chapter, I present Jevons's representation of the economic subject. The image of this subject was shaped by Jevons's account of human nature. According to his views, the economic agent was able to weigh pleasures and pains and to take proper decisions on the basis of these estimations. The economic agent was self-interested, concerned with maximising pleasure. Such an account, for which he was indebted to Bentham, lay at the foundation of Jevons's economic theory. Nonetheless, the economic agent was

capable of relinquishing their own good when the call of higher motive appeared.

Jevons's picture of the economic agent is investigated in the light of the 'is-ought question', consistent with the *fil rouge* of the present study. Jevons aimed at defining the laws regulating human economic behaviour, showing a descriptive tendency. However, through his economic theory, Jevons established rules of correct behaviour. He developed a value-laden and prescriptive account, which was at odds with his descriptive perspective. The economic agent, as Jevons depicted him, had a dual nature: he was bound by exact and inescapable laws, and he thus did not seem to be eligible for prescription; but he also he had the right to choose whether to oppose those laws or foster them. Thus, the economic agent was a creature of both 'is' and 'ought'. Moreover, Jevons's economic theory displays a dual nature too, being at once concerned with developing a scientific description of economic laws and the agent's behaviour, while it still identifies and prescribes a code of right behaviour.

As I have shown in the present work, Jevons was indeed a polymath. His work explored many subject matters, while displaying a continuity of thought throughout all these domains. Vis-à-vis such thought, what can we learn and which way of approaching it seems the most profitable? Jevons's interests were diverse, ranging from meteorology, chemistry and geology to religion, morality and social policy. We have seen that Jevons believed the over-specialization of the branches of knowledge to diminish the power of our understanding[2]. Consistent with this view, Jevons made very different domains interact in his work, even when such domains seemed impossible to reconcile.

The connections which Jevons instituted between such different spheres of thought could perhaps appear inconceivable in the eyes of the modern reader. We could be tempted to ignore them or to relegate some of his concerns – like the religious one – to the private sphere. We could be tempted to consider some of his concerns to be unscientific, and, as such, to set them aside. I do not assume *a priori* that any of Jevons's concern can be neglectable, even if from the

[2] See the section "The tyranny of specialism", in the first chapter.

perspective of our modern knowledge we may think that some topics should be neglected. Thanks to the study of Jevons's thought, we can thus learn not to reduce a different way of thinking to ours. In the present work, historical research and philosophical reflection is thus conceived as a means to *think differently*.

Historical research is meant to help us think differently from what we consider to be normal, obvious, taken for granted. This is why I have often chosen to underline the differences rather the similarities between our way of thinking and Jevons's – those features of his thought which are in our eyes old-fashioned and even obsolete. The inquiry into Jevons's thought has therefore another relevant effect: it displays how some concepts which are familiar to us originated from a completely different ground.

Indeed many examples could be given. For instance, we have seen how the theory of probability, which is nowadays of crucial importance for many branches of economy and scientific inquiry, was connected to theological and ontological views. What is for us now indisputably secular sprung from religious ideas. This is also the case with Jevons's picture of the economic agent, which has been so influential for the development of modern economic theory (see Morgan, 2012, chap. 4). Unscientific as this may seem, Jevons's representation of the economic subject resulted from many inputs which had nothing to do with pure economic theory, being rather connected to the anthropological foundations of his thought. It was informed by his belief in God as guarantor of nature's stability, by the moral code of Victorian age, by his moral individualism and account of society as centred on the individual.

What kind of attitude should we take in studying Jevons's thought, provided that we want to understand it and learn from it? As I have already remarked in the third chapter, I have no interest in judging Jevons, or accusing him of inconsistency and negligence. I would like to quote Spinoza's words to express what I believe to be a profitable attitude in analysing a thinker's work: "*humanas actiones non ridere, non lugere, neque detestari, sed intelligere*" (Spi-

noza, 2016, Vol. II, 505 [chap. I, § IV])[3]. Some features of Jevons's thought led undoubtedly to self-contradiction; this is the case with his treatment of topics involving the 'is-ought question'. However, we can hardly understand Jevons by marking him as an inconsistent or superficial thinker, passing thus a rushed judgement on him. To understand him, we could more profitably ask: why did Jevons think so? What led him to this inconsistency?

I answer this in relation to the 'is-ought question'. This topic is the very core of the present work, and one of the most problematic Jevons's thought. As I have shown, the tension between 'is' and 'ought' runs through all of Jevons's *oeuvre*. The reference to these two aspects came with many intricacies, which I have elucidated in several parts of this study. The crucial question is: why did this ambiguity dwell in Jevons's thought? The problematic entanglement of these two concepts seems to have escaped Jevons's attention entirely. My contention is: this intricacy is not to be seen as a simple logical error. Rather, it had deeper roots. It related to Jevons's aspirations as a man of science as well as a political thinker.

Jevons was torn between two contrasting wishes: on the one hand, he wanted to provide a scientific, objective description of reality; on the other, he wanted to provide the means for improving it. This division within his mind was mirrored by his attitude towards specialization in political economy. On the one hand, he wanted political economy to become a scientific and independent branch of knowledge. As such, he encouraged the development of different independent branches of political economy and of the professionalization of the economist (see Jevons, 1905, 200-201)[4]. On the other hand, he urged that all sciences shared a common method and sprung from a common source, *i.e.* logic.

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[3] In English translation: "I took great pains *not to laugh at human actions, or mourn them, or curse them, but only to understand them*" (translated part emphasized).

[4] Jevons favoured indeed a development towards specialization in political economy, as Peart has shown (see Peart, 1996). However, Jevons was also persuaded that the different branches of scientific inquiry should meet on the ground of logic. Economic inquiry, *qua* scientific investigation, was no exception.

These two contrasting thoughts triggered a tension between ‘is’ and ‘ought’. Jevons was positive that every branch of knowledge should rely on scientific methodology. For him, every topic could be treated in scientific terms, the social sciences no less than the physical. Moreover, as we have seen, Jevons’s conception of the human nature was in a high degree deterministic: humans were bound by the impulse to search for pleasure and avoid pain. Consistent with such views, the task of the social scientist seemed to be reduced to describing the world as it was. If humans are bound by their nature to behave in certain ways, they are not eligible for prescription. Their actions would be as necessary as the falling of a dropped stone. Jevons’s willingness to extend the power of scientific explanation to the social sciences ensued from the desire to explain reality as it is, that is, the first of the two contrasting wishes. In Jevons’s eyes, scientific knowledge was the best candidate for providing an exact and reliable explanation of the world. This desire finds its most suitable expression in the idea of a value-free scientific investigation – an inquiry which would be solely concerned with what is, instead with what ought to be.

However, when Jevons’s analysis touched the sphere of human action the matter became more complicated, since the other wish made its voice clear. A deterministic account of human nature, so fitting for scientific description, gives hardly any latitude for envisaging an improvement of the described state of things. Jevons could not renounce this possibility of improvement. He also believed that, as a social scientist, he was responsible for fostering this improvement in society. Hence, the ‘ought’ demanded its rightful place in Jevons’s thought. Without the possibility of giving prescriptions to humans no improvement of our condition could be conceivable, and this scenario was unacceptable for Jevons.

Both description and prescription, ‘ought’ and ‘is’, could be found in Jevons’s thought, even when assuming these perspectives at once entailed a lack of consistency. However, inconsistency was the price to be paid for complying at the same time with the call of ‘is’ and of ‘ought’. In Jevons’s eyes, humans were governed by exact and flawless natural laws. They seemed to be beyond the reach of prescription. However, Jevons could not conceive a society de-

prived of the possibility of self-improvement, and in order to make self-improvement possible prescription was needed. This complicated relationship between ‘is’ and ‘ought’ gives a dual nature to Jevons’s thought: it is a scientific theory which does not forsake the burdens and honour of modifying reality.

REFERENCES

Manuscripts

Jevons Archives. The John Rylands University Library of Manchester.

William Stanley Jevons's works

Jevons, W. S. (1865) 1906. *The Coal Question. An Inquiry Concerning the Progress of the Nation, and the Probable Exhaustion of our Coal-mines*. London: Macmillan.

—. 1866. "Brief Account of a General Mathematical Theory of Political Economy", *Journal of the Statistical Society of London* 29 (2): 282-290.

—. 1869. "A Deduction from Darwin's Theory", *Nature* 1: 232-233.

—. 1870. "On the Laws of Muscular Exertion", *Nature* 2: 158-160.

—. 1871. *The Theory of Political Economy*. London: Macmillan.

—. (1871) 1879. *The Theory of Political Economy*. 2nd ed. London: Macmillan.

—. 1874. "The Mathematical Theory of Political Economy", *Journal of the Statistical Society of London* 37 (4): 478-488.

—. (1874) 1877. *The Principles of Science: A Treatise on Logic and Scientific Method*. London: Macmillan.

—. 1875. "Heredity", *Nature* 11: 503-504.

—. (1880) 1884. *Studies in Deductive Logic*. London: Macmillan.

—. (1882) 1910. *The State in Relation to Labour*. London: Macmillan.

—. 1883. *Methods of Social Reform and Other Papers*. London: Macmillan.

—. 1884. *Investigations in Currency and Finance*. London: Macmillan.

—. 1886. *Letters and Journal of William Stanley Jevons*. Ed. by H. A. Jevons. London: Macmillan,

—. 1890. *Pure Logic and Other Minor Works*. London: Macmillan.

—. 1905. *The Principles of Economics: A Fragment of a Treatise on the Industrial Mechanism of Society and Other Papers*. London: Macmillan.

—. 1972-1981. *Papers and Correspondences of William Stanley Jevons*. Ed. by Black R. D. C., and Könekamp R. Vols. I-VII. London: Macmillan.

Other Primary Sources

Alighieri, D. (1302-1305) 1996. *De vulgari eloquentia*. Transl. by Botterill S. Cambridge: Cambridge University Press.

Aristotle. 1928. *De Interpretatione*. In Ross W. D., and Smith J. A. (eds.). *The Works of Aristotle*. Vols. I-XII. Oxford: Clarendon Press, Vol. I.

—. 1946. *De Poetica*. In Ross W. S., and Smith J. A. (eds.). *The Works of Aristotle*. Vols. I-XII. Oxford: Clarendon Press, Vol. XI.

Bacon, F. (1605) 1857-1874. *The Advancement of Learning*. In Spedding J., Ellis R. L., and Heath D. D. (eds.). *The Works of Francis Bacon*. Vols. I-XIV. London: Longmans, Vol. III.

—. (1620) 1857-1874. *Novum organum*. In Spedding J., Ellis R. L., and Heath D. D. (eds.). *The Works of Francis Bacon*. Vols. I-XIV. London: Longmans, Vol. I.

Ben Joseph, A. 1996. *Sepher Yetzirah: The Book of Formation*. Edmonds: Holmes.

Bentham, J. (1823) 1996. *An Introduction to the Principles of Moral and Legislation*. In Burns J. H. (ed.). *The Collected Works of Jeremy Bentham*. Oxford: Clarendon Press.

—. (1815) 1983. *A Table of the Springs of Action*. In Goldworth A. (ed.). *The Collected Works of Jeremy Bentham*. Oxford: Clarendon Press.

—. 1838-1843. *A Fragment on Ontology*. In Browning J. (ed.). *The Works of Jeremy Bentham*. Vols. I-XI. Edinburgh: William Tate, Vol. VIII.

—. 1983. *Deontology*. In Goldworth A. (ed.). *The Collected Works of Jeremy Bentham*. Oxford: Clarendon Press.

Boole, G. 1854. *An Investigation of the Laws of Thought, on Which Are Founded the Mathematical Theories of Logic and Probabilities*. London: Macmillan.

Butler, J. (1736) 1867. *The Analogy of Religion to the Constitution and Course of Nature*. London: Tegg.

Camillo, G. 2005. *L'idea del theatro, con "L'idea dell'eloquenza", il "De transmutatione" e altri testi inediti*. Milano: Adelphi.

Channing, W. E. 1819. *Unitarian Christianity. A Discourse on Some of the Distinguishing Opinions of Unitarians. Delivered at Baltimore, May 5th, 1819*. Boston: American Unitarian Association.

—. 1828. *Likeness to God. Discourse at the Ordination of the Rev. F.A. Farley*. Providence, R.I.: published online at the following address: http://www.americanunitarian.org/likeness.htm.

—. (1835) 1903. *Ministry for the Poor*. In *The Works of William Ellery Channing*. Vols. I-VI. Boston: American Unitarian Association, Vol. IV.

—. 1839. *Self-culture. An Address Introductory to Franklin Lectures*. London: John Mardon.

—. (1840) 1903. *Lectures on the Elevation of the Labouring Portion of the Community*. In *The Works of William Ellery Channing*. Vols. I-VI. Boston: American Unitarian Association, Vol. V.

—. 1880. *The Life of William Ellery Channing*. Ed. by W. H. Channing. Boston: American Unitarian Association.

De Morgan, A. (1838) 1841. *An Essay on Probability, and on Their Application on Life Contingencies and Insurance Offices*. London: Longman.

Dickens, C. 1968. *The Adventures of Oliver Twist*. London: Oxford University Press.

Gaskell, E. 1982. *North and South*. Oxford: Oxford University Press.

Gaskell, W. 1844. *Eternal Salvation not Dependent on Correctness of Belief*. London: British and Foreign Unitarian Association.

—. 1858. *The Duties of the Individual to Society: A Sermon in the Occasion of the Death of Sir John Potter*. London: Whitfield.

—. 1859. *A Sermon Preached in Cross Street Chapel, Manchester, September 25th, 1859, on the Occasion of the Death of John Ashton Nicholls*. London: Whitfield.

—. 1873. *Strong Point of Unitarian Christianity*. London: British and Foreign Unitarian Association.

—. 1875. *The Christianity of Christ*. London: British and Foreign Unitarian Association.

Giles, H., Martineau, J. Thom, and Hamilton J. 1839. *Unitarianism Defended: A Series of Lectures by John Hamilton Thom, James Martineau, Henry Giles*. Liverpool: Wilmer and Smith.

Herschel, J. F. (1830) 2009. *A Preliminary Discourse on the Study of Natural Philosophy*. Cambridge: Cambridge University Press.

Hume, D. (1739) 1878. *A Treatise on Human Nature*. Vols I-II. London: Longmans.

Leibniz, G. W. 1875-1890. *Die philosophischen Schriften von G. W. Leibniz*. Ed. by Gerhardt C. I. Vols. I-VII. Berlin: Weidmann.

—. 1903. *Opuscules et fragments inédits de Leibniz. Extraits des manuscrits de la Bibliothèque Royale de Hanovre*. Transl. by Couturat L. Paris: Félix Alcan.

—. (1934) 1997. *Philosophical Writings*. Transl. by Morris M., and Parkinson G. H. R.. London: J. M. Dent.

—. (1956) 1989. *Philosophical Papers and Letters*. Transl. by Loemker L. E. Chicago: University of Chicago Press.

—. 1966. *Logical Papers*. Transl. by Parkinson G. H. R. Oxford: Clarendon Press.

Lyell, C. (1832-1833) 2009. *Principles of Geology*. Vols. I-III. Cambridge: Cambridge University Press.

Llull, R. 1617. *Opera*. Strasburg: L. Zetzner.

—. 1721-1742. *Raymundi Lulli Opera omnia*. Vols. I-X. Mainz: Salzinger.

—.1985. *Selected Works of Ramon Llull*: Ed. by A. Bonner. Vols. I-II. Princeton: Princeton University Press.

—. 1986. *Raimundi Lvlli Opera Latina*. Turnhout: Brepols.

Martineau, J. 1834. "Bentham's Deontology", *Monthly Repository* 8 (85): 612-624.

—. (1836) 1845. *The Rationale of Religious Inquiry, or the Question Stated of Reason, the Bible and the Church; in Six Lectures*. London: Chapman.

—. 1839a. *The Christian View of Moral Evil*. In Giles H., Martineau J., and Thom J. H. *Unitarianism Defended: A Series of Lectures by John Hamilton Thom, James Martineau, Henry Giles*. Lecture XI. Liverpool: Wilmer and Smith.

—. 1839b. *The Bible: What It Is, and What It Is Not*. In Giles H., Martineau J., and Thom J. H. *Unitarianism Defended: A Series of Lectures by John Hamilton Thom, James Martineau, Henry Giles*. Lecture XI. Liverpool: Wilmer and Smith.

—. 1840. *Hymns for the Christian Church and Home*. London: John Green.

—. 1890. *Essays, Reviews and Addresses*. Vols. I-IV. London: Longmans.

—. 1900. *Christ, the Divine Word*, in: *Hours of Thought on Sacred Things*. Vols. I-II. London: Longmans.

Mill, John Stuart. (1840) 1969. *Coleridge*. In Robson J. M. (ed.). *The Collected Works of John Stuart Mill*. Vols. I-XXXIII. Toronto: University of Toronto Press, Vol. X.

—. (1843) 1974. *A System of Logic Ratiocinative and Inductive*. In Robson J. M. (ed.). *The Collected Works of John Stuart Mill*. Vols. I-XXXIII. Toronto: University of Toronto Press, Vols. VII-VIII.

—. (1852) 1969. *Whewell on Moral Philosophy*. In Robson J. M. (ed.). *The Collected Works of John Stuart Mill*. Vols. I-XXXIII. Toronto: University of Toronto Press, Vol. X.

—. (1859) 1977. *On Liberty*. In Robson J. M. (ed.). *The Collected Works of John Stuart Mill*. Vols. I-XXXIII. Toronto: University of Toronto Press, Vol. XVIII.

—. (1865) 1979. *An Examination of Sir William Hamilton's Philosophy*. In Robson J. M. (ed.). *The Collected Works of John Stuart Mill*. Vols. I-XXXIII. Toronto: University of Toronto Press, Vol. IX.

Ould, F. *et alt*. 1839. *Unitarianism Confuted: A Series of Lectures Delivered in Christ Church, in Liverpool*. Liverpool: Henry Perris.

Paley, W. (1785) 1815. *The Principles of Moral and Political Philosophy*. Boston: White.

—. (1802) 2009. *Natural Theology: or, Evidences of the Existence and Attributes of the Deity*. Cambridge: Cambridge University Press.

Pope, A. (1733-1734) 2006. *An Essay on Man*. In Rogers P. (ed.). *Alexander Pope. The Major Works*, Oxford: Oxford University Press.

Priestley, J. 1777. *The Doctrine of Philosophical Necessity Illustrated*. London: J. Johnson.

Smith, A. (1776) 1937. *An Inquiry into the Nature and Causes of the Wealth of the Nations*. New York: Modern Library.

Spencer, H. (1851) 1868. *Social Statics: Or, the Conditions Essential to Human Happiness, Specified, and the First of Them Developed*. London: Williams and Norgate.

—. (1857) 1891. "Progress: Its Law and Cause". In *Essays*. Vols. I-III. London: Williams and Norgate: Vol. I, 8-62.

—. (1860) 1891a. "Bain, on the Emotions and the Will". In *Essays*. Vols. I-III. London: Williams and Norgate, Vol. I, 241-264.

—. (1860) 1891b. "Social Organism". In *Essays*. Vols. I-III. London: Williams and Norgate, Vol. I, 265-307.

—. (1861) 1911. "Education: Intellectual, Moral and Physical". In *Essays in Education and Kindred Subjects*. London: Dent, (accessible online at: https://oll.libertyfund.org/titles/spencer-essays-on-education-and-kindred-subjects-1861-1911#lf1501_head_002).

—. 1862. *First Principles*. London: Williams and Norgate.

—. (1862) 1887. *First Principles*. 5th ed. London: Williams and Norgate.

—. (1864-1867) 1898-1899. *The Principles of Biology*. Vols. I-II. London: Williams and Norgate.

—. (1871) 1891. "Specialized administration". In *Essays*. Vols. I-III. London: Williams and Norgate, Vol. III, 401-444.

—. 1879. *Data of Ethics*. London: Williams and Norgate.

—. (1855) 1881. *The Principles of Psychology*. London: Williams and Norgate.

—. (1886) 1891. "The Factors of Organic Evolution". In *Essays*. Vols. I-III. London: Williams and Norgate, Vol. I, 389-466.

—. 1891. *Justice: Being Part IV of the Principles of Ethics*. London: Williams and Norgate.

—. 1892-1893. *The Principles of Ethics*. Vols. I-II. London: Williams and Norgate.

—. 1904. *An Autobiography*. Vols. I-II. London: Williams and Norgate.

Spinoza, B. 2016. *Political Treatise*. In Curley E. (ed.). *The Collected Works of Spinoza*. Vols. I-II. Princeton: Princeton University Press, Vol. II.

Tayler, J. 1851. *The Religion of the Intellect and the Religion of the Heart*. In *Christian Aspects of Faith and Duty*, New York: Francis.

VV. AA. 20th September 1864. "Science and Religion". *The Times*, p. 7.

Walras, L. 1965. *Correspondence of Léon Walras and Related Papers*. Ed. by Jaffé W. Vols. I-III. Amsterdam: North Holland Publishing Co.

Whewell, W. 1832. "Lyell's Geology", *Quarterly Review* 2 (47): 103-132.

—. (1840) 1847. *The Philosophy of the Inductive Sciences, Founded upon their History*. London: Parker.

Wilkins, J. 1668. *An Essay towards a Real Character and a Philosophical Language*. London: S. Gellibrand and John Martin Printers for the Royal Society.

Secondary Literature concerning William Stanley Jevons

Aldrich, J. 1987. "Jevons as a Statistician: The Role of Probability", *Manchester School* 60 (3): 233-253.

Black, R. D. C. 1970. *Introduction*. In Jevons W. S. *The Theory of Political Economy*. Harmondsworth: Penguin Books.

—. 1972a. "Jevons, Bentham and De Morgan", *Economica* 39 (2): 119-134. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, 280-297.

—. 1972b. "W. S. Jevons and the Foundation of Modern Economics", *History of Political Economy* 4 (2): 362-378. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, Vol. I, 298-310.

—. 1972c. "Jevons, Marginalism and Manchester", *Manchester School* 40 (1): 2-8.

—. 1993. "Jevons' Contribution to the Teaching of Political Economy in Manchester". In Kaish A., and Tribe K. (eds.). *The Market for Political Economy*. London and New York: Routledge, 162-183.

Black, R. D. C. Coats, A. W., and Goodwin, C. D. W. (eds.). 1973. *The Marginal Revolution in Economics. Interpretation and Evaluation*. Durham: Duke University Press.

Blaug, M. 1972. "Was There a Marginal Revolution?", *History of Political Economy* 4 (2): 269-280.

Bostaph, S. 1989. "Jevons's 'Antipodean Influence': The Question of Early Influences", *History of Political Economy* 4 (2): 601-623.

Bostaph, S., and Shieh, Y.-N. 1986. "W. S. Jevons and Lardner's Railway Economy", *History of Political Economy* 18 (1): 49-64. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, Vol. I, 316-332.

Bowley, M. 1972. "The Predecessors of Jevons – The Revolution that Wasn't", *Manchester School* 60 (1): 9-29.

Bowman, R. S. 1989. "Jevons's Economic Theory in Relation to Social Change and Public Policy", *Journal of Economic Issues* 23 (4): 1123-1147.

—. 1997. "The Place of Education in W.S. Jevons's Political Economy", *The European Journal of the History of Economic Thought* 4 (3): 455-477.

Chao, H-K., and Maas, H. 2017. "Engines of Discovery: Jevons and Marshall on the Methods of Graphs and Diagrams", *Research in the History of Economic Thought and Methodology* 35 (A): 35-61

Coats, A. W. 1972. "The Economic and Social Context of the Marginal Revolution of the 1870s", *History of Political Economy* 4 (2): 303-324.

Comim, F. V. 1998. "'Jevons and Menger Re-Homogenized? Jaffé After 20 Years': A Comment on Peart", *American Journal of Economics and Sociology* 57 (3): 341-344.

De Marchi, N. B. 1972. "Mill and Cairnes and the Emergence of Marginalism in England", *History of Political Economy* 4 (2): 344-363.

Fontaine, P. 1998. "Menger, Jevons, and Walras Un-Homogenized, De-Homogenized, and Homogenized: A Comment on Peart", *American Journal of Economics and Sociology* 57 (3): 333-339.

Hébert, R. F. 1998. "Jevons and Menger Re-Homogenized: Who Is the Real 'Odd Man out'? A Comment on Peart", *American Journal of Economics and Sociology* 57 (3): 327-332.

Higgins, B. H. 1935. "W. S. Jevons – A Centenary Estimate", *Manchester School* 6 (2): 103-111. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, Vol. I, 50-58.

Hutchison, T. W. 1969. "Economists and Economic Policy in Britain after 1870", *History of Political Economy* 1 (2): 231-255.

—. 1982. "The Politics and Philosophy in Jevons's Political Economy", *Manchester School* 50 (4): 366-378. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, Vol. I, 383-395.

—. 1994a. "White on 'the Irish Factor' in Jevons' Statistics: A Rebuttal", *History of Economics Review* 21: 65-70.

—. 1994b. "Three Strikes Against White", *History of Economics Review* 21: 87.

Jaffé, W. 1976. "Menger, Jevons and Walras De-Homogenized", *Economic Inquiry* 14 (4): 511-524.

Keynes, J. M. (1936) 2010. *William Stanley Jevons*. In Johnson E., and Moggridge D. (eds.). *The Collected Writings of John Maynard Keynes. Essays in Biography*. Vols. I-XXIX. Cambridge: Cambridge University Press, Vol. X.

Kim, J. 1995. "Jevons versus Cairnes on Exact Economic Laws". In Rima I. H. (ed.). *Measurement, Quantification and Economic Analysis: Numeracy in Economics*. London and New York: Routledge, 140-156.

Könekamp, M. 1972-1981. *Biographical Introduction*. In Jevons W. S. *Papers and Correspondences of William Stanley Jevons*. Ed. by Black R. D. C., and Könekamp R. Vols. I-VII. London: Macmillan, Vol. I.

La Nauze, J. A. 1941. "Jevons in Sydney", *The Economic Record* 17 (32): 31-45. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, Vol. I, 109-124.

—. 1953. "The Conception of Jevons's Utility Theory", *Economica* 20 (80): 356-358. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, Vol. III, 58-61.

Maas, H. 2005. *William Stanley Jevons and the Making of Modern Economy*. Cambridge: Cambridge University Press.

—. 2016. "*Letts* Calculate: Moral Accounting in the Victorian Period", *History of Political Economy* 48 (Annual Supplement): 16-43.

MacLennan, B. 1972. "Jevons's Philosophy of Science", *Manchester School* 60 (1): 53-71. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, Vol. I, 251-267.

Mays, W. P., and Henry, D. P. 1953. "Jevons and Logic", *Mind* 62: 484-505.

Mays, W. P. 1962. "Jevons' Conception of Scientific Method", *Manchester School* 40 (3): 223-249. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, Vol. I, 212-232.

Mazlish, B. 1986. "Jevons' Science and His 'Second Nature'", *Journal of the History of Behavioural Sciences* 22: 140-149. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, Vol. I, 419-431.

Mirowski, P. 1989. *More Heat than Light: Economics as Social Physics, Physics as Nature Economics*. Cambridge: Cambridge University Press.

Morgan, M. 1990. *The History of Econometric Ideas*. Cambridge: Cambridge University Press.

Moscati, I. 2013. "Were Jevons, Menger and Walras Really Cardinalists? On the Notion of Measurement in Utility Theory, Psychology, Mathematics and Other Disciplines, 1870-1910", *History of Political Economy* 45 (3): 373- 414

Mosselmans, B. 2007. *William Stanley Jevons and the Cutting Edge of Economics*. London and New York: Routledge.

Okada, M. 2012. "A Reappraisal of Jevons's Thought on Labour", *History of Economic Thought* 53 (2): 21-40.

Paul, E. F. 1979. "Jevons: Economic Revolutionary, Political Utilitarian", *Journal of the History of Ideas* 60 (2): 267-283.

Peart, S. 1993. "W. S. Jevons's Methodology of Economics: Some Implications of the Procedures for 'Inductive Quantification'", *History of Political Economy* 25 (3): 435-460.

—. 1995a. "'Disturbing Causes', 'Noxious Errors', and the Theory-Practice Distinction in the Economics of J. S. Mill and W. S. Jevons", *Canadian Journal of Economics* 28 (4b): 1194-1211.

— 1995b. "Measurement in Utility Calculations: The Utilitarian Perspective". In Ingrid H. R. (ed.). *Numeracy in Economics*, London and New York: Routledge, 63-86.

—. 1996. *The Economics of W. S. Jevons*. London and New York: Routledge.

—. 1998. "Jevons and Menger Re-Homogenized? Jaffé after 20 Years", *American Journal of Economics and Sociology* 57 (2): 307-325.

Richiardi, P. S., and Sigot, N. 2013. "William Stanley Jevons et la 'réforme sociale': une théorie du bien-être sans postérité", *Cahiers d'économie politique* 64 (1): 221-251.

Robbins, L. 1936. "The Place of Jevons in the History of Economic Thought", *Manchester School* 7 (1): 1-17. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, Vol. I, 94-108.

Robertson, G. 1876. "Mr. Jevons's Formal Logic", *Mind* 1: 206-222. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, Vol. I, 11-25.

Robertson, R. 1951. "Jevons and his Precursors", *Econometrica* 19 (3): 229-249. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, Vol. I, 146-166.

Schabas, M. 1984. "The 'Worldly Philosophy' of William Stanley Jevons", *Victorian Studies* 28 (1): 129-147. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, Vol. I, 401-418.

—. 1989. "Alfred Marshall, W. Stanley Jevons, and the Mathematization of Economics", *Isis* 80: 60-73.

—. 1990. *A World Ruled by Number: William Stanley Jevons and the Rise of Mathematical Economy*. Princeton: Princeton University Press.

Sigot, N. 2002. "Jevons's Debt to Bentham: Mathematical Economy, Morals and Psychology", *Manchester School* 70 (2): 262-278.

Stigler, S. M. 1982. "Jevons as a Statistician", *Manchester School* 50 (4): 354-365. Reprinted in Wood J. C. (ed.). 1988. *William Stanley Jevons: Critical Assessments*. Vols. I-III. London and New York: Routledge, Vol. I, 369-382.

Strong, J. V. 1976. "The Infinite Ballot Box of Nature: De Morgan, Boole, and Jevons on Probability and the Logic of Induction", *Proceedings of the Philosophy of Science Association* 1: 197-211.

Winch, D. 1972. "Marginalism and the Boundaries of Economic Science", *History of Political Economy* 4 (2): 325-343.

White, M. V. 1982. "Jevons in Australia: A Reassessment", *Economic Record* 58 (1): 32-45.

—. 1989. "Why Are There No Supply and Demand Curves in Jevons?", *History of Political Economy* 21 (3): 425-456.

—. 1991. "Jevons on Utility, Exchange, and Demand Theory: Comment", *Manchester School* 59 (1): 80-83.

—. 1993. "The 'Irish Factor' in Jevons' Statistics: a Note", *History of Economics Review* 19: 79-85.

—. 1994c. "A Five Per Cent Racist? Rejoinder to Professor Hutchison", *History of Economics Review* 21: 71-86.

—. 1994b. "Bridging the Natural and the Social: Science and Character in Jevons's Political Economy", *Economic Inquiry* 32: 429-444.

—. 1994a. "The Moment of Richard Jennings: The Production of Jevons's Marginalist Economic Agent". In Mirowski P. (ed.). *Natural Images in Economic Thought. "Market Read in Tooth and Claw"*. Cambridge: Cambridge University Press, 197-230.

—. 1994d. "'That God-Forgotten Thornton': Exorcising Higgling after *On Labour*", *History of Political Economy* 26 (Annual Supplement): 149-183.

—. 2004. "In the Lobby of the Energy Hotel: W. S. Jevons Formulation of the Post-Classical Economic Problem", *History of Political Economy* 36 (2): 227-271.

Other Secondary Sources

Berlin, I. (1959) 2002. "John Stuart Mill and the Ends of Life". In *Liberty. Incorporating Four Essays on Liberty*. Oxford: Oxford University Press, 218-251.

Black, M. 1962. *Models and Metaphors. Studies in Language and Philosophy*. Ithaca, N.Y.: Cornell University Press.

Blaug, M. (1962) 1985. *Economic Theory in Retrospect*. Cambridge: Cambridge University Press.

Boogs, A. 1966. "Without Dogma, Without Creed: English Unitarianism during the First Two-Thirds of the Nineteenth Century", *Transactions of the Unitarian Historical Society* 13 (4): 141-154.

Brill, B. 1984. *William Gaskell, 1805-1884*. Manchester: Manchester Literary and Philosophical Publications.

Brown, D. G. 2010. "Mill's Moral Theory: Ongoing Revisionism", *Politics, Philosophy and Economics* 9 (1): 5-45.

Camp, E. 2007. "Showing, Telling and Seeing. Metaphor and 'Poetic' Language", *Baltic Yearbook of Cognition, Logic and Communication*, Vol. III, 1-24.

Cannon, W. F. 1960. "The Uniformitarian-Catastrophist Debate", *Isis* 51 (1): 38-55.

Centrone, S. 2013. "Aspekte des Psychologismus-Streits: Husserl und Frege über Anzahlen und logische Gesetze". In Centrone S. (ed.). *Versuche über Husserl*. Hamburg: Meiner, 65-96.

Cohen, D. J. 2005. "Reasoning and Belief in Victorian Mathematics". In Daunton M. (ed.). *The Organisation of Knowledge in Victorian Britain*. Oxford: Oxford University Press, 139-158.

—. 2007. *Equations from God: Pure Mathematics and Victorian Faith*. Baltimore: Johns Hopkins University Press.

Collini, S. 1979. *Liberalism and Sociology: L. T. Hobhouse and Political Argument in England, 1880-1914*. Cambridge: Cambridge University Press.

—. 1991. *Public Moralists: Political Thought and Intellectual Life in Britain, 1850-1930*. Oxford: Clarendon Press.

Cowling, M. 1985. *Religion and Public Doctrine in Modern England*, *Vol. II: Assaults*. Cambridge: Cambridge University Press.

—. 2001. *Religion and Public Doctrine in Modern England. Vol. III: Accommodations*. Cambridge: Cambridge University Press.

Dan, J. 2005. *Kabbalah. A Very Short Introduction*. Oxford: Oxford University Press.

Davidoff, L., and Hall, C. 1987. *Family Fortunes: Men and Women of the English Middle Class, 1780-1850*. London and New York: Routledge.

Davidson, D. 1978. "What Metaphors Mean". In Sacks S. (ed.). *On Metaphor*. Chicago: Chicago University Press, 25-45.

Day, J. P. 1975. "The Uniformity of Nature", *American Philosophical Quarterly* 12 (1): 1-16.

Desmond, A. 1989. *The Politics of Evolution: Morphology, Medicine, and Reform in Radical London*. Chicago: University of Chicago Press.

Eco, U. 1993. *La ricerca della lingua perfetta nella cultura europea*. Roma and Bari: Laterza.

Fabbrichesi, R. 2000. *I corpi del significato: lingua, scrittura e conoscenza in Leibniz e Wittgenstein*. Milano: Jaca Book.

Fogelin, R. J. (1988) 2011 *Figuratively Speaking*. Oxford: Oxford University Press.

Formigari, L. 1970. *Linguistica ed empirismo nel Seicento inglese*. Roma and Bari: Laterza.

Foster J. R. 1932. "Science and Language in England of the Mid-Seventeenth Century", *The Journal of English and Germanic Philology* 31 (3): 315-331.

Francis, M. 2007. *Herbert Spencer and the Invention of Modern Life*. Abingdon: Routledge.

Geike, A. 1905. *The Founders of Geology*. London: Macmillan.

Gray, T. S. 1985. "Herbert Spencer: Individualist or Organicist?", *Political Studies* 33: 236-253.

—. 1996. *The Political Philosophy of Herbert Spencer: Individualism and Organicism*. Aldershot: Averbury.

Greenwood, A., and Harris, M. W. 2011. *An Introduction to Unitarian and Universalist Traditions*. Cambridge: Cambridge University Press.

Hames, H. J. 2000. *The Art of Conversion: Christianity and Kabbalah in the Thirteenth Century*. Leiden and Boston: Brill.

Harris, M. W. 2009. *The A to Z of Unitarian Universalism*. Lanham: Scarecrow Press.

Hilton, B. 1988. *The Age of Atonement. The Influence of Evangelicalism on Social and Economic Thought, 1795-1865*. Oxford: Clarendon Press.

—. 2000. "The Politics of Anatomy and an Anatomy of Politics c. 1825-1850". In Collini S., Whatmore R., and Young B. (eds.). *History, Religion and Culture. British Intellectual History 1750-1950*. Cambridge: Cambridge University Press, 179-197.

—. 2006. *A Mad, Bad, and Dangerous People? England 1783-1846*. Oxford: Oxford University Press.

Holt, Raymond V. 1938. *The Unitarian Contribution to Social Progress in England*. London: George Allen.

Hudson, W. D. (ed.). 1969. *The Is/Ought Question*. London: Macmillan.

Idel, M. 1988. *The Mystical Experience of Abraham Abulafia*. Albany: State University of New York Press.

—. 1996. "*Dignitates* and *Kavod*: Two Theological Concepts in Catalan Mysticism", *Studia Lulliana* 36: 69-78.

Kelly, P. J. 1990. *Utilitarianism and Distributive Justice: Jeremy Bentham and the Civil Law*. Oxford: Clarendon Press.

Ledger-Lomas, M. 2010. "Unitarians and the Contradictions of Liberal Protestantism in Victorian Britain: the Free Christian Union, 1867–70", *Historical Research* 83: 486-505.

—. 2017. "Unitarians and Presbyterians". In Larsen T., and Ledger-Lomas M. (eds.). *The Oxford History of Protestant Dissenting Traditions: The Nineteenth Century*. Vols. I-III. Oxford: Oxford University Press, 99-123.

Maat, J. 2004. *Philosophical Languages in the Seventeenth Century: Dalgarno, Wilkins, Leibniz*. New York: Springer.

Macleod, C., Miller, D. E. (eds.). 2017. *A Companion to Mill*. Hoboken: Wiley.

McCann, C R. Jr. 2004. *Individualism and Social Order. The Social Element in the Liberal Thought*. London and New York: Routledge.

McCloskey, D. N. (1985) 1998. *The Rhetoric of Economics*. Madison: University of Wisconsin Press.

Mirowski, P. 2002. *Machines Dreams: Economics Becomes a Cyborg Science*. Cambridge: Cambridge University Press.

Moore, G. E. (1903) 1993. *Principia Ethica*. Cambridge: Cambridge University Press.

Morgan, M. 2012. *The World in the Model. How Economists Work and Think*. Cambridge: Cambridge University Press.

Offer, J. 2010. *Herbert Spencer and Social Theory*. Basingstoke: Palgrave Macmillan.

Pagano, U. 1985. *Work and Welfare in Economic Theory*. Oxford: Basil Blackwell.

Peel, J. D. Y. 1992. *Herbert Spencer: The Evolution of a Sociologist*. Aldershot: Gregg Revivals.

Pickstone, J. V. 2005. "Science in Nineteenth-Century England: Plural Configurations and Singular Politics". In Daunton M. (ed.). *The Organisation of Knowledge in Victorian Britain*. Oxford: Oxford University Press, 29-60.

Postema, G. J. 2006. "Interests, Universal and Particular: Bentham's Utilitarian Theory of Value", *Utilitas* 18 (2): 109-133.

Punter, D. 2007. *Metaphor*. London and New York: Routledge.

Quinn, M. 2008. "A Failure to Reconcile the Irreconcilable? Security, Subsistence and Equality in Bentham's Writings on the Civil Code and on the Poor Laws", *History of Political Thought* 29 (2): 320-343.

Raymond, J., and Pickstone, J. V. 1986. "The Natural Sciences and the Learning of English Unitarians". In Smith B. (ed.). *Truth, Liberty, Religion. Essays Celebrating Two Hundred Years of Manchester College*. Oxford: Manchester College, 127-164.

Rosen, F. 2003. *Classical Utilitarianism from Hume to Mill*. London and New York: Routledge.

Rossi, P. 1957. *Francesco Bacone: dalla magia alla scienza*. Roma and Bari: Laterza.

—. 1960. *Clavis universalis: arti mnemoniche e logica combinatoria da Lullo a Leibniz*. Milano and Napoli: Riccardo Ricciardi.

Rubio, J. E. 2018. "Llull's 'Great Universal Art'". In Austin A. M., and Johnston M. D. (eds.). *A Companion to Ramon Llull and Lullism*. Leiden and Boston: Brill, 81-116.

Ruse, M. 1976. "Charles Lyell and the Philosophers of Science", *The British Journal for the History of Science* 9 (2): 121-131.

Rudwick, M. J. S. 1967. "A Critique of Uniformitarian Geology: A Letter from W. D. Conybeare to Charles Lyell, 1841", *Proceedings of the American Philosophical Society* 111 (5): 272-287.

—. 2014. *Earth's Deep History: How It Was Discovered and Why It Matters*. Chicago: University of Chicago Press.

Rumelhart, D. E. (1979) 1993. "Some Problems with the Notions of Literal Meanings". In Ortony A. (ed.). *Metaphor and Thought*, Cambridge: Cambridge University Press, 71-82.

Sadock, J. M. (1979) 1993. "Figurative Speech and Linguistics". In Ortony A. (ed.). *Metaphor and Thought*. Cambridge: Cambridge University Press, 42-57.

Schneewind, J. B. 1977. *Sidgwick's Ethics and Victorian Moral Philosophy*. Oxford: Clarendon Press.

Scholem, G. 1941. *Major Trends in Jewish Mysticism*. New York: Knopf Doublebay.

Schumpeter, J. A. (1954) 1987. *History of Economic Analysis*. London and New York: Routledge.

Searle, J. R. (1979) 1993. "Metaphor". In Ortony A. (ed.). *Metaphor and Thought*. Cambridge: Cambridge University Press, 83-111.

Seed, J. 1982. "Unitarianism, Political Economy and the Antinomies of Liberal Culture in Manchester, 1830-50", *Social History* 7 (1): 1-25.

—. 1986. "Theologies of Power: Unitarianism and the Social Relations of Religious Discourse, 1800-50". In Morris R. J. (ed.). *Class, Power and Social Structure in British Nineteenth-Century Towns*. Leicester: Leicester University Press, 108-156.

Segol, M. 2012. *Word and Image in Medieval Kabbalah: The Texts, Commentaries, and Diagrams of the Sefer Yetsirah*. New York: Palgrave Macmillan.

Singer, T. C. 1989. "Hieroglyphs, Real Characters, and the Idea of Natural Language in English Seventeenth-Century Thought", *Journal of the History of Ideas* 50 (1): 49-70.

Smith, L. 2006. *The Unitarians: A Short History*. Providence: Blackstone Editions.

Stigler, G. 1941. *Production and Distribution Theories*. New York: Macmillan Company.

Taylor, C. 1994. *The Politics of Recognition*. In Gutmann A. (ed.). *Multiculturalism: Examining the Politics of Recognition*. Princeton: Princeton University Press.

Taylor, M. W. 1992. *Men Versus the State: Herbert Spencer and Late Victorian Individualism*. Oxford: Clarendon Press.

—. 2007. *The Philosophy of Herbert Spencer*. London: Continuum.

Topham, J. R. 2010. "Science, Religion, and the History of the Book". In Dixon T., Cantor G., and Pumfrey S. (eds.). *Science and Religion: New Historical Perspectives*. Cambridge: Cambridge University Press, 221-244.

Wach, H. 1991. "A 'Still, Small Voice' from the Pulpit: Religion and the Creation of Social Morality in Manchester, 1820-1850", *The Journal of Modern History* 63 (3): 425-456.

—. 1993. "Unitarian Philanthropy and Cultural Hegemony in Comparative Perspective: Manchester and Boston, 1827-1848", *Journal of Social History* 6 (3): 539-557.

Waller, R. 1986. "James Martineau: the Development of his Religious Thought". In Smith B. (ed.). *Truth, Liberty, Religion. Essays Celebrating Two Hundred Years of Manchester College*. Oxford: Manchester College, 225-264.

—. 2002. "James Martineau: The Critical Mind and the Will to Believe", *Transactions of the Unitarian Historical Society* 22 (4): 339-354.

Webb, R. K. 1986. "Views of Unitarianism from Halley's Comet", *Transactions of the Unitarian Historical Society* 18 (4): 180-195.

—. 1988. "The Gaskells as Unitarians". In Shattock J. (ed.). *Dickens and other Victorians*. London: Macmillan, 144-171.

—. 1994. "The Liverpool Controversy", *Faith and Freedom* 47 (1): 39-44.

—. 1990. "The Faith of Nineteenth-Century Unitarians: A Curious Incident". In Helmstadter R. J., Lightman B. (eds.). *Victorian Faith in Crisis: Essays on Continuity and Change in Nineteenth-Century Religious Belief*. London: Macmillan, 126-149.

Weinstein, D. 1998. *Equal Freedom and Utility. Herbert's Spencer's Liberal Utilitarianism*. Cambridge: Cambridge University Press.

Weintraub, E. R. 2002. *How Economics Became a Mathematical Science*. Durham and London: Duke University Press.

White, P. 2017. "Science and Religion". In Holmes J., and Ruston S. (eds.). *The Routledge Research Companion to Nineteenth-Century British Literature and Science*. London and New York: Routledge, 41-52.

Wilbur, E. M. (1945) 1947. *A History of Unitarianism: Socinianism and its Antecedents*. Cambridge: Harvard University Press.

—. 1945. *A History of Unitarianism: In Transylvania, England and America*. Boston: Beacon Press.

Wiltshire, D. 1978. *The Social and Political Thought of Herbert Spencer*. Oxford: Oxford University Press.

Wood, P. (ed.). 2004. *Science and Dissent in England, 1688-1945*. Farnham: Ashgate.

Yates, F. 1954. "The Art of Ramon Lull. An Approach to it through Lull's Theory of the Elements", *Journal of the Warburg and Courtauld Institutes* 27: 115-173.

—. 1982. *Lull & Bruno*. London and Boston: Routledge and K. Paul.

Young, I. M. 1990. *The Ideal of Community and the Politics of Difference*. In Nicholson L. J. (ed.). *Feminism/Postmodernism*. New York: Routledge.