

# Classical Pragmatism and Metaphysics: James and Peirce on Scientific Determinism

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## 1. Introduction

The present paper has two main aims. The first one is philosophical and is related to the general topic of this volume (*Logical Empiricism and Pragmatism*): I would like to draw attention to the fact that the issue of classical scientific determinism<sup>1</sup>, despite being ‘metaphysical’ and thereby ‘nonsensical’ according to the Vienna Circle’s ‘scientific world conception’, bothered philosophers, like William James and Charles Peirce, who were deeply involved in scientific practice. At the end of the paper I shall raise the question of why it was so and what this fact may suggest about the relationship between science and metaphysics. The second main aim of this paper is historico-philosophical: in the time span between the late 1870s and by the turn of 1900 James (1842–1910) and Peirce (1839–1914) contributed repeatedly to the ongoing discussions about scientific determinism. In this paper I will give a general overview of their positions based mainly on primary sources and I embed them into the broader context of the history of the concept of scientific determinism, dedicating special attention to their relationship with a particular French anti-deterministic tradition (Renouvier, Poincaré, Boutroux and Bergson).

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<sup>1</sup>There are many possible formulations of scientific determinism (I have tried to develop a sort of classification system of the different forms of determinism in: Romizi 2013, Ch. 1). By ‘classical scientific determinism’ I refer here to the well-known formulation by Laplace, comprised in his *A Philosophical Essay on Probability*, originally published in French in 1814: ‘We may regard the present state of the universe as the effect of its past and the cause of its future. An intellect which at a certain moment would know all forces that set nature in motion, and all positions of all items of which nature is composed, if this intellect were also vast enough to submit these data to analysis, it would embrace in a single formula the movements of the greatest bodies of the universe and those of the tiniest atom; for such an intellect nothing would be uncertain and the future just like the past would be present before its eyes’ (Laplace 1951 [1814], p. 4).

## 2. Contextualization: Scientific Determinism in the late 19<sup>th</sup> century.

### A French Anti-deterministic Tradition

According to Ian Hacking, the explicit<sup>2</sup> concept of scientific determinism started to appear sporadically in the first half of the 19<sup>th</sup> century and became established in Europe between 1854 and 1872<sup>3</sup>. Elsewhere (Romizi 2013) I have argued that there had been two main reasons for the emergence of an explicit concept of scientific determinism in the second half of the 19<sup>th</sup> century. The first one was the successful application of the deterministic paradigm of physics to sociology, history, physiology and psychology in the course of the 19<sup>th</sup> century: the attempt, to an impressive extent successful, to extend the domain of validity of (implicit) scientific determinism to the realm of human mind, will, behaviour and society infused scientific determinism with ethical implications and provoked public and emotionally charged discussions. It was within these discussions that a label was eventually needed for what we retrospectively call scientific determinism — which thus became explicit. The second reason why the concept of scientific determinism emerged explicitly in the second half of the 19<sup>th</sup> century, according to my reconstruction (Romizi 2013, Part C), is that natural scientists in the course of the 19<sup>th</sup> century became public men, science was increasingly popularized, and scientific issues were increasingly related to life-issues, to worldview-questions, and even to politics. In such a context the problem of the validity—or of the domain of validity—of determinism attracted interest far beyond the restricted circles of philosophers and scientists. Again, in such a public discussion both supporters and opponents of ‘scientific determinism’ needed a label to designate the standpoint we call so today.

Since scientific determinism was often considered both by its supporters and by its opponents as the essential feature of science, the debates about its validity were often intertwined with those about the scientific status of disciplines other than physics (which, as

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<sup>2</sup> By ‘explicit concept’ I mean a concept identifiable by its actual name (‘scientific determinism’, or at least ‘determinism’ in the scientific meaning of the word) and indicating a precise philosophical position publicly discussed as such. An *implicit* concept of scientific determinism may be assumed to be much older. For instance, Cassirer (1956, Ch. 1) holds classical rationalism as already implying scientific determinism (Cassirer 1956, Ch. 1), while Hacking considers authors as Holbach and La Mettrie as propounding versions of ‘modern’ determinism (Hacking 1983, p. 461).

<sup>3</sup>Cf. Hacking (1983; 1990, Ch. 18). 1854 is the year of publication of the first of Renouvier’s *Essais de Critique générale* (I will expand on this below). 1872 is the year in which De Bois-Reymond gave his famous talk about ‘The Limits of Our Knowledge of Nature’ (*Über die Grenzen der Naturkenntnis*). On the relevance of this talk for the history of the concept of scientific determinism cf. also Cassirer (1956, Ch. 1).

an allegedly fully-deterministic science, functioned as a model), with those about the range of validity of science *tout court*, and with those about the legitimacy and opportunity of a scientific world-conception in competition with, for example, a religious one. Moreover, these debates mostly involved also the problem of free will (or ethical determinism), since scientific determinism, once applied to human will and behaviour, seemed to deny it.

In the context of the origins and the early development of scientific determinism French authors played a pivotal role, both among the supporters (beside Laplace, I think for example, of Adolphe Quetelet<sup>4</sup> and Claude Bernard) and among the opponents of scientific determinism. Here I would like to point briefly to what might be called a French anti-deterministic tradition<sup>5</sup>, and in particular to some of its anti-deterministic arguments, which are to be found again in James' and Peirce's philosophy.

As already mentioned, Hacking emphasizes the year 1854 as a relevant point of reference for the emergence of the explicit concept of scientific determinism. This was the year in which the first of Charles Renouvier's *Essais de Critique générale* was published<sup>6</sup>. In his *Essais de Critique générale* and in many of his articles for the philosophical journal *La Critique philosophique* (founded by himself and his friend François Pillon) Charles Renouvier (1815–1903) refers to the concept of *déterminisme*, but the meaning of this word still oscillates between ethical and scientific determinism. Much of Renouvier's philosophical efforts have been in fact devoted to the defence of free will<sup>7</sup>, and his interest in scientific determinism seems to have been conditional on this issue. Here I shall try to focus mainly on Renouvier's concept of scientific determinism<sup>8</sup> and on some related arguments by Renouvier which are to be found in a similar form in James and Peirce.

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<sup>4</sup>Quetelet was in fact a *Belgian* French-speaking author, but he had close contacts to the French scientific community and his work shows certain continuity with the tradition of the French *mathématique sociale*.

<sup>5</sup>Indeed, if we intend the term 'tradition' *sensu stricto* not every French author who supported arguments against scientific determinism can be said to belong to the same tradition. In this paper I use the expression 'French anti-deterministic tradition' simply to recall the fact that many anti-deterministic arguments have been developed by French authors (in the second half of the 19<sup>th</sup> Century); among them, I consider here only those which have a close relationship with James' and Peirce's standpoints on the issue of determinism.

<sup>6</sup>Charles Renouvier's extensive philosophical work, which is often just mentioned *en passant* as a French version of Kantianism (even if Renouvier in fact criticized important aspects of Kant's philosophy), has been quite neglected by the recent philosophical literature. Perhaps this is going to change after two important articles by Warren Schmaus (2007; 2011) and—concerning especially the relationship between Renouvier and the classical pragmatism of James and Peirce—a new research project going on about *Idealism and Pragmatism* (<http://idealismandpragmatism.org/> website accessed on April 2<sup>nd</sup> 2014).

<sup>7</sup>Cf. Schmaus (2011), esp. § 3 and 4.

<sup>8</sup>It may be appropriate in this context to remind that Renouvier was not just a Kantian or idealist philosopher, but that he had studied mathematics and engineering at the École Polytechnique, where he had also worked under the direction of Comte (for an overview of Renouvier's life and work see Gunn (1932a; 1932b)).

In his first *Essai*<sup>9</sup> Renouvier not only criticizes quite in detail Laplace's theory of probability<sup>10</sup>, but he also mentions Laplace's *déterminisme* as a common assumption of natural scientists which he rejects as 'useless'—a quite pragmatic predicate, indeed<sup>11</sup>. The rejection of scientific determinism plays an important role also within the broader context of Renouvier's comprehensive criticism of Comte's positivistic philosophy: Renouvier not only rejects Comte's 'illegitimate induction' according to which all phenomena, including social and psychological ones, will be shown to follow the same deterministic laws as physical phenomena; but also, he criticizes Comte's ignorance with respect to the role played by probability and statistics in science<sup>12</sup>.

In his works Renouvier deals extensively with the dilemma of 'determinism vs. free will': this is presented, on the one hand, as a sort of Kantian antinomy, *i.e.* as a question which cannot really be answered<sup>13</sup>. On the other hand, as Gunn writes, 'we are presented with a system of antinomies *apparently* insoluble'<sup>14</sup>. In fact, especially in the second of his *Essais*, Renouvier offers an entire series of arguments in defence of free will and against determinism<sup>15</sup>. The crucial point to be considered is that the solution of the antinomies, from Renouvier's perspective, cannot be expected to derive from theoretical considerations or experimental results, but rather is reached through a *decision*. In fact, Renouvier supported a voluntaristic theory of knowledge: he emphasized how theories and statements, including scientific ones, can be justified and demonstrated only to a certain degree, and never completely; as a

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<sup>9</sup>The first *Essai* was published in 1854 with the title *Analyse générale de la Connaissance: Bornes de la connaissance*. The second *Essai*, which I will mention below, was published in 1859 with the title *L'homme: la raison, la passion, la liberté. La certitude, la probabilité morale*. Renouvier will publish a revised and enlarged version of both *Essais* with new, different titles in 1875. In the following I will refer to the first editions.

<sup>10</sup>Renouvier (1854) devotes the entire § XXXVIII ('Du nécessaire, du possible, du probable — Mesure de la probabilité — Prépositions modales') to the illustration of his views on probability, pointing to the relationship between this topic and the question of free will (cf. p. 247: 'La question que nous venons de traiter se lie intimement au problème fameux du libre arbitre et du déterminisme'). Renouvier expands then on the issue of probability in the Appendix IX (p. 587f.), where he comes to his criticism towards Laplace's conception of probability in conjunction with his determinism (see in particular p. 589).

<sup>11</sup> Cf. Renouvier (1854), p. 589: here Renouvier declares Laplacian determinism to be 'une profession de foi dans la nécessité, qui me semble a moins inutile, et par conséquent arbitraire' (*ibidem*, p. 589). See also the third of the arguments in favour of free will which Renouvier presents in the second of his *Essais*: Renouvier (1859), p. 608. Renouvier (1854, pp. 589–90) also offers an interesting criticism of the concept of causality and of the principle of sufficient reason.

<sup>12</sup>Cf. Schmaus (2011), pp. 77–78.

<sup>13</sup> At the end of the already mentioned Appendix IX Renouvier (1854, p. 595) argues: 'n'ai-je conclu qu'à une sorte de parité logique et expérimentale entre la thèse du *nécessaire* et l'antithèse du *contingent* [...]'. See also the fourth of the arguments in favour of free will which Renouvier presents in the second of his *Essais*: Renouvier (1875), p. 608.

<sup>14</sup>Gunn (1932b), p. 191; my emphasis. Gunn (*ibidem*, pp. 191–192) makes clear how Renouvier does in fact endeavour 'to cut the Gordian-knot' of the antinomies.

<sup>15</sup> Cf. Renouvier (1859), p. 607f, where the author presents a 'Récapitulation des Preuves de la Liberté'.

consequence, any belief in them requires a supplemental decision by the will<sup>16</sup>. This applies, of course, also to the belief in determinism: but then determinism cannot be true, since in the very moment in which we declare it as being true we are making use of our freedom, and thus (according to Renouvier) we are denying it<sup>17</sup>.

In general it may be argued that Renouvier's rejection of scientific determinism (which he regarded as incompatible with free will) follows from Renouvier's affirmation of the primacy of practical reason and action:

The practical reason must lay down its own basis and that of all true reason; for reason is not divided against itself; reason is not something apart from man; it is man, and man is never other than practical, *i.e.* acting.<sup>18</sup>

This primacy of action explains both Renouvier's already mentioned rejection of scientific determinism on the basis of epistemological voluntarism and a further argument of Renouvier's in favour of free will: we cannot dispense with the concept of free will if we want to make sense of human acts and behaviour, or of concepts like those of responsibility, regret, duty and reproach<sup>19</sup>. The admission of determinism would render nonsensical just as the *most* important realm of human morality and action<sup>20</sup>.

A 'voluntaristic argument' against scientific determinism very similar to Renouvier's one will be later put forward also by Henri Poincaré (1854–1912), in an article entitled 'Sur la valeur objective de la science' (Poincaré 1902a, 286):

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<sup>16</sup> Cf. esp. Renouvier (1859), Ch. XVII. On Renouvier's voluntaristic theory of knowledge cf. Gunn (1932b), esp. p. 193 and 198, and Schmaus (2011), esp. § 4. Gunn (1932a, p. 50) may also suggest that there was a religious side to Renouvier's voluntarism: referring to Renouvier's hostility toward the Roman Catholic Church and to his 'aggressive' Protestantism, Gunn notices: 'Certitude is, he [Renouvier] held, the fruit of intelligence, *heart, and will*, consequently it can never come about by the coercion of authority' (my emphasis).

<sup>17</sup> To see how, in Renouvier's philosophy, the affirmation of free will logically follows from his theory of knowledge, cf. the very beginning of his 'Récapitulation des Preuves de la Liberté' (Renouvier 1859, p. 607f.). Here Renouvier also notices ironically how it is precisely on liberty which depends 'cet ordre spéculatif où les philosophes ont travaillé vainement à s'affranchir de leur franc arbitre' (*Ibidem.*, p. 607).

<sup>18</sup> This is Gunn's English translation of an important passage from Renouvier's *Psychologisationnelle* (cit. in: Gunn 1932b, p. 196). The same passage is translated and put in the context of Renouvier's criticism of Kant by Schmaus (2011), p. 85.

<sup>19</sup>As Renouvier puts it, 'la croyance à l'ambiguïté des futurs est une condition de l'exercice moral de la conscience' (Renouvier 1859, p. 610).

<sup>20</sup>Cf. esp. the second part of Renouvier's 'Récapitulation des Preuves de la Liberté' (Renouvier 1859, p. 607f.), starting from his 6th argument in favour of free will: 'Les conséquences morales de l'hypothèse de la nécessité, dans la vie humaine, ne sont point de nature à être appliquées et pratiquées, quoi qu'on fasse. Elles amèneraient une perturbation complète de la conscience et de ses rapports'. Cf. also Schmaus (2011), esp. pp. 80–81 (on the concept of 'moral induction') and pp. 87–88.

Les lois expérimentales ne sont qu'approchées, et si quelques-unes nous apparaissent comme exactes, c'est que nous les avons artificiellement transformées en ce que j'ai appelé plus haut un principe. Cette transformation, nous l'avons faite librement, et comme le caprice qui nous a déterminés à la faire est quelque chose d'éminemment contingent, nous avons communiqué cette contingence à la loi elle-même. C'est en ce sens que nous avons le droit de dire que le déterminisme suppose la liberté, puisque c'est librement que nous devenons déterministes.

Poincaré's concept of exactness plays here the same role as Renouvier's concept of certitude: the voluntaristic claim is then that we cannot reach them without a free act or decision of the will. But this means that determinism comes to rest upon a free act or decision, thus contradicting itself.

Poincaré is not usually considered as an exponent of an anti-deterministic position. In fact, even in the very same article I have just mentioned he insists on the impossibility to prove that scientific determinism fails<sup>21</sup>. However, this impossibility was admitted by Renouvier as well, who for this reason spoke of an 'antinomy'. As already mentioned, Renouvier gave then his antinomy an anti-deterministic solution by referring to practice, and this applies in general also with respect to Poincaré's position. In fact, his fundamental work as a mathematical physicist on the three body problem<sup>22</sup> made clear just how distant the Laplacian ideal of perfect predictability is from real scientific practice. Whenever we consider a system with more than two bodies interacting with each other our prediction of the future development of the state of the system will be affected by a degree of approximation which increases with time. In many cases our knowledge of the state of the system deteriorates very quickly. In light of these precise scientific results of his, it is no wonder if Poincaré emphasized repeatedly the approximate and incomplete character of scientific laws. Sure enough, Poincaré 'reduced' chance (*le hasard*, or *le phénomène fortuit*) to a great amount of complexity and instability (non-linearity)—and in this sense he seems to have endorsed an epistemic, rather than ontological, concept of chance<sup>23</sup>. But it may also be argued that Poincaré endorsed a concept of *objective* chance, since he regarded it as having an intersubjective character and conceived of objectivity as intersubjectivity<sup>24</sup>. Moreover,

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<sup>21</sup> Cf. Poincaré (1902a), pp. 282–285.

<sup>22</sup> Poincaré (1890) and (1892–97). On Poincaré's work on the three body problem cf. Barrow-Green (1997).

<sup>23</sup> Cf. the chapter on 'Le hasard' in Poincaré's *Science et méthode* (Poincaré 1920 [1908]). An English translation of this chapter will be published in 1912 in *The Monist* (Poincaré 1912), the same journal in which Peirce—as we will see below—had developed his polemic against determinism in the 1890s.

<sup>24</sup> 'We have sought to define chance, and now it is proper to put a question. Has chance [...] objectivity?'; '[...] if it retains an objective character, it is because all men have approximately the same senses, the power of their

Poincaré held that ‘chance is something other than the name we give our ignorance’ (Poincaré 1912, 33) and recognized the importance of probability calculus in dealing with ‘fortuitous phenomena’ (Poincaré 1912) and within scientific practice in general (Poincaré 1902b, Ch. XI). For these reasons I would count Poincaré among the exponents of the French anti-deterministic ‘tradition’<sup>25</sup>.

But the French 19<sup>th</sup> century philosopher best known for his anti-deterministic arguments is probably Poincaré’s brother-in-law<sup>26</sup>, Émile Boutroux (1845–1921), author of a renowned book on the contingency of the laws of nature (*De la contingence des lois de la nature*, 1874<sup>27</sup>) and of a later work on the concept of law of nature (*De l’idée de loi naturelle dans la science et la philosophie contemporaines*, 1895). Boutroux’s palette of anti-deterministic arguments covers almost the entire spectrum of the main 19<sup>th</sup> century arguments against determinism<sup>28</sup>. Here I would like to mention briefly only those which are relevant for the following discussion of James’ and Peirce’s views.

Boutroux sees scientific determinism as a product of rationalism and as resulting from a deductivistic standpoint, which he criticizes in favour of an appraisal of observation, experiment and sense data<sup>29</sup>. He recommends not to mistake formal categories of the intellect, and especially deterministic relationships, for real properties of the world<sup>30</sup>.

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instruments is limited, and besides they use it only exceptionally’ (Poincaré 1912, p. 47 and 49 respectively). Cf. also Poincaré (1902a), p. 288: ‘Ce que nous garantit l’objectivité du monde dans lequel nous vivons, c’est que ce monde nous est commun avec d’autres êtres pensants’.

<sup>25</sup>The French authors I discuss in this section are only some amongst several French authors who held anti-deterministic standpoints. One could also mention, for example, the mathematician Joseph Valentin Boussinesq, as well as his mentor and friend Saint-Venant: they developed an anti-deterministic line of argument which was taken very seriously in the 1870s (cf. Romizi 2013, § 6.b). Later in the 19<sup>th</sup> Century and at the time around 1900 other French authors defended free will against determinism also on religious grounds (cf. Nye 1976 and 1979): among them were Maurice Blondel, student of Boutroux’s, and Edouard Le Roy, who will inherit Bergson’s chair for Philosophy: however, they focused rather on *ethical* than on scientific determinism.

<sup>26</sup> On the relationship between Boutroux’s and Poincaré’s philosophical work cf. Nye (1979), p. 117f.

<sup>27</sup> The book (Boutroux 1895 [1874]) is a revised and enlarged version of Boutroux’s PhD thesis, which was originally planned as a work on ‘Determinism in its connections with the physical and the moral sciences’. Cf. Heidelberger (2009), footnote 9.

<sup>28</sup>Cf. Romizi (2013), pp. 264–270. On Boutroux’s philosophy, with particular regard to his concept of a contingency of the laws of nature, cf. Boelitz (1907), Nye (1979, pp. 112–117) and esp. Heidelberger (2009).

<sup>29</sup> This is clear already from the ‘Introduction’ (Boutroux 1895 [1874], pp. 1–5), where Boutroux associates determinism with ‘la doctrine qui place dans l’entendement le point de vue suprême de la connaissance’ and complains that this doctrine ‘ne rend pas un compte suffisant de la nécessité absolue de l’observation et de l’expérimentation dans les sciences positives’ (*Ibidem*, pp. 4–5). Cf. also *Ibidem*, p. 133 (‘Lors même que la science a pu prendre la forme déductive, il ne s’ensuit pas que les conclusions en soient objectivement nécessaires’).

<sup>30</sup> Cf. for example Boutroux (1895 [1874]), p. 60: ‘La certitude singulière que présentent les mathématiques comme sciences abstraites ne nous autorise pas à regarder les abstractions mathématiques elles-mêmes, sous

Determinism is the product of a rationalist perspective which neglects many aspects of reality and focuses in particular on quantities: however, according to Boutroux, quantities grasp only a limited aspect of the qualities which experience reveals—thus, the validity of determinism must be restricted<sup>31</sup>. According to Boutroux, if we adopt an empirical standpoint, observation will show characters of reality which are not compatible with scientific determinism: indeterminacy, changeability, variety, individuality:

Tout ce que est possède des qualités et participe, á ce titre même, de l'indétermination et de la variabilité radicales qui sont de l'essence de la qualité. Ainsi, le principe de la permanence absolue de la quantité ne s'applique pas exactement aux choses réelles: celles-ci ont un fonds de vie et de changement qui ne s'épuise jamais.<sup>32</sup>

Variety, individuality, indeterminacy, and changeability increase, according to Boutroux, the more one ascends in the hierarchy of the different worlds which characterizes his emergentism: from the inorganic world to the world of the organisms, from this one to the world of the intellect and the will. Consequently, from Boutroux's standpoint, it is clear that the will is not reducible to the body and the living body is not reducible to inorganic bodies governed by deterministic laws<sup>33</sup>. Correspondingly, Boutroux dedicates the whole seventh chapter of his book on the contingency of the laws of nature to a relativization (which does not mean confutation or depreciation) of the results of experimental physiology and psychology, which, from Boutroux's standpoint, cannot affirm the validity of the

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leur forme rigide et monotone, comme l'image exacte de la réalité'. Cf. also p. 23: 'Ainsi la science a pour objet une forme purement abstraite et extérieure, qui ne préjuge pas la nature intime de l'être'.

<sup>31</sup> Cf. Boutroux (1895 [1874]), p. 136: '[...] la nécessité ne peut consister que dans le rapport quantitatif de l'antécédent à conséquent. Or la quantité ne se conçoit que comme mesure de la qualité, comme subordonnée à la qualité [...]']

<sup>32</sup>Boutroux (1895 [1874]), p. 60. Cf. also *Ibidem*, p. 25: 'Le progrès de l'observation révèle de plus en plus la richesse de propriétés, la variété, l'individualité, la vie, là où les apparences ne montraient que des masses uniformes et indistinctes'.

<sup>33</sup>Cf. Boutroux (1895 [1874]), pp. 132–133: 'On peut distinguer dans l'univers plusieurs mondes, qui forment comme des étages superposés les uns aux autres. Ce sont, au-dessus du monde de la pure nécessité, de la quantité sans qualité, qui est identique au néant, le monde des causes, le monde des notions, le monde mathématique, le monde physique, le monde vivant, et enfin le monde pensant. Chacun de ces mondes semble d'abord dépendre étroitement des mondes inférieurs, comme d'une fatalité externe, et tenir d'eux son existence et ses lois. [...] Cependant, si l'on soumet à un examen comparatif les concepts des principales formes de l'être, on voit qu'il est impossible de rattacher les formes supérieures aux formes inférieures par un lien de nécessité.'



deterministic laws governing matter beyond the physical world, *i.e.* in the realm of consciousness, thought and the will<sup>34</sup>.

The attempt to extend the validity of scientific determinism to consciousness and thought was rejected also by Henri Bergson, who studied with Boutroux between 1878 and 1881<sup>35</sup>. Like Boutroux, Bergson defended, against any rationalistic and mathematical standpoint, immediate experience as a source of knowledge (cf. esp. Bergson 1963 [1889]). Like Boutroux, he emphasized concepts as freedom, individuality and spontaneity as opposed to determinism. Finally, he also supported a kind of emergentism: in his famous work *L'évolution créatrice* (Bergson 1963 [1907]), he claims that nature and natural laws evolve in a way which brings about always something new and irreducible to the past—thus, something unpredictable. The argumentative line which rejects determinism by appealing to the irreducibility of present and future (new phenomena, new laws etc.) to the past had been supported for the first time probably by Theodore Fechner<sup>36</sup>, it was shared also by Boutroux and is to be found in Peirce as well, as we shall see below. It suggests the idea of an openness of the future, which makes room for something—as Peirce would say —‘really *sui generis* and new’.

It is a well-known fact that William James and—mainly through him—Charles S. Peirce had contacts with Renouvier, Boutroux and Bergson<sup>37</sup>. Here I shall not expand on the issue of the personal relationships among these authors, or on the question of their more or less mutual

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<sup>34</sup>Boutroux’s anti-reductionism is both ontological and epistemological, that is, it also means a pluralistic standpoint with respect to different sciences: cf. Heidelberger (2009), § 3, ‘The Disunity of Science’.

<sup>35</sup> Cf. the section on ‘Le déterminisme physique’ in his *Essai sur les données immédiates de la conscience* (Bergson 1963 [1889]), where he shows a notable acquaintance with the scientific theories of his days (both of the natural and of the social sciences). With respect to scientific determinism he points out that taking an abstract principle of mechanics as if it were a universal law is ‘une erreur d’ordre psychologique’ (*Ibidem*, p. 102).

<sup>36</sup>Cf. esp. Fechner (1849) and the corresponding analysis of Heidelberger (1993), in particular at p. 331. In the summer of 1908 James recommended Bergson to read Fechner’s *Zend-Avesta*: ‘[Fechner] seems to me of the real race of prophets, and I cannot help thinking that *you*, in particular, if not already acquainted with this book, would find it very stimulating and suggestive.’ At the beginning of the following year Bergson replied that he had not had the time to read it yet (cf. the correspondence between the two in Perry (1936), vol. II, pp. 627–629).

<sup>37</sup>James had much contact with Europe, where he received part of his education: it was as a student that he, in the late 1860s, began to deal enthusiastically with Renouvier’s philosophy. He then started a correspondence with the 27 years older Renouvier, which will continue until Renouvier’s death. The two met personally for the first time in 1880 in Avignon, during one of James’ European trips. During their long friendship James and Renouvier exchanged ideas, reviewed and translated each other’s works, often mentioned each other in their works, and James delivered articles for Renouvier’s journal *La Critique philosophique*. Their relationship is very well documented in Perry (1936), Ch. XLI, XLII (especially devoted to their exchange of views on freedom and determinism), and XLIII. With Boutroux and Bergson James developed a philosophical exchange and a close friendship later in his life (after James’ death, Boutroux would publish an intellectual biography of his friend). On James’ relationship with Boutroux and Bergson cf. Perry (1936), Ch. LXXXIII–LXXXVI (which contain also part of their correspondence), Girel (2003) and Sachs (2014), pp. 17–25.

influences: in the next two sections I shall rather focus on James' and Peirce's development of anti-deterministic lines of arguments similar to those considered in this section.

### 3. William James on Scientific Determinism

Charles Renouvier's anti-deterministic philosophy had on the young William James such an impact, that one may almost speak of a 'spiritual healing'. In 1869 a depressed James was persuaded 'that we are Nature through and through, that we are wholly conditioned, that not a wiggle of our will happens save as the result of physical laws'<sup>38</sup>. A year later, an enthusiastic adhesion to Renouvier's voluntaristic line of argument against determinism is recorded by James together with his recovery from depression<sup>39</sup>. It is no wonder, thus, that James, in his earliest letter to Renouvier, confesses that he owes it to Renouvier's philosophy, if he now possesses 'for the first time an intelligible and reasonable conception of freedom', and that it is through Renouvier's philosophy that he is 'beginning to experience a rebirth of the moral life'<sup>40</sup>.

James appreciated Renouvier's empiricism, from which the recognition of the dubiousness of knowledge in wide theoretical matters followed. From this recognition followed in turn, as already mentioned, Renouvier's epistemological voluntarism, which James' famous 'will to believe' is akin to<sup>41</sup>. Furthermore, James would publicly share Renouvier's anti-deterministic argument from epistemological voluntarism to the postulation of free-will:

In every wide theoretical conclusion we must seem more or less arbitrarily to *choose* our side. ... But if our choice is truly free, then the only possible way of getting at that truth is by the exercise of the freedom which it implies<sup>42</sup>.

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<sup>38</sup>Cit. in Perry (1936), vol. I, p. 654.

<sup>39</sup>Cf. Perry (1936), vol. I, p. 658.

<sup>40</sup>Cit. in Perry (1936), vol. I, p. 662. The letter, from Cambridge (Massachusetts), is dated Nov. 2, 1872.

<sup>41</sup>Cf. James (1927 [1896]).

<sup>42</sup>James' statement, published in 1876, is quoted in Perry (1936), vol. I, p. 658. In a later review of Renouvier's third *Essai* James has become more cautious but still accepts the essence of Renouvier's argument: 'if free-will be admitted at all into the Universe, it must be left as a legitimate 'methodological' factor in the construction of philosophy. For philosophies are acts. Whether men admit or deny the fact, passion always plays some part in making them reject or hold to systems, and volition, whether predestinate or unpredestinate, always will play a part in deciding when to encourage and when to suppress one's doubt. [...] The question of universal predestination [...] is theoretically insoluble. But if our wills *be* ever free from antecedent determination, what is more fit than that they should have a voice in acknowledging that truth, which by acting they create? We may, then, without shame postulate our freedom [...]' (James 1893, p. 214).

Noteworthy is the fact that James, in the dedication of his *Some Problems of Philosophy* (published posthumously in 1911) to Renouvier, retrospectively emphasizes *pluralism* as the character of Renouvier's philosophy which made the 'decisive impression' on him in the 1870s<sup>43</sup>. And we know precisely from the correspondence with Renouvier that James thought, at least in the early 1880s, that 'indeterminism and pluralism are the same thing'<sup>44</sup>. How should this statement be interpreted?

Long before his defence of an ontological pluralism in his *A Pluralistic Universe* (1928 [1909]), James emphasized in many of his writings a pluralism of perspectives, depending on the variety of the aims of human thought and action. This kind of 'pragmatist perspectivism'—as we may call it—becomes, in the context of James' philosophy, a main line of argument against scientific determinism. In 'The Sentiment of Rationality' (1879)<sup>45</sup> James conceives of determinism as the result of 'theoretic rationality', which is the label under which he comprises both science and philosophy insofar as they both tend 'to banish uncertainty from the future'<sup>46</sup>. This would be the reason of the resistance which science and philosophy offer against, for instance, miracles and free will, which imply uncertainty to some degree<sup>47</sup>. However, theoretical thinking and its abstract concepts can only grasp a part of reality and cannot exhaust its richness. This was also Boutroux's general criticism against determinism, as already mentioned. In fact, in the last years of his life and work James would emphasize his convergence with Boutroux and Bergson regarding the criticism of 'intellectualism'<sup>48</sup>: with this term James means the kind of radical rationalism which pretends to reduce reality to abstract and universal concepts, or—vice versa—which pretends that abstract concept

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<sup>43</sup> Cf. James (1916 [1911]), dedication: 'He [Charles Renouvier] was one of the greatest of philosophic characters, and but for the decisive impression made on me in the seventies by his masterly advocacy of pluralism, I might never have got free from the monistic superstition under which I had grown up. [...]'.

<sup>44</sup> This is mentioned by Renouvier in a letter to James dated Dec 28, 1882 and reported in Perry (1936), vol. I, p. 688f: 'To me your expression that *indeterminism and pluralism are the same thing* is very profound.' (*Ibidem*, p. 689).

<sup>45</sup> James (1927 [1879]). By the way, Renouvier wrote to James in a letter dated Aug. 21, 1879: 'As to the 'Sentiment of Rationality,' I have just finished a translation of it to which I have given all the attention and the care I am capable of... I count myself very fortunate to publish this fine piece of work in French, the more so because while we both have the same stock of ideas, make the same critical applications and reach the same general conclusion, your version of *criticisme* is presented with a startling originality [...]' (cit. in Perry 1936, vol. I, p. 669).

<sup>46</sup> James (1927 [1879]), p. 77.

<sup>47</sup> 'The wrath of science against miracles, of certain philosophers against the doctrine of free-will, has precisely the same root, - dislike to admit any ultimate factor in things which may rout our prevision or upset the stability of our outlook' (James 1927 [1879]), p. 80.

<sup>48</sup> Cf. James (1928 [1909]), Lecture VI: 'Bergson and his Critique of Intellectualism'.

would provide the true and exhaustive knowledge of reality<sup>49</sup>. Against this position all three philosophers—Boutroux, James and Bergson—developed, in different ways, a philosophy of immediate experience and action<sup>50</sup>.

In ‘The Sentiment of Rationality’ James connects the criticism of ‘intellectualism’ with his own kind of pragmatist perspectivism, and argues:

No abstract concept can be a valid substitute for a concrete reality except with reference to a particular interest in the conceiver. The interest of theoretic rationality [...] is but one of a thousand human purposes. When others rear their heads, it must pack up its little bundle and retire till its turn recurs.<sup>51</sup>

Theoretic rationality aims at prevision, certainty and determinacy, and it comes to a representation of reality which is coherent with this aims. But there are other, different aims, and theoretic rationality should not ‘choose some part of the world to interpret the whole by’<sup>52</sup>.

Besides ‘theoretic rationality’ there are, in James’ views, other kinds of rationality—as he would explain some years later in his article on ‘The Dilemma of Determinism’ (1884). Here he mentions, for example, a ‘moral’, a ‘mechanical’ and a ‘logical’ rationality<sup>53</sup>. This pluralism, again, becomes the starting point of an anti-deterministic line of argument. First, according to James, advocates of scientific determinism do not speak from a perspective which should be privileged because of its alleged objectivity, in contrast with an alleged purely subjective and emotional root of the belief in free will: to recognize this is for James a

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<sup>49</sup> Cf. James (1928 [1909]), p. 237: ‘Reality must be one and unalterable. Concepts, being themselves fixities, agree best with this fixed nature of truth, so that for any knowledge of ours to be quite true it must be knowledge by universal concepts rather than by particular experiences, for these notoriously are mutable and corruptible. This is the tradition known as rationalism in philosophy, and what I have called intellectualism is only the extreme application of it.’

<sup>50</sup>Cf. Perry (1936), vol. II, p. 567: ‘In an article entitled ‘A Great French Philosopher at Harvard’, which he wrote for the *Nation*, James gave Boutroux credit for being ‘the leader *de jure* of the reaction against the abstract, and in favour of the concrete point of view in philosophy’, explaining that Boutroux was the historic precursor of the movement which was represented in its more ‘strident’ and ‘revolutionary’ phases by Bergson and himself. ‘The most important features of ‘pragmatism’ and ‘Bergsonism’, he said, ‘find clear expression in *La Contingence des lois de la nature*, published by Boutroux over forty years before’.

<sup>51</sup> James (1927 [1879]), p. 70.

<sup>52</sup> Cf. the title of the 4th of the subtitles by means of which James summarizes the contents of his Lecture I in James (1928 [1909]): ‘The process of Philosophizing: Philosophers choose some part of the world to interpret the whole by’.

<sup>53</sup> James (1927 [1884]), p. 147.

necessary condition to start discussing about determinism at all<sup>54</sup>. Secondly, ‘moral rationality’, requires, from James’ point of view, the rejection of determinism in favour of free will. In fact, James defends an argument very similar to Renouvier’s claim according to which we cannot dispense with the assumption of free will if we want to be able to make sense of acts and behaviour. James summarizes his argument as follows:

I cannot understand the willingness to act [...] without the belief that acts are really good and bad. I cannot understand the belief that an act is bad, without regret it at its happening. I cannot understand regret without the admission of real, genuine possibilities in the world.<sup>55</sup>

Thus, James did not rest content with the idea of a pluralism of perspectives or rationalities, none of which should be privileged. He did, in fact, privilege one: the ethical one—which implies, in his view, the rejection of scientific determinism as *condition sine qua non* for the admission of free will.

James’ priorities affected also his conception of psychology. As I have already mentioned, one of the reasons why scientific determinism became explicit and fiercely debated in the second half of the 19<sup>th</sup> century was the successful application of the deterministic paradigm of physics to human mind and behaviour. This was due in particular to the development of experimental physiology and psychology: thus, it is noteworthy that James, as a professor of Anatomy and Physiology (1873–76), and later of Psychology, taught the first American course on experimental psychology, in 1875. This discipline was the main source of worries for the advocates of free will. However, already in 1878, in his article ‘Some Remarks on Spencer’s Definition of Mind as Correspondence’, James made clear that he would not commit to any mechanistic or deterministic conception of mind<sup>56</sup>. Later, in his *Principles of Psychology* (1890) James admits that Psychology as empirical science cannot develop any

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<sup>54</sup>Cf. James (1927 [1884]), pp. 147–148: ‘[...] if anyone pretends that while freedom and variety are, in the first instance, subjective demands, necessity and uniformity are something altogether different, I do not see how we can debate at all’.

<sup>55</sup> James (1927 [1884]), p. 175. An even subtler version of this argument appears already in 1882 precisely in a letter to Renouvier: ‘I believe more and more that free will, if accepted at all, must be accepted as a postulate in justification of our moral judgment that certain things already done might have been better done. This implies that something different was possible in their place. The determinist, who calls this judgment *false*, cannot consistently mean that so far as it actually was rendered, a truer judgment could have been in *its* place’ (James, cit. in Perry 1936, p. 682). I shall not go into more detail with respect of James’ argument in favour of *ethical* determinism, since my main focus here is *scientific* determinism.

<sup>56</sup>Vgl. James (1910 [1978]). This article got the appreciation of Renouvier, who in a letter to James dated May 14, 1878, writes: “I have received your ‘Remarks on [Spencer’s] Definition of Mind As Correspondence’, and have read them with the most lively interest. As regard the question of Spencer, the point of your attack is very well chosen, and your arguments striking...” (cit. in Perry (1936), vol. I, p. 667).

concept of mind which could solve the problem of the incompatibility between mechanical determinism and free will<sup>57</sup>. But he would not remain agnostic with respect to the problem of determinism. In his *Psychology: A Briefer Course* (1892) we find a further instance of his ‘pragmatist perspectivism’ as a starting point for relativizing, and then basically rejecting, the validity of scientific determinism:

Let psychology frankly admit that *for her scientific purposes* determinism may be *claimed*, and no one can find fault. If, then, it turns out later that the claim has only a relative purpose, and may be crossed by counter-claims, the readjustment can be made. Now ethics makes a counter-claim; and the present writer, for one, has no hesitation in regarding her claim as the stronger, and in assuming that our wills are ‘free’. For him, then, the deterministic assumption of psychology is merely provisional and methodological<sup>58</sup>.

The already mentioned article on ‘The Dilemma of Determinism’ (1884) presents one of the earliest occurrences of the dichotomy ‘determinism vs. indeterminism’ in the sense of *scientific* determinism and indeterminism. James defines the two concepts as follows:

[Determinism] professes that those parts of the universe already laid down absolutely appoint and decree what the other parts shall be. [...]

Indeterminism, on the contrary, says that the parts have a certain amount of loose play on one another, so that the laying down of one of them does not necessarily determine what the others shall be.<sup>59</sup>

If we compare these definitions with James’ defence of pluralism in his *A Pluralistic Universe*, published a year before his death, we come to understand why James supported the view according to which ‘indeterminism and pluralism are the same thing’:

What pluralists say is that a universe *really connected loosely* [...] is possible, and that for certain reasons it is the hypothesis to be preferred<sup>60</sup>.

In the light of the aforementioned evidence we also know that these reasons were for James especially those of ‘moral rationality’. If we finally add to the picture the definitions of

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<sup>57</sup>James (1998 [1890]), vol. 2, p. 572f.

<sup>58</sup>James (1984 [1892]), p. 395.

<sup>59</sup>James (1927 [1884]), pp. 150–151.

<sup>60</sup>James (1928 [1909]), p. 76. Pape (2002, p. 14) suggests that the category of ‘real possibility’ must play a decisive role within a philosophy based on the concept of action. This issue implies of course, from a logical point of view, further reflections on modality.

empiricism and rationalism that James gives in the very same book, an ‘axis’ empiricism-pluralism-indeterminism emerges, which James opposes to the ‘axis’ rationalism-monism-determinism:

Reduced to their most pregnant difference, *empiricism means the habit of explaining wholes by parts, and rationalism means the habit of explaining parts by wholes*. Rationalism thus preserves affinities with monism, since wholeness goes with union, while empiricism inclines to pluralistic views.<sup>61</sup>

In sum, indeed James (like Renouvier) held the dilemma ‘determinism vs. indeterminism’ to be theoretically insoluble; and he admitted that scientists and philosophers may decide to assume the validity of determinism while trying to ‘banish uncertainty’. However, an empiricist standpoint would suggest to stick to the ‘parts’ as the starting point of our explanations and to be cautious in postulating a fully connected ‘whole’ beyond them. Moreover, precisely because the dilemma ‘determinism vs. indeterminism’ is theoretically insoluble we have to *decide* what to believe—and from a pragmatist point of view the criteria for this decision would be our aims and the practical consequences of our commitment to determinism or to indeterminism. From this perspective, according to James, we have good reasons for preferring indeterminism: James holds indeterminism to be a necessary condition for admitting free will, and, in turn, it is only by admitting free will that ‘moral rationality’ can account for human behaviour and acts. Since ‘moral rationality’, or practical reason, has the primacy over theoretical thinking within James’ philosophy (as it follows even from his epistemological voluntarism alone), it is clear, from his point of view, that we should believe in indeterminism.

#### 4. Charles S. Peirce on Scientific Determinism

‘The position we are rescuing is “Tychism”’—wrote James to Bergson on June 13, 1907<sup>62</sup>. The term was borrowed from his friend Charles Peirce<sup>63</sup>, who had defended the correspondent indeterministic (‘Tyche’ is the ancient Greek term for chance) philosophy

<sup>61</sup> James (1928 [1909]), pp. 7–8.

<sup>62</sup>Quoted in Perry (1936), vol. II, p. 619.

<sup>63</sup>Even if - as it is well-known - there were important differences between James’ and Peirce’s conception of pragmatism (an issue that cannot be further inquired in the context of this paper), it seems that precisely on the issue of determinism the two reached a considerable agreement: see Bernstein (2011), pp. 54–56.

already in the 1890s, in the journal *The Monist*. In a series of articles published between 1891 and 1893 in this journal, Peirce developed his indeterministic ‘Cosmogonic Philosophy’ against ‘the doctrine of necessity’ and provoked a debate in which also Paul Carus—as editor of the journal—and John Dewey became involved. An article by Peirce in 1891, where he drafts an evolutionary and indeterministic ‘Cosmogonic Philosophy’ started the series (Peirce 1891). In a second article published in the following year, Peirce puts forward a circumstantial attack on the ‘doctrine of necessity’—as he calls scientific determinism (Peirce 1892)<sup>64</sup>. This article provoked a reply by Carus (1892a; 1892b) in defence of determinism. In two following articles Peirce (1893a; 1893b) continued to develop his Tychism and replied in turn to Carus’ objections. Finally, also John Dewey (1893) intervened in the debate: in his article the concepts of ‘necessity’ and ‘chance’ are analysed mainly from a purely epistemic (and not metaphysical) point of view.

Peirce focused on scientific determinism rather than on the problem of free will. However, Carus addressed the problem in a way which made clear the ethical implications of the debate: he put it as a matter of conflicting ‘world-conceptions’, he stated that the problem was ‘...of great consequence in practical life...’; finally, he even referred to necessity and chance as to two different ideas of God ‘from which we derive our rules of conduct’. According to him, if we take our standpoint with respect to the question of scientific determinism seriously, ‘we shall as a matter of consistency have to [endorse correspondent] views of ethics also’<sup>65</sup>.

The entire debate is characterized by a high degree of complexity and by very detailed arguments and counterarguments. Here I shall only try to reconstruct systematically and

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<sup>64</sup> In the same year, but in another article, Peirce explained in a footnote that Renouvier appeared to share his opinion regarding the existence of ‘absolute chance’ in the universe (cf. Peirce 2010 [1892], p. 165). I thank David Wagner for having pointed out this to me. To him I also owe the information according to which Peirce came to know of Renouvier through James in 1891, while his first drafts of Tychism date back to an earlier time. Thus, it seems that Peirce did not develop the very idea of Tychism under the influence of Renouvier. However, after 1891 Peirce had certainly an intellectual exchange with Renouvier. It is not clear whether Peirce had personal contacts also with Boutroux and Bergson, but it is likely that they knew about each other’s philosophy through James. Hacking (1990, p. 157) argues that ‘We must not discount the importance of Renouvier for Peirce’, and he comments on their relationship emphasizing two main differences: first, Renouvier left the antinomy ‘determinism vs. indeterminism’ open and to be solved only by transcendental analysis, while Peirce had ‘a firm one-sided thesis’. Secondly, other than Renouvier (and James), Peirce ‘was rightly very cautious in connecting his anti-determinism with “free will”’.

<sup>65</sup>Carus (1892a), p. 560 and 582.



briefly Peirce's main line of argument—which is a very difficult task in itself, since his analyses are very circumstantial and sometimes quite obscure<sup>66</sup>.

To begin with, we can identify Peirce's *pars destruens*, that is, his main arguments against scientific determinism or, as he calls it, 'the doctrine of necessity'. Particularly interesting is the way in which Peirce let a certain tautological character of determinism emerge. Referring to Democritus as to the first advocate of scientific determinism, he remarks:

[H]aving restricted his attention to a field where no influence other than mechanical constrain could possibly come before his notice, he [Democritus] straightaway jumped to the conclusion that throughout the universe that was the sole principle of action.<sup>67</sup>

As Boutroux had already pointed out, scientific determinism is valid only after we have reduced reality to some properties—typically the quantifiable ones. Of course it is part of scientific modelling to restrict the attention to those properties of reality which are measurable and which recur in a way which allows us to predict: however, we should not forget afterwards how many aspects of reality we have excluded. We should not—using James' words—'choose some part of the world to interpret the whole by'. It is no wonder that we end up with a deterministic image of the world if we have bracketed off all indeterministic properties.

Peirce also rejects the classical Kantian idea according to which scientific determinism is a necessary presupposition of science. Peirce just does not share the classical, rationalistic and deductivistic conception of science which for a long time had supported scientific determinism (Cf. Romizi 2013, Ch. 2). He endorses a modern, empiricist and probabilistic conception of science instead:

Considering [...] that the conclusions of science make no pretense to being more than probable, and considering that a probable inference can at most only suppose something to be most frequently, or otherwise approximately, true, but never that anything is precisely true without exception throughout the universe, we see how far this proposition [*i.e.* the doctrine of necessity] in truth is from being so postulated.

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<sup>66</sup> Cf. for instance Peirce (1892), p. 335: 'But I must leave undeveloped the chief of my reasons, and I can only adumbrate it. The hypothesis of chance-spontaneity is one whose inevitable consequences are capable of being traced out with mathematical precision into considerable detail. Much of this I have done and find the consequences to agree with observed facts to an extent which seems to me remarkable. But the matter and the methods of reasoning are novel, and I have no right to promise that other mathematicians shall find my deductions as satisfactory as I myself do, so that the strongest reason for my belief must for the present remain a private reason of my own [...]'.  
<sup>67</sup> Peirce (1892), S. 321.

Porter and Hacking have convincingly argued that Peirce's probabilism rooted in his long professional activity as a measurer at the *Coast and Geodetic Survey*, which made him familiar with the statistical methods of error theory and with the probabilistic nature of measurement results<sup>68</sup>.

Finally, according to Peirce, scientific determinism does not receive support *a posteriori* either—on the contrary:

Those observations which are generally adduced in favor of mechanical causation simply prove that there is an element of regularity in nature, and have no bearing whatever upon the question of whether such regularity is exact and universal, or not. Nay, in regard to this exactitude, all observation is directly opposed to it; [...] Try to verify any law of nature, and you will find that the more precise your observations, the more certain they will be to show irregular departures from the law. We are accustomed to ascribe these, and I do not say wrongly, to errors of observation; yet we cannot usually account for such errors in any antecedently probable way.

This last sentence, which is not very clear, I interpret as follows: before we have collected the data ('antecedently') we cannot give any explanation of the irregularities that will emerge *after* we have collected the data. If we, *a posteriori*, reduce these irregularities to errors of observation we are implicitly assuming the validity of determinism (for this reason we call them 'errors'): but this means begging the question<sup>69</sup>.

These seem to be the main arguments of Peirce's *pars destruens*, that is, against scientific determinism. Peirce's *pars construens* corresponds to his indeterministic 'cosmogonic philosophy'. One can identify a sort of bridge between these two parts, which is a general abductive argument. In fact, Peirce's general argumentative strategy against determinism and in favour of indeterminism seems to be an abductive one: Peirce believed that there is a set of facts which the determinist cannot explain and which his indeterministic cosmogonic philosophy can explain instead.

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<sup>68</sup>Cf. Porter (1986), p. 220, Hacking (1990), pp. 202–203, and—on Peirce's work at the *Coast and Geodetic Survey*—also Pape (2002), p. 41. The following passage by Peirce supports, for example, Hacking's and Porter's hypothesis: 'For the essence of the necessitarian position is that certain continuous quantities have certain exact values. Now, how can observation determine the value of such a quantity with a probable error absolutely *nil*? To one who is behind the scenes, and knows that the most refined comparisons of masses, lengths, and angles, far surpassing in precision all other measurements, yet fall behind the accuracy of bank-accounts, and that the ordinary determinations of physical constants, such as appear from month to month in the journals, are about on a par with an upholsterer's measurements of carpets and curtains, the idea of mathematical exactitude being demonstrated in a laboratory will appear simply ridiculous' (Peirce 1892, p. 328).

<sup>69</sup> Cosculluela (1992, p. 744) seems to share this interpretation.

These facts are<sup>70</sup>, first, *growth* and *increasing complexity*<sup>71</sup>. The determinist is committed to the law of conservation of matter and energy and to the reversibility of phenomena: for Peirce it is—as he says—‘an immediate corollary’ that growth is not explicable by those laws<sup>72</sup>. Secondly, the determinist cannot give a satisfactory account of *variety and spontaneity* either, by which Peirce means ‘the really *sui generis* and new’<sup>73</sup>: ‘Exact law’—writes Peirce (1891, 165)—‘obviously never can produce heterogeneity out of homogeneity’. A third phenomenon which determinism cannot explain is *irregularity*: according to Peirce, determinism excludes real deviations from laws by definition<sup>74</sup>. It is striking that all the phenomena mentioned by now are the same phenomena which Boutroux and Bergson (growth, variety, spontaneity), as well as Poincaré (complexity, irregularity) were pointing to in the same period (between the 1870s and the first decade of the 20<sup>th</sup> Century).

However, according to Peirce, determinism does not even explain *the existence of laws*, since it simply postulates their existence and their absolute character. Peirce, instead, requires an explanation of natural laws, of their origin, of their properties, of some surprising similarities among them: ‘these things— he writes—call for explanation; yet no explanation of them can be given, if the laws are fundamentally original and absolute’<sup>75</sup>. Here lies, to my mind, a crucial insight by Peirce, as well as a crucial point in his abductive line of argument: it is preferable, or more plausible, to explain the emergence of regularity and laws out of irregularity than to explain irregularity after having postulated absolute laws.

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<sup>70</sup> The following ‘list’ is based mainly on Peirce (1892), pp. 333–334 and Peirce (1893b), pp. 561f.

<sup>71</sup> ‘Question any science which deals with the course of time. Consider the life of an individual animal or plant, or of a mind. Glance at the history of states, of institutions, of language, of ideas. Examine the successions of forms shown by paleontology, the history of the globe as set forth in geology, of what the astronomer is able to make out concerning the changes of stellar systems. Everywhere the main fact is growth and increasing complexity’ (Peirce 1892, p. 333).

<sup>72</sup> Cf. Peirce (1893b), pp. 562–64, for the detailed argument.

<sup>73</sup> Peirce (1892), p. 334). Cf. also Peirce (1891), p. 174.

<sup>74</sup> The following passage makes clear Peirce’s conception of “irregularity” and seems to corroborate again Porter’s and Hacking’s thesis according to which Peirce spoke in the light of his experience as a measurer at the *Coast and Geodetic Survey*: ‘Just as, when we attempt to verify any physical law, we find our observations cannot be precisely satisfied by it, and rightly attribute the discrepancy to errors of observation, so we must suppose far more minute discrepancies to exist owing to the imperfect cogency of the law itself, to a certain swerving of the facts from any definite formula’ (Peirce 1891, p. 165).

<sup>75</sup> Peirce (1893b), pp. 564–565. Beside (1) growth and complexity, (2) variety and spontaneity, (3) irregularity, and (4) the existence of laws, there is a fifth ensemble of phenomena which determinism cannot explain, while indeterminism, according to Peirce, does: (5) mind, consciousness and feeling. Peirce tends to identify determinism with materialism and mechanism, and he argues that from this standpoint it is impossible to explain these phenomena: ‘that a certain mechanism will feel is a hypothesis absolutely irreducible to reason’ (Peirce 1891, p. 170). In the context of this article I shall leave aside the issue of Peirce’s idealism, since it would require an article in itself. I can only mention again the new research project going on about *Idealism and Pragmatism* (<http://idealismandpragmatism.org/> website accessed on April 2<sup>nd</sup> 2014), which will certainly provide new insights on the topic.

As an explanation of the emergence of laws out of irregularity Peirce offers his indeterministic cosmogonic philosophy, which of course is also meant to explain the other facts (growth, variety, etc.), which scientific determinism, according to Peirce, cannot explain. The summary of Peirce's indeterministic cosmogonic philosophy sounds admittedly a bit oracular: 'Chance is First, Law is Second, the tendency to take habits is Third. Mind is First, Matter is Second, Evolution is Third'<sup>76</sup>. Here I shall leave aside the second series (mind, matter, evolution) –the analysis of which would lead us to issues far beyond the scope of this article—and try to briefly explain the first one, instead.

'Chance is First': while determinism postulates laws as fundamental, Peirce postulates a primordial chaos<sup>77</sup>. Needless to say, Peirce's cosmogonic philosophy implies the rejection of the classical epistemic conception of chance as a product of ignorance:

[...] chance [...] is not the mere creature of our ignorance. It is that diversity and variety of things and events which law does not prevent. Such is that real chance upon which the kinetical theory of gases, and the doctrines of political economy, depend. To say that it is not absolute is to say that it, - this diversity, this specificalness, - can be explained as a consequence of law. But this is [...] logically absurd.<sup>78</sup>

According to Peirce, chance is real, while determinism is based on abstract or ideal constructions which only have a formal character. In rejecting Carus' aprioristic and formalistic line of argument in favour of determinism<sup>79</sup>, Peirce employs a similar argumentative strategy as Boutroux and James: he restricts the validity of determinism to the formal aspects of reality<sup>80</sup> and points to the fact that—as he says— 'there is all the difference between the ideal and the real'<sup>81</sup>.

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<sup>76</sup> Cf. Peirce (1891), p. 175.

<sup>77</sup> Cf. Peirce (1891), p. 176: '[...] in the beginning, - infinitely remote, - there was a chaos of unpersonalised feeling, which being without connection or regularity would properly be without existence.'

<sup>78</sup> Peirce (1893b), p. 560. Noteworthy in this passage is the identification of diversity and variety with chance: it becomes almost tautological, then, to say that Peirce's indeterministic cosmology explains diversity and variety. In fact, rather than to explain them, Peirce just postulates their existence, together with the existence of chance, as primordial: in this respect, he does not explain irregularity better than the determinist explains regularity. Probably Peirce found deviations from law self-evident, while the exact and universal validity of law does not seem to be so.

<sup>79</sup> Carus argued that scientific determinism has the same validity of (valid) mathematical propositions and of the principle of sufficient reason (cf. esp. Carus 1892a, p. 568 and § VII, as well as Carus 1892b, pp. 77–78).

<sup>80</sup> Cf. for example Peirce (1893b), p. 534 (my emphasis): '[...] the propositions of arithmetic, which Dr. Carus usually adduces as examples of formal law (§15), are, in fact, only corollaries from definitions. They are certain *only as applied to ideal construction* [...]'. And also: 'Dr. Carus argues that whatever is unequivocally determinate is necessary. [...] But the expression used, *eindeutig bestimmt*, merely expresses a mathematical determination, and therefore no real necessity ensues' (Peirce 1893b, p. 537). Anyway, Peirce regarded even analytical propositions as *not* being 'perfectly certain': 'Deduction is really a matter of perception and of

According to Peirce's indeterministic cosmology, it is from a real, primordial chaos that a regularity would arise, following an evolutionary pattern: 'the germ of a generalising tendency' would emerge from 'pure arbitrariness' ('Law is Second'), and then, as a third step in Peirce's cosmogony, a 'tendency to habit would be started; and from this with the other principles of evolution all the regularities of the universe would be evolved' (Peirce 1891, 176). Note that, despite the emergence of these regularities, 'an element of pure chance survives and will remain until the world becomes an absolutely perfect, rational, and symmetrical system [...] in the infinitely distant future' (*Ibidem*).

Admittedly, Peirce's narrative sounds like a mythological, certainly metaphysical, cosmogony. But his concept of an evolution from chaos to regularity strongly reminds the frequentist account of the emergence of statistical laws from stochastic systems. The assumption of the chance character of single events as a starting point to explain the emergence of statistical regularities in the long run is a typical feature of frequentism, as an empirical interpretation of probability<sup>82</sup>. While a full-fledged and systematic version of frequentism would be developed only in 1919 by the mathematician and engineer Richard von Mises (1919a, 1919b), authors like the physicist and psychologist Theodor Fechner (in the second half of the 19<sup>th</sup> Century) and the physicist Franz Serafin Exner (in the first decade of the 20<sup>th</sup> Century) had thought already earlier of real chance as a condition of possibility of laws<sup>83</sup>. Peirce's 'Tychism' was evidently a quite eccentric elaboration of ideas which were spreading among scientists between the late 19<sup>th</sup> and the early 20<sup>th</sup> Century together with the recognition of the fundamental role of probability within scientific practice.

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experimentation, just as induction and hypothetic inference are; only, the perception and experimentation are concerned with imaginary objects instead of with real ones. The operations of perception and of experimentation are subject to error, and therefore it is only in a Pickwickian sense that mathematical reasoning can be said to be perfectly certain.' (Peirce 1892b, p. 534).

<sup>81</sup> Peirce (1892b), p. 536. Cf. also p. 558: 'Forms may indulge in whatever eccentricities they please in the world of dreams, without responsibility; but when they attempt that kind of thing in the world of real existence, they must expect to have their conduct inquired into'.

<sup>82</sup> Cf. Gillies (2000), Ch. 5.

<sup>83</sup> Cf. Fechner's *Kollektivmaßlehre*, published posthumous in 1897, and Exner (1909), esp. pp. 13–16. On Fechner's theory of probability, cf. Heidelberger (1987) and (1993), §§7.4 and 7.5. On Exner's indeterminism cf. Stöltzner (1999).

## 5. Closing remarks: Pragmatism, Metaphysics and Science

At the end of this historical-philosophical reconstruction it is appropriate to recall the philosophical problem mentioned at the beginning of this paper and related to the very general issue considered in this volume, *Logical Empiricism and Pragmatism*. From the standpoint of Logical Empiricism, and in particular according to the Vienna Circle's 'scientific world-conception'<sup>84</sup>, the problem of scientific determinism would certainly be classified as 'metaphysics' and, to this effect, as meaningless. Classical scientific determinism is namely a 'theory about the world' (considered as a whole), and, as such, it would elude the requirement of verifiability, and therefore of meaningfulness<sup>85</sup>.

Moreover, from the standpoint of Logical Empiricism, philosophies like those of Boutroux's and Bergson's were highly suspected of irrationalism<sup>86</sup>, and a theory like Peirce's 'Tychism' was—using Carnap's terms—'hardly acceptable'<sup>87</sup>.

Still, as we have seen, most arguments against scientific determinism put forward (well before the 'indeterministic turn' of quantum mechanics) by Renouvier, Boutroux, Poincaré and Bergson, as well as by James and Peirce, were not just a metaphysical or irrationalistic reaction against science. They were rooted, at least in part, in an empiricist attitude, which emphasized the value of experience, observation and practice against a deductivist, rationalistic and theoretical standpoint. Laplacian determinism, insofar as it affirms predictability in terms of calculability, bears essentially on mathematics, so that its alleged material and universal truth is conditional upon the assumption that mathematical models represent reality in a univocal and exhaustive way. However, some of the arguments I have considered in the previous section draw the attention to the fact that mathematical models

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<sup>84</sup> With the 'scientific world-conception' and the rejection of metaphysics entailed in it I have dealt elsewhere: cf. Romizi (2012), esp. Section 2.

<sup>85</sup> On the rejection of 'theories about the world' as metaphysical and meaningless on the base of the 'scientific world-conception' cf. Romizi (2012), p. 215.

<sup>86</sup> Cf., for instance, Edgar Zilsel's comments on Boutroux's and Bergson's philosophy in his *Das Anwendungsproblem* (Zilsel 1916), p. 145. Here he complains that Boutroux and Bergson would disdain rationality, which, for Bergson, would even be the "radical evil". On the contrary, Perry (1936, vol. 2, p. 602) argues that both 'James and Bergson agree [...] in assigning a cognitive role both to concepts and to immediate experience.' Most interestingly, Perry (*Ibidem*) presents James and Bergson as dealing with a philosophical problem which corresponds exactly to the problem Zilsel deals with in his *Anwendungsproblem*, the 'application problem': according to Perry, 'Both philosophers [*i.e.* James and Bergson] recognize the problem of accounting for the fact that concepts somehow *work* – for even though concepts do, unless properly supplemented, misrepresent reality, it is nevertheless inherent in the nature of reality that it should be misrepresentable in precisely this manner'.

<sup>87</sup> Cf. Pasquinelli (1979), p. 50.

are the result of just *one* possible perspective on reality and offer a *selective* representation of it (which is implicit in the very concept of ‘model’). Such a perspective does indeed work to a certain extent and fits specific aims, but cannot be taken as exhaustive with respect to reality and experience—which are much more complex, rich and irregular. As soon as we renounce to assume *a priori* the absolute validity of theoretical or mathematical models and we ascribe epistemological priority to experience and scientific practice instead, we are faced with approximation, uncertainty, complexity, irregularity and probability, as well as with qualitative aspects of reality that can hardly be entirely forced into the formal, mathematical deterministic scheme.

But of course, from the standpoint of Logical Empiricism the very concept of a reality in itself should be rejected as a metaphysical one, since we cannot meaningfully express the alleged knowledge of a reality taken to be independent of our knowing it. From a verificationist point of view there is no meaningful way to distinguish statements referring to reality as we (intersubjectively) know it and statements referring to reality ‘in itself’.

Notice, however, that all of the authors I have dealt with in the previous sections perfectly recognized that the dilemma ‘determinism vs. indeterminism’ is *in principle* theoretically insoluble, or, in other words, that neither scientific determinism nor indeterminism is verifiable. Why bothering, then? Does the pragmatist way of dealing with scientific determinism give us any hint about the function that metaphysics could have with respect to science?

The key insight for answering this question lies in the fact that a pragmatist attitude—like that of Renouvier (‘man is never other than practical, *i.e.* acting’), James and Peirce—suggests to conceive of science not only as a set of theories, but also as a practice. The pragmatist attitude points to the fact that science is an activity directed towards specific aims or towards the fulfilment of a certain ideal of knowledge. I would call it a *dynamical* conception of science. Insofar as science is characterized by this goal-directedness, it cannot simply—so to say—stick to the verified or verifiable facts: scientists must possess an idea of how reality is, or at least an ideal of how scientific theories should look like, in order to *decide what to search for* and in what *direction* their theories should be *developed*. The case of quantum mechanics has shown in the meanwhile that scientists could either rest content with an indeterministic theory or decide to try hard towards reaching a deterministic one, depending on their (speculative, metaphysical) idea of how reality is or on their ideal of how

a true physical theory should look like. As to the role of the concept of reality in itself: believing that there is a reality which goes beyond our knowledge (as it is available at the moment) appears to be a main motor to go on with scientific inquiries. Imagining how this reality could be, for example assuming it to be fundamentally deterministic or indeterministic, can certainly influence the direction of future research.

In his 'Philosophical Conceptions and Practical Results', James formulates what he calls 'Peirce's principle' as follows:

To develop a thought's meaning we need only determine what conduct it is fitted to produce; that conduct is for us its sole significance.<sup>88</sup>

From a pragmatist point of view the *meaning* of a thought is strictly related to its practical consequences. Some metaphysical concepts—like determinism and indeterminism—appears to have consequences not only for practical life in general, but also, specifically, for scientific practice. Thus, from a pragmatist standpoint not all metaphysics can be regarded as *meaningless*.

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<sup>88</sup> James (1920 [1898]), p. 411.



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