

Chapter 2

The Young Philosopher of Mathematics

2.1 The Choice of the Philosophy of Mathematics

Wiener's doctoral thesis was very technical. He was eager to make an original contribution to formal logic, and this was what had prompted him to ask to do his doctoral dissertation in this discipline under Royce. The latter would have accepted to be his supervisor, but his state of health had worsened. Wiener was therefore entrusted to the care of Karl Schmidt at Tufts College. The topic chosen was strictly technical: *A comparison between the treatment of the algebra of relatives by Schröder and that by Whitehead and Russell*.¹

The “algebra of relatives” by Ernst Schröder (1841–1902) constituted a systematization of the work on the logic of relations by C.S. Peirce. The logic of relations is a fundamental chapter of formal logic, which was developed by both Peirce and Schröder in the form of Boolean algebra. The logic of relations exposed in Russell and Whitehead's *Principia*, although largely modeled on the one by Peirce, had adopted the propositional formalism introduced by Peano. However, it is very likely that the choice of focusing on the logic of relations was also correlated with metaphysical questions, considering that the issue of relations was one of the hottest spots in contemporary epistemological debates, already discussed by Bradley and Royce. And it was also one of the main aspects of the neo-realist controversy.

The dissertation set out to examine the state of the art in the logic of relations. This research called for a strong formal commitment, as it set out to test by demonstrative procedures that the two formulations, algebraic and propositional, were equivalent (Cf. Mangione and Bozzi 1995). His teachers thus urged Wiener to study abstract algebra.

After discussion of the dissertation, his philosophical orientation seemed clear, and it was thought that he should follow the Ph.D. with 2 years of postdoctoral

¹Letter for doctoral submission, cit. by Grattan-Guinness 1975, 132.

studies in one of the major centers for the study of logic in Europe. As the first hypothesis of studying with Peano was abandoned on the advice of his supervisors, it was considered that the ideal place to continue those studies would have been Russell's school in Cambridge. As Leo Wiener wrote to Russell in 1913: "His [Norbert's] predilection is entirely for Modern Logic, and he wishes during his one or 2 years' stay in Europe to be benefited from those who have done distinguished work in that direction".²

Norbert Wiener arrived in Cambridge in September 1913. He spent the second half of the first year at the University of Göttingen, with Edmund Husserl, as had already been planned for some time, since Russell was due to be absent, because teaching in Harvard. The second AY (1914–1915) was disrupted by the war and, on the advice of Russell, it was finished at Columbia University in New York, under John Dewey.

Although half way between philosophy and mathematics, logic was then even more than today a philosophical discipline, so Wiener went to Europe as a young philosopher to study with philosophers, in the perspective of a philosophical academic career. This point should be stressed because the autobiography suffers from a kind of amnesia in this respect, dwelling rather on complementary experiences in math or physics, rather than on the central part occupied by philosophical studies. At Trinity College he followed the courses of some of the most prominent philosophers of the day: McTaggart, Moore, and Russell.

"I can't imagine what on earth you are doing with McTaggart unless you are reading Hegel or drinking whiskey",³ Eliot wrote jokingly to his friend Wiener. McTaggart was a neo-idealist who, more than Bradley, had remained faithful to the philosophy of Hegel, of whom he was a translator and commentator. He differed from Hegel as he denied that the real was rational even as it appears in the present. In his view, current reality is contingent and imperfect, as it appears to be sensitive to knowledge and it is only through the dialectical process that it tends towards its future realization as rationality and perfection. This reassessment of contingency may have influenced Wiener, resonating with the ideas already acquired from James, Royce, and Bergson. In this sense Wiener may have felt somewhat more "at home" listening to McTaggart than to George E. Moore (1873–1958), the realist discourse of which had arisen in direct contrast to neo-idealism, especially in the form that it had taken with Bradley, and was explicitly expressed in the Scottish tradition which defended the beliefs of common sense. The first belief to defend according to Moore was the one concerning the existence of material objects which, in his opinion, remained as they were, whether or not there was a subject to perceive them. The relationships between objects were also exclusively external and not likely to affect their properties.

Moore's main interest was in ethics, thought of as an objective science that deals with realities we call "goods". In his opinion, just as anyone knows what the color

²Leo Wiener to Bertrand Russell, 15 June 1913, cit. by Russell 1967, 223–224.

³Eliot to Wiener, end of year 1914 (WAMIT). Cit. by Masani 1990, 60.

yellow is, so everybody knows what “good” is: the purpose of ethics is to analyze the nature of goodness in general, and to determine the direction in which an action can be said to be good.

2.2 Bertrand Russell

Bertrand Russell held positions similar to the realism of G.E. Moore. He had been initiated into the philosophy of Hegel, sharing the stance of Bradley, but later converting to realism. Russell writes:

[G.E. Moore] also had a Hegelian period [...] He took the lead in rebellion, and I followed, with a sense of emancipation. Bradley argued that everything common sense believes in is mere appearance; we reverted to the opposite extreme, and thought that *everything* is real that common sense, uninfluenced by philosophy or theology, supposes real. With a sense of escaping from prison, we allowed ourselves to think that grass is green, that the sun and the stars would exist if no one was aware of them, and also that there is a pluralistic timeless world of Platonic ideas. The world, which had been thin and logical, suddenly became rich and varied and solid. Mathematics could be *quite* true, and not merely a stage in dialectic. Something of this point of view appeared in my *Philosophy of Leibniz* (Russell 2009, 15–16)

Russell’s realism tended to turn mainly toward problems in the foundation of mathematics and hence in the direction of logic and the theory of knowledge. Russell had initially studied the problems in the foundations of geometry, dealing with the Kantian perspective, then with the logic of Leibniz (Cf. Russell 1900). In 1900, at the International Congress of Philosophy in Paris, he discovered the rigor that characterized Peano’s symbolic logic and decided to adopt its symbolism to address the foundational problem unambiguously.

Russell’s philosophy of mathematics has two characteristics. On the one hand, there was logicism, i.e., the belief that mathematics can find a rigorous and absolute foundation in logic. To prove this he undertook with Alfred Whitehead the project realised in the three volumes of the *Principia Mathematica* (1910–1913). On the other hand, there was Platonic realism: just like Frege, Russell believed that mathematics was just like India for Columbus, meaning that the truths it identifies are really a kind of discovery, rather than inventions.

Once he had finished with the Herculean effort involved in writing the *Principia*, whose third volume appeared in 1913, but which was concluded in 1910, Russell’s reflection continued with *The problems of philosophy* (1912), which dealt with the theory of knowledge, and proposed the theory of *sense data*: factual knowledge is the only true knowledge. He subdivided this into “knowledge by acquaintance”, that is, direct knowledge which is accessed “in person” as sense data, and “knowledge by description”, a kind of knowledge derived from the first (Cf. *The problems of philosophy* by Russell 1912, and in parallel the *Philosophical studies* by Moore 1922).

When that odd student of philosophy who was Wiener arrived at Trinity College in the autumn of 1913, destined to spend his life as a mathematician alongside the

engineers, Ludwig Wittgenstein, another young man with an unusual character, had just taken leave of Russell. Wittgenstein, an Austrian, had arrived in the United Kingdom to study engineering, but had dropped those studies when he became fascinated by the logic of Russell. Powered by a kind of philosophical fire that had rarely been seen before, he had become in those 2 years—from 1911 to 1913—first Russell’s student, and later a colleague and a kind of adviser. Wittgenstein had just disappeared to Norway and shortly thereafter would enlist in the Austrian army at the outbreak of the war, during which he wrote the *Tractatus Logico-Philosophicus* (1921), which would become a sort of Bible of logical positivism (Cf. Monk 1990, 284).

Wiener attended two courses given by Russell. One of them was on the theory of knowledge. Among other things, Russell presented his theory of sense data. It was, Wiener tells us, “an extremely elegant presentation of his views on sense data as the raw material for experience” (64h [53h], 191). But Wiener disagreed with his teacher. He argued:

I have always considered sense data as constructs, negative constructs, indeed, in a direction diametrically opposite to that of the Platonic ideas, but equally constructs that are far removed from unworked-on raw sense experience. (64h [53h], 191)

Apart from this disagreement, he “found the course new and tremendously stimulating”. Russell introduced his students “to Einstein’s relativity, and to the new emphasis on the observer” (64h [53h], 191). He “also saw the present and future significance of electron theory, and he urged me to study it, even though it was very difficult for me at that time, in view of my inadequate preparation in physics” (64h [53h], 194).

Russell seems to have been influenced by Wiener’s ideas. In fact, he assumed a constructivist stance in his book *Our knowledge of the external world as a field for scientific method in philosophy* (1914) (Cf. Russell 1918–1919). Among other things it uses the Whitehead constructivist approach, already mentioned when discussing Royce, and which allows us to interpret geometric points and instants of time as a series of events of finite dimensions, and in general to consider external things as a “logical construction” that starts from and uses sense data (Cf. Restaino 1978, 98).

The other course was “a reading course on the *Principia Mathematica*”. It was the same course that Wittgenstein had attended up until the previous year, and, as then, there were only three students.⁴ “His [Russell’s] presentation of the *Principia* was delightfully clear; and our small class was able to get the most out of it” (64h [53h], 193–194).

It is of paramount importance to pursue the matter of the relationship between the already illustrious teacher and the student who was just nineteen. Right at the beginning, Russell had a totally negative impression. In October 1913, he had told a friend that a Harvard professor, Leo Wiener, had barged into his study, and in a few

⁴Cf. Wiener to Perry, October 1913, cit. by Grattan-Guinness 1975, 106.

minutes had briefed him on his eclecticism and his adventurous life, and had introduced his son, about whom Russell had concluded: “The youth has been flattered, and thinks himself God Almighty - there is a perpetual contest between him and me as to which is to do the teaching”.⁵

Wiener felt Russell’s hostility towards him and wrote to his father in the same period:

I have a great dislike for Russell; I cannot explain it completely, but I feel detestation for the man. As far as any sympathy with me, or with anyone else, I believe [sic], he is an iceberg. His mind impresses one as a keen, cold, narrow logical machine.⁶

This mutual coldness, however, soon melted away and this seems to have happened especially after Russell had read the doctoral thesis. Wiener wrote in a letter to Perry, his teacher at Harvard:

I have shown my thesis to Mr. Russell, and he has read it. Before he read it, his attitude to me (as well as that of Mr. Hardy, whom I also met) seemed rather cold and indifferent, and they seemed inclined to doubt my mathematical ability, but after Mr. Russell had read my thesis, he warmed up considerably towards me. He praised my thesis, saying that it was a very good technical piece of work, and even went so far as to give me a copy of volume III of the *Principia*.⁷

In this change of attitude towards Wiener there is a strong analogy with what happened to the young Wittgenstein soon after Russell had read his manuscript. About Wittgenstein, Russell had written at the time that it was something “very good, much better than my English pupils do. I shall certainly encourage him. Perhaps he will do great things”.⁸

Wiener received the same encouragement; “[Russell] said some very complimentary things to me”,⁹ and, as in the case of Wittgenstein, Russell became a real mentor, something that was not obvious. Wiener writes in the memoirs,

My chief teacher and mentor was Bertrand Russell, with whom I studied mathematical logic and a good many more general matters concerning the philosophy of science and mathematics (64g [56g], 21).

Russell was always convinced that philosophy cannot be fruitful if it is detached from science, and it is no coincidence that in his course he introduced the students to the most recent views in physics, in particular Einstein’s theory of relativity, as well as the nascent atomic physics (Cf. 64h [53h], 191, 193–194) and 64g [56g], 25). Here, Wiener came up against his “inadequate preparation in physics” (64h [53h], 194), a matter which had remained quite foreign to his curriculum until then. Russell also advised him to follow some courses in mathematics in the strict sense. A year earlier Russell had confided:

⁵Russell to Lucy Donnelly, 19 October 1913, cit. by Grattan-Guinness 1975, 105.

⁶Norbert Wiener to Leo Wiener, cit. by Grattan-Guinness 1975, 104.

⁷Wiener to Perry, October 1913, cit. by Grattan-Guinness 1975, 106.

⁸Russell to Ottoline Morrell, 23 January 1912. Cit. by Monk 1990, 41.

⁹Norbert Wiener to Leo Wiener, February 1914. Cit. by Grattan-Guinness 1975, 104.

It has been one of my dreams to found a great school of mathematically-minded philosophers, but I don't know whether I shall ever get it accomplished. I had hopes of Norton, but he has not the physique, Broad is all right, but has no fundamental originality. Wittgenstein of course is exactly my dream.¹⁰

Writing these things, Russell was putting his hopes on Wittgenstein in particular, but we could probably apply them also to Wiener and to the handful of young people who attended his seminar on *Principia*. This dream was after all that, a decade later, the plan to create, through symbolic logic (just that of *Principia*), a genuinely “scientific” philosophy would have triumphed with logical positivism. It was a dream that, given the logical tools adopted, could not meet Wiener’s endorsement, considering he had long been attracted by the idea of a strict philosophy in formal terms. Nevertheless he did not share Russell’s foundational demands all the way. So Wiener wrote to his father, at the end of October 1913:

His [Russell’s] type of mathematical analysis he applies as a sort of Procrustean bed to the facts, and those that contain more than his system provides for, he lops short, and those that contain less, he draws out. He is, nevertheless, within his limitations, a wonderfully accurate thinker.¹¹

During the seminar on the *Principia*, Wiener became fully aware of the theory of logical types and the important philosophical considerations included in it, as well as the shortcomings of his doctoral thesis in the light of the question of paradoxes. On the other hand, despite getting over the early disagreements, he had an incurable difficulty in fully accepting the way his master operated. Wiener did not accept and would never accept the logicist project, that is, to reduce the whole of mathematics to a closed set of logical axioms. As he would say in his autobiography:

As for myself, I already then felt that an attempt to state all the assumptions of a logical system, including the assumptions by which these could be put together to produce new conclusions, was bound to be incomplete. It appeared to me that any attempt to form a complete logic had to fall back on unstated but real human bits of manipulation. To attempt to embalm such a system in a completely adequate phraseology seemed to me to raise the paradoxes of type in their worst possible form. I believe I said something to this effect in a philosophical paper which later appeared in the *Journal of Philosophy, Psychology and Scientific Method*. Bertrand Russell and the other philosophers of the time used to term this journal “the Whited Sepulchre,” an allusion to the simple white paper cover in which it appeared. (64h [53h], 192–3)

Here Wiener appears too modest regarding his philosophical past since, albeit without the complex techniques of Hilbert’s meta-mathematics used by Gödel, he had tried at that time to work out a genuine philosophical system based on those issues, which he expressed in at least four publications in the so-called “Whited Sepulchre”.

¹⁰Bertrand Russell to Ottoline Morrell, 29 December 1912 cit. by Schwartz 2012, 46.

¹¹Norbert Wiener to Leo Wiener, 25 October 1913 (WAMIT). Cit. by Heims (1984 [1980], 18–19).

2.3 The Term Under Husserl

During the second semester of the first year abroad, Wiener went to Göttingen to follow “three courses with Husserl, one on Kant’s ethical writings, one on the principles of ethics, and the seminar on phenomenology”.¹² However, he did not like Husserl’s way of doing philosophy. As he confessed to Russell:

The intellectual contortions through which one must go before one finds oneself in the true phenomenological attitude are utterly beyond me. The applications of phenomenology to mathematics, and the claims of Husserl that no adequate account can be given of the foundations of mathematics without starting out from phenomenology seem to me absurd.¹³

He also attended a course on abstract algebra given by Landau and one on calculus by Hilbert. He wrote to Russell:

At present I am studying here in Göttingen, following your advice. I am hearing a course on the theory of groups with Landau, a course on differential equations with Hilbert (*I know it has precious little to do with philosophy but I wanted to hear Hilbert*).¹⁴

The phrase in brackets testifies on the one hand to Wiener’s instinctive attraction to mathematics, while on the other it further confirms that the purpose of the visit was primarily to listen to Husserl and understand how mathematics was included there in terms of philosophy alone.

The Göttingen philosophy department also included the mathematics department, and Wiener had the opportunity to frequent both communities, the philosophers and the mathematicians (Cf. Rowe 1986 and 1989). An argument which took place with a philosophy student who had asked him for clarification about Bertrand Russell’s work would remain emblematic for Wiener throughout his life. When he heard the reply, Wiener quickly retorted: “But he [Russell] doesn’t belong to any school” (64h [53h], 208). The idea of belonging to a movement of thought would always be judged by Wiener as “intellectual gregariousness”. The incident, however, is especially symptomatic of the situation of confusion in which he found himself. He became interested in the meetings of the Mathematische Gesellschaft chaired by Hilbert, where he befriended two young mathematicians: Felix Bernstein, who had done a remarkable job on Cantor’s theory, and Otto Szasz, who became his close friend and protector (Cf. 64h [53h], 211). However, he did not feel at home in either environment. He wrote to Russell:

Symbolic logic stands in little favor in Göttingen. As usual, the mathematicians will have nothing to do with anything so philosophical as logic, while the philosophers will have nothing to do with anything so mathematical as symbols. For this reason, I have not done much original work this term: it is disheartening to try to do original work where you know that not a person with whom you talk about it will understand a word you say.¹⁵

¹²Wiener to Russell, June or July 1914, cit. by Russell 1968, 41.

¹³Ibid.

¹⁴Ibid. Italics added.

¹⁵Ibid.

The only person he really found himself at ease with was Frege, whom Wiener went to see at Brunnshaupten in Mecklenburg. Of this meeting he wrote to Russell: "I had several interesting talks with him about your work" (see Footnote 12). This was a time when logical positivism had not yet made its big impact. Russell's research, like Frege's, were still something esoteric for most.

2.4 Philosophy of Relativism

Against the claim of an ultimate foundation for mathematics and, in general, for knowledge, Wiener wrote in that period a wide-ranging essay on *Relativism* (14d). This put forward a line of thought, "relativism" in fact, which excluded the possibility of absolute certainty in all areas of knowledge and extolled systematic doubt, but without falling into a skepticism that completely denied the possibility of knowing. *Relativism* begins by confronting the views of new realism and new idealism. Both, Wiener argued, admit knowledge only when it is self-sufficient, that is, only when it refers to an object for which the fact of being in relationship with another is not essential to know it.

According to Moore these are the particular objects, or according to Bradley the absolute. On the basis of similar arguments to those used by neo-idealists, Wiener concluded that "in no significant sense can we assert the existence of self-sufficient knowledge", because there is nothing that is devoid of essential relationships with others, and our consciousness forever modifies the observed object. From this observation he comes to the most radical conclusion: "But if no knowledge is self-sufficient, none is absolutely certain" (14d, 566). To deny certainty is not to say, in his opinion, denying the possibility of knowledge.

The 'agnosticism' which first appeared in Wiener's high school days now seemed to have swallowed and digested the lessons of pragmatism, intuitionism, and neo-idealism, offering a new and rich image of science; one which, defending cognitive ability, avoids both the deterministic outcome of the old nineteenth-century materialism and the Platonism of the realistic epistemology of Moore and Russell.

The fallibilist epistemology of *Relativism* is associated with a sort of fallibilist ethics, outlined in his article *The highest good* (14c), also written in Göttingen. Here he took a position opposite to that of Moore, arguing that "there is no highest good" (14c, 520), and denying the possibility of an objective morality, owing to the mutability of the ideals of morality, both geographically and in time. In *The highest good*, one could perceive the influence of James' meliorism, while *Relativism* frankly acknowledges the debt contracted by pragmatism, as well as by Bergson's philosophy itself. However, Wiener suggests, on the one hand, that pragmatism ought not to be considered as the ultimate philosophy and, on the other, that intuitionism should be intuitionist to the very end, avoiding, where science is concerned, those clear distinctions it criticizes in science itself. Wiener claims in *Relativism*:

But, all things considered, relativism is far nearer to pragmatism than to Bergsonianism. Relativism only objects to pragmatism in so far as it seems to claim to have said the last word in philosophy: a relativistic pragmatism is quite possible. But Bergsonianism contains elements which are essentially non-relativistic. Bergson postulates gulfs which can not be bridged between homogeneous duration and mathematical time, between purposes and mechanism, between life and matter, between language and thought, between that intuitive thought which allows the mutual interpenetration of idea with idea, and intellectual thought, —that thought which deals in absolutely hard-and-fast concepts and clear-cut distinctions. The world is for Bergson divided by a set of fundamental dichotomies, which are made with absolute sharpness. Though he believes that the opposing sides of these dichotomies are found everywhere intertwined and interrelated with one another, their opposition is for him a fundamental and irreducible fact. Now, to suppose the existence of absolutely sharp distinctions runs directly counter to the spirit of relativism, and, I believe, of Bergsonianism itself. (14d, 570)

Wiener sought a “Hegelian synthesis”, some would say, taking up an expression dear to him, which would fill the “abysses” postulated by Bergson, a need felt strongly by both Santayana and Royce. But the latter philosophers both retained a nostalgia for a Platonically understood science, and both viewed the absolute certainties of logic and mathematics as a life raft at sea in the storm of skepticism, whereas the showdown between Wiener and Bergson takes place right on the ground of logic and mathematics, where he launched his final attack in *Relativism*, evocatively writing:

Bergson believes that the physical sciences and mathematics deal with notions that are absolutely rigid. Though the world of space and matter is for him but a surface-world, but the external manifestation of the true world of time and life, it is a world of pure space and pure matter and *pure forms*, uncontaminated by any taint of time or of life or of the “mutual interpenetration” of idea with idea. [...] But we have seen that such a world is a mere nonentity; that natural science, like every other intellectual discipline, must deal with imperfectly defined concepts, and hence must permit a certain amount of the interpenetration of idea with idea. Even in the case of mathematics, the most abstract and most formal of all disciplines, we have seen that no assignable set of rules will ever exhaust the conditions of the validity of a single deduction; we have seen how the very use of a symbolism is conditioned by our thinking according to the *spirit of the symbolism*, which can never itself be exhaustively and adequately symbolized. No! Bergson’s dualism is a false one: pure formal thought exists only as a misinterpretation of mathematics by Bergson and certain formalistic philosophers of mathematics. [...]

Since Bergson regards mathematics and the allied sciences as purely formal disciplines, and puts them in a world by themselves, he is forced to consider the realm of the mutual interpenetration of idea with idea as free from all taint of mathematics. In our true insight into the world, he believes, we cast aside the shackles of formal reasoning, and with a sort of a systematical intuition perceive immediately the inmost nature of reality. [...] This mysticism is the necessary result of a belief in the purely formal character of mathematics and physical science. But, if we do not believe that mathematics and physical science are purely formal, [...] then there is no ground for thinking that they, too, do not play their part in our true insight into the universe. [...] *Bergson sets up a windmill, calls it physical science, and then charges it most valiantly. But it is only because it is a windmill, and not true science, that he attacks, that he comes off victorious.* (14d, 570–1. Italics added)

The paper reaches its climax with the consideration that no set of rules can be assigned that could be considered exhaustive of the conditions of validity of a

single deduction, as the actual use of any symbolism requires the reference to unwritten rules, the so-called “spirit of symbolism”, which in turn cannot be properly and comprehensively symbolized. One had to conclude that the complete closure of any axiomatic system was impossible, whence absolute certainty could not even be granted either for mathematics or for logic. These concepts were further developed in *Is mathematical certainty absolute?* [15b]; cf. also *Mr. Lewis and implication* (16a). Following this path he had come very close to the consequences of Gödel’s theorems (1967 [1931]). Wiener writes in his autobiography:

When I studied with Bertrand Russell, I could not bring myself to believe in the existence of a closed set of postulates for all logic, leaving no room for any arbitrariness in the system defined by them. Here, without the justification of their superb technique, I foresaw something of the critique of Russell which was later to be carried out by Gödel and his followers, who have given real grounds for the denial of the existence of any single closed logic following in a closed and rigid way from a body of stated rules. (64g [56g], 324; see also 64h [53h], 193).

In pushing its operation to the level of logic and mathematics, Wiener, however, was going to find himself truly alone. As the philosopher Ernst Nagel, an heir to Viennese logical positivism, acknowledged in an all too short comment on *Relativism*:

In expressing his doubts concerning the possibility of a completely inclusive axiomatization of formal logic, [Wiener] was challenging what was perhaps the dominant conviction of the foremost students of the subject at that time (Nagel 1985, 67).

As for logic and mathematics, the strong ideal of science would continue to reign supreme for many years yet, an ideal that would be crystallised by logical positivism and in the *Tractatus Logico-Philosophicus* by Wittgenstein. The book ends with the sentence: “What we cannot speak about we must pass over in silence” (Wittgenstein 1963 [1921], 151).

And for the *Tractatus* one “can speak” only about what is verifiable with logical algorithms (regarding the propositions of logic and mathematics) or by observational and experimental procedures (for factual propositions of empirical science). This principle, called the “principle of verification”, was used by the logical positivists like a sharp, clear-cut, line to separate “real science”, the territory of verifiable propositions, from “non-science”, the field of unverifiable meaningless pseudo-sentences: metaphysics, art, religion, etc. This was a way of seeing things that Wiener would criticize throughout his life.

2.5 A Future Mathematician with a Future Poet: Wiener and Eliot

Pesi Masani has rightly emphasized the appreciation for *Relativism* coming from a single but very significant person among his contemporaries, Thomas S. Eliot, who expressed his “heartly agreement” with the views in the essay.

The scion of an old New England family who had moved to St. Louis, Mo., Eliot had studied at Harvard between 1906 and 1909, obtaining a Bachelor of Arts degree in 1909. At Harvard he was greatly influenced by George Santayana and the literary critic Irving Babbitt. In the academic year 1909–1910 he was an assistant in philosophy at Harvard. Later, he spent the academic year 1910–1911 in France to listen to the lectures of Henri Bergson at the Sorbonne. He returned to Harvard as a candidate for the Ph.D. from autumn 1911 to June 1914, where he studied the poetry of Dante as well as British and French writers, but also Indian philosophy and Sanskrit. During the 1913–1914 academic year, when he was already in England, he attended the seminar on the scientific method of Royce (Cf. Skaff 1986, 16). In 1913 he read *Appearance and Reality* by Bradley and in the autumn of 1914 left for Oxford with the intention of writing a doctoral thesis on Bradley. This was completed in 1916 with the title *Knowledge and Experience in the Philosophy of F.H. Bradley* (published many years after as Eliot 1964). He sent it to Harvard where it met with the appreciation of Royce, who considered it “the work of an expert”. (Cf. Lowe, s.d.). But Eliot never went to the US to discuss it, partly because submarine warfare had made transatlantic crossings unsafe. Meanwhile, in 1914, he met the poet Ezra Pound, who was as great a poet as a mentor of literary talents. It was a meeting that definitely influenced his choice to move from the philosophical career to a literary one.

Wiener and Eliot had previously spent time with each other at Harvard in the 1911–1913 biennium. They had in common their interest in the philosophies of Santayana and Royce. They met again in London to spend Christmas together in 1914. Eliot had come to England in the autumn of that year to study Bradley’s philosophy at Oxford, and Wiener was at the end of the first quarter of his second year with Russell in Cambridge (Cf. 64h [53h], 220).

On 6 January 1915, in a long letter to Wiener, Eliot writes to say that he has read all the papers published by Wiener, and especially the one on *Relativism*. Eliot believed it contained a new doctrine that could be “officially promulgated”. He also felt that it could “be worked out, under different hands, with an infinite variety of detail”.¹⁶ Echoing previous conversations, Eliot added:

Of course one cannot avoid metaphysics altogether, because nowhere can a sharp line be drawn; to draw a sharp line between metaphysics and common sense would itself be metaphysical and not common sense. Any relationship does I think suggest this recommendation: not to pursue any theory to a conclusion, and to avoid complete consistency. Now the world of natural science may be unsatisfying, but after all it is the most satisfactory that we know, so far as it goes. And it is the only one which we must all accept. (see Footnote 16)

After what looks like a sort of an ante litteram rejection of logical positivism, at least a decade prior to its advent, Eliot added, however, that “relativism, strictly interpreted, is not an antidote for the other systems. [...] Who is to be the referee?” The consequences that he drew on a personal level were anti-philosophical:

¹⁶Eliot to Wiener, 6 January 1915, cit. by CW4, 73–75, 74.

although we can never do without philosophy, it had to be abandoned, for him to move from the philosophy of art to art *tout court*, and for Wiener to move from the philosophy of science to real science. Eliot argued:

I am quite ready to admit that the lesson of relativism is: to avoid philosophy and devote oneself to either *real* art or *real* science. (For philosophy is an unloved guest in either company.) Still, this would be to draw a sharp line, and relativism preaches compromise. For me and for Santayana philosophy is chiefly literary criticism and conversation about life; and you have the logic, which seems to me of great value. The only reason why relativism does not do away with philosophy altogether, after all, is that there is no such thing to abolish! There is art, and there is science. And there are works of art, and perhaps of science, which would soon have occurred had not many people been under the impressions that there was philosophy.¹⁷

We do not know what Wiener's response was. He took advantage of his holidays in London to visit Whitehead, some of whose ideas Wiener was using in that period to develop his own "synthetic logic", a direct consequence of his "relativistic" epistemology.

2.6 Wiener's Logical Research and the "No" from Harvard

Since the first months of his stay in England, Wiener felt an intense desire to work on a logical research in the strict sense. The result was an activity which ran alongside his reflections on relativism, as evidenced by the numerous papers he published during his European biennium. His first paper ever came out in 1913, and it was on mathematics: *On a method of rearranging the positive integers* (13a). Shortly afterwards his first work on logic came out, the fundamental and justly famous (Cf. Kyburg 1976, 33) paper on *A simplification of the logic of relations* (14a), in which Wiener reduced the logic of relations to the logic of classes, through the notion of ordered pairs, "the importance of which", according to the historians of logic Mangione and Bozzi, "it is difficult to overestimate in its simplicity" (Mangione and Bozzi 1995, 431).

The proposal by Wiener had left Russell doubtful and he wrote to him: "I do not think a relation ought to be regarded as a set of ordered couples".¹⁸ To this, the 19 year old curtly replied: "It seems to me that what is possible in mathematics is legitimate".¹⁹ As we can see, Wiener continued to behave in an extremely self-assured manner, even towards his mentor.

Wiener's itinerary of logical research continued during his stay in Göttingen, where he devoted himself to an entirely new field, which he referred to with the terms "synthetic or constructive logic". In his autobiography Wiener explains:

¹⁷Eliot to Wiener, 6 January 1915, cit by CW4, 73–75, 74–75. Italics in the original.

¹⁸Russell to Wiener (WAMIT) Folder MC cit. by Masani 1990, 55.

¹⁹Wiener to Russell, in WAMIT, Folder MC cit. by Masani 1990, 55.

Whitehead had been perhaps the chief English postulationalist, but he supplemented a pure postulationism with the view that the objects of mathematics were logical constructions rather than simply the original concepts described in the postulates. For example, at times he regarded a point as the set of all convex regions which in our ordinary language might be able to contain this point. As a matter of fact, Huntington has formulated very similar ideas quite independently, and an important essay in this direction had been made by the philosopher Josiah Royce several years earlier. But the classical example of constructionism in mathematics is the definition of the whole numbers which occurs in the *Principia Mathematica* of Whitehead and Russell (64g [56g], 52).

The "principle of extensive abstraction" maintains that the ideal entities necessary to science, such as the point, the number, etc., can be considered as non-postulated concepts, but as defined in terms of familiar notions suggested by perception. This is the same principle as the one used by Russell to define the number as a set of all the sets with the same numerosity; e.g., the number 3 is the set of all the sets containing 3 elements: 3 apples, 3 trees, 3 pens, etc. (Cf. Masani 1990, 54–77, in particular 63). Wiener was particularly attracted by this approach, which he felt could have become his own field of research, probably perceiving it as a way, in the spirit of *Relativism*, to allow the concrete to penetrate into the abstract, and almost as a way to give tangible examples of the vision of science he had drawn upon to reply to Bergson.

His first logical work along this line of research was *A contribution to the theory of relative position* (14b), completed just before *Relativism*, in which he dealt with the concept of 'total or complete relation'. He used this concept to develop a theory of space and time in which entities such as moments and points are considered as constructs derived from psychologically less remote entities such as temporal events characterized by duration and spatial extension (Cf. Masani 1990, 56). It was followed by *Studies in synthetic logic* (15a), written in Göttingen in the Summer of 1914 and dealing with a type of relationship which could be used to measure psychic sensations such as the intensity of a sound, which cannot be dealt with in the same way as extended quantities such as length and duration (Cf. 64h [53h], 201). Wiener says this in his autobiography:

I had the idea that a method I had already used to obtain a series of higher logical type from an unspecified system could be used to establish something to replace the postulational treatment for a wide class of systems. The idea occurred to me to generalize the notions of transitivity and permutability, which had already been employed in the theory of series, to systems of a larger number of dimensions. I lived with this idea for a week, leaving my work only for an occasional bite of black bread and Tilsiter cheese, which I bought at a delicatessen store. I soon became aware that I had something good; but the unresolved ideas were a positive torture to me until I had finally written them down and got them out of my system. The resulting paper, which I entitled *Studies in Synthetic Logic*, was one of the best early pieces of research which I had done. It appeared later in the *Proceedings of the Cambridge Philosophical Society* and served as the basis for the Docent Lectures which I gave at Harvard about a year afterward (64h [53h], 211–2).

Before submarine warfare reached its climax with the sinking of the ocean liner *Lusitania* on 7 May 1915, making it extremely difficult for the young man to return to his homeland, Russell advised him to end the second year postdoctoral fellowship with Dewey at Columbia University in New York. We read in Wiener's autobiography:

Following the advice of Bertrand Russell, I studied with John Dewey. I also took courses with some of the other philosophers. In particular, I listened to lectures by one of the New Realists, but I was only able to confirm my impression of an undigested mass of the verbiage of mathematical logic, completely uncombined with any knowledge of what it was all about.

My term at Columbia was a makeshift at best and although I began to develop the intellectual consequences of my own ideas, I did not get much help from my professors. Indeed, the only one of them who was a great name comparable to those I had learned to appreciate at Cambridge and Göttingen, was John Dewey; and I do not think I got the best of John Dewey. He was always *word-minded* rather than *science-minded*: that is, his social dicta did not translate easily into the precise scientific terms and mathematical symbolism into which I had been inducted in England and Germany. As a very young man I appreciated the help and discipline of a rigid logic and a mathematical symbolism. (64h [53h], 222–3. Italics added).

Wiener had been strongly influenced by the pragmatist's *Weltanschauung* to introduce elements of contingency and fallibilism even into his own logic and philosophy of mathematics. By now his old dream “to combine in some manner the logical standards of formal consistency and practicality” had become a solid program that he was developing with pretty clear ideas: “relativism” in the theory of knowledge with “synthetic logic” as its logical aspect. At Columbia University, however, Wiener did not meet interlocutors who were able to understand his program or encourage the young rookie.

In the AY 1915–1916, he was granted a job lasting 1 year as an unpaid assistant and docent lecturer at Harvard University, which he was entitled to as a Ph.D. graduate. In this context he held two courses for undergraduate students, one on philosophy and one on logic in the strict sense (Cf. 64h [53h], 228), and a series of docent lectures, dedicated to the theme of his “synthetic logic and measure theory,” in which he presented the content of the papers already published and other new ideas. In the last part of these lectures, he dealt with the philosophy of space, discussing the theses of Kant, and then, using the procedures of synthetic logic, he went on to speak about combinatorial topology, or what is now known as algebraic topology. The material of the course, once revised, was used in *The relation of space and geometry to experience* (22a), and in *A new theory of measurement. A study in the logic of mathematics* (21a). Russell wrote as follows about the latter paper to recommend its publication:

This is a paper of very considerable importance, since it establishes a completely valid method for the numerical measurement of various kinds of quantity which have hitherto not been amenable to measurement except by very faulty methods.

Although Dr. Wiener's principles can be applied (as he shows in the later portions of his paper) to quantities of any kind, their chief importance is in respect of such things as intensities, which cannot be increased indefinitely. Much experimental work in psychology, especially in connection with Weber's law, has been done with regard to intensities and their differences. But owing to lack of the required mathematical conceptions its results have often been needlessly vague and doubtful. So far as I am aware. Dr. Wiener is the first to consider, with the necessary apparatus of mathematical logic, the possibility of obtaining

numerical measures of such quantities. His solution of the problem is, so far as I can see, complete and entirely satisfactory. His work displays abilities of high order, both technically and in general grasp of the problem; and I consider it in the highest degree desirable that it should be printed.²⁰

As an aside, the Weber–Fechner law is a psychological law that establishes a relationship between how stimuli feel as distinct from the absolute magnitude of their intensity. Historically the law has been expressed in different analytical forms (cf. Galimberti 1992, 977). Coming to the letter, we can notice a very positive judgment indeed, which does not seem a circumstantial compliment. The Wiener's studies on constructive logic were really deep and seminal. They would later give rise to a vast field of research for the formalization of experimental psychology. As Peter Fishburn and Bernard Monjardet showed in an essay that does a retranslation in today's symbolic language of the research conducted by Wiener at that time,

Wiener's contributions to measurement theory deserve to be remembered because they include important concepts that were rediscovered by others and now have a central place in the representational theory of measurement and in graph theory (Fishburn and Monjardet 1992, 165).

In spite of everything, in 1916, the young Wiener's performances were not considered sufficient to get him the yearned, stable commitment at the Harvard Department of Philosophy. Not only that, but the young man found the doors closed everywhere and wherever principals and heads of every departments of philosophy that were looking for staff (Cf. 64h [53h], 236–7).

Wiener never knew the reasons why Harvard did not want to hire him. Münsterberg, an applied psychologist, his former professor at Harvard, and the mathematician G.D. Birkhoff had been auditors of his docent lectures. Wiener assumed that problems might have arisen because of some disagreements, for personal reasons, between Münsterberg and his father; perhaps there had been also a negative opinion from Birkhoff, who had criticized some statements during the docent lectures.

In my opinion there is a contingent environmental aspect of great importance that one cannot be neglected. And that curiously nobody, Wiener first of all, has ever taken in consideration: the fact that in a very short time the miracle of the Pragmatist Hellas had mostly ended. James died in 1910, Peirce in 1914, Royce in 1916, while Santayana—just like Eliot 2 years after—had gone to Europe in 1912, to stay there for the rest of his life. Rightly so, the autobiography of Wiener has tones of regret for the fact that he did not draw the best from John Dewey, who remained the only big name in the American philosophical environment; and the choice of Russell to direct him to Columbia University, at Dewey, had been very wise. Moreover, on the other side of the ocean, in 1916, Russell had been removed

²⁰Russell to Hardy for the publication of (Wiener 21a) by the London Mathematical Society, cit. by Grattan-Guinness 1975, 104.

from teaching at Trinity College because of his pacifist ideas. Because of that he was even sent for six months to prison in 1918 and for many years had no more academic assignments. There were only Hardy and Huntington left, they were the only in the academic world that might recognize the value of the young Wiener, and in fact they kept encouraging the young man. But they were mathematicians, not philosophers.

The only point of philosophical reference of Wiener remained Perry, which did not consider him “worthy of recommendation” (64h [53h], 236–7). And also this fact is not strange. The coolness between the two men was mutual, considering the expressions Wiener uses toward him in the autobiography. In addition, despite Perry’s neo-realist interest for Russell, it is reasonable to doubt that he could easily understand and appreciate the young Wiener’s philosophical character, which remained really unknown to him. The young age, but overall the peculiarity of Wiener’s philosophy and logic, must have actually played a most important role in the exclusion judgment. He had learned in depth the logical techniques used by Russell and Whitehead, techniques that very little people were able to handle and appreciate in that period, as the Wiener’s experience at Göttingen proved. Philosophically speaking Wiener was not a neo-realist like Perry; on the contrary he his Pragmatism was excessively mixed with the Roycean idealism, the same Perry had harshly criticized in his *Manifesto*. The choice of the auditors of his docent lectures seems to have been the best that environment could offer. To try to grasp Wiener’s difficult research on logic applied to psychology was ask a distinguished experimental psychologist and an outstanding mathematician, Hugo Münsterberg—who by the way will die in 1916. But he was an experimental psychologist educated in the Germany in the second half of the Nineteenth century. How Münsterberg had could understand the perspectives inner in Wiener’s measure theory rediscovered only almost a century later? Similarly, it is difficult to believe that George David Birkhoff (1884–1944), a great mathematician and mathematical physicist, but firmly anchored to the idea of science of that Poincaré who was a staunch opponent of Cantor’s set theory, would welcome with open arms the completely based on logic Wiener’s approach, who will no doubt must have shown some serious shortcoming in the mathematical training.

In his autobiography Wiener is, in my opinion, very close to the truth of things when he states:

I was assured by Professor Perry that I was not good enough to merit much of a recommendation. I was not a very promising bet at that time, but I cannot help believing that some part of my department’s coolness was based on my lack of years and on a conservative unwillingness to experiment with the unknown. (64h [53h], 236–7); cf. also (64g [56g], 27).

Anyway, Wiener’s predicament does not actually appear so different from other lacks of understanding with which the history of science is littered. We may think, for example, of Laplace and Lagrange’s refusal to acknowledge Fourier’s heat theory: too bizarre for their scientific canons, and also containing mathematical gaps in its early stages (Cf. e.g. Narasimhan 1999).

2.7 The University of Maine

Faced with the impossibility for his child to get recruited by any department of philosophy, his father urged him to seek a position as a professor of mathematics, and suggested to do so through an employment agency for teachers (Cf. 64h [53h], 237). And that was how that in the academic year 1916–1917 Wiener was hired as a mathematics college instructor at the University of Maine in Orono. This period lasted only a year but was extremely significant because it marked the first attempt to move on to the teaching of mathematics. A well-documented article by Eisso J. Atzema (2003) adds new information to what we already knew about this from *Ex-prodigy*. The University of Maine, or rather the Maine State College of Agriculture and the Mechanical Arts, was an institution whose main purpose was to support agriculture, with a student population of rather undisciplined, mostly rural extraction (Atzema 2003, 13). For a 20 year old man who had been educated by the finest philosophical minds of the time, it was not the ideal place to have his first experience as a mathematics teacher, and this can help us to understand why he speaks in his autobiography about a cultural environment that seemed humanly poor and unambitious (64h [53h], 10). The Dean of the University, James Norris Hart (1861–1958), struck by the quantity and quality of Wiener's publications, was hesitant about hiring him, especially considering his young age and the general turbulence of the students.

Hart asked for references from William Fogg Osgood (1864–1943), head of the Harvard mathematics department, who replied that he could not judge Wiener's ability as a teacher, because he had not been involved in any activity of this kind in his department. On Wiener's own suggestion, Hart then turned to Edward Huntington, who had just gone to teach at Harvard. Here is the precious testimony of a mathematician and logician among those best qualified to speak of the young man:

I am not surprised that you are rather skeptical as to Dr. Wiener's fitness for your work, and I think that this skepticism is in a measure justified, on account of the fact that Dr. Wiener has had, as yet, no experience of this kind of teaching. On the other hand, he is not at all the type of over-brilliant, unpractical scholar which one might naturally suppose him to be. We have had other 'precocious' students here, whom I would not for a moment recommend for your position. He is not of that type. His brilliancy consists simply in having a mind which works more smoothly and rapidly than is the case with most of us – the kind of mind that is likely to do well anything that he undertakes to do. He has a good sense and good humor, and infinite patience, and has been successful in private tutoring and in handling conference sections. While his appointment would certainly be in the nature of an experiment, I believe that the experiment would be worth making. I have talked with him a good deal about methods of teaching mathematics, and have been greatly impressed with the soundness of his ideas, which are progressive and at the same time thoroughly sensible.²¹

Wiener was granted a teaching term on trigonometry and algebra, one on elements of analysis, and one on solid geometry. In his letter of acceptance he also

²¹Huntington to Hart, 20 April 1916 (WAUM). Cit. by Atzema 2003, 10.

asked to give a course in logic, as this was his ‘Fach’ and he wished to “keep his hands in it”.²² So Hart talked to Craig Wallace, teacher of philosophy, and he was allowed to teach an elementary logic course. Hart also suggested that he teach a course on the history of mathematics.

The “experiment”, in Huntington’s words, was not successful as great difficulties emerged in maintaining discipline, and Wiener realized that the interests of the learners would not in any way have allowed him to go as deeply into the logic and the history of mathematics as he would have wished. Moreover, the human environment provided by his colleagues did not seem to meet his cultural expectations. The letters he sent to his mother and father show an almost complete despair. He also reported these difficulties and his intention to quit to the Dean.

It took the American entry into World War I with the declaration of war on Germany in April 1917 to break the deadlock. The general mobilization led the university to dismiss all instructors until the following year; new hires were only confirmed for those faculties which remained active for war needs. Wiener resigned in early May, before being officially discharged, in order to follow the training program of the Harvard Reserve Officers’ Training Corps [R.O.T.C.]. In the end, however, he was not mobilised, for reasons of myopia and high blood pressure. He then managed to find a technical job in a factory in Lynn, Massachusetts. Despite the fact that Norbert Wiener felt at ease working alongside the engineers in the factory, his father found him a new job at the *Encyclopedia Americana* in New York, where shortly afterwards he was admitted to the editorial staff.

2.8 Collaboration with the *Encyclopedia Americana*

The articles that Wiener wrote between 1917 and 1918 for the *Encyclopedia Americana*, which we have often already referred to, were subject to strict instructions from the publisher to avoid personal judgment. In fact, they consist largely of historical treatments, although the strong personality of the author does not fail to shine; we cannot even rule out the possibility that they were sometimes subjected to cuts. In any case they allow us to draw a picture of the main philosophical interests of Wiener at the time in which he was about to enter the Massachusetts Institute of Technology.

In light of what we know so far about Wiener, it is not surprising to discover that these articles were all about strictly philosophical or logical subjects: *Aesthetics* (18b); *Metaphysics* (19f); *Soul* (20h); *Ecstasy* (18j); *Apperception* (18f); *Meaning* (19d); *Universals* (20j); *Category* (18g); *Substance* (20i); *Pessimism* (19g); *Duty* (18i); *Dualism* (18h); *Mechanism and Vitalism* (19e); *Induction, in logic* (1919b); *Infinity* (19c); *Postulates* (19h). Only two of them can be considered as dealing with mathematics in the strict sense, *Algebra, definitions and fundamental concepts* (18c)

²²Cf. *Ibid.*, 12.

and *Geometry, non-Euclidean* (19a), although they both also have logical and philosophical aspects.

The most discussed issues are those concerned with mind-body dualism and the vitalism/mechanism dichotomy: ubiquitous issues in the philosophical debate of that period. The articles often draw upon the new vigor given to the dualist thesis by Bergson, in contrast with the monistic solutions offered by the mechanistic materialism, absolutist idealism, and above all the neutral monism expounded by James, later taken up by Holt and Perry (cf. 18h). The article *Soul* (20h) also refers to this latter theory, and Wiener also includes a detailed account of Russell's arguments against it. Years later, when Wiener had ceased to be a professional philosopher, Russell would have changed his mind about those views. The article notes that:

[the concept of neutral monism] may be expressed in Aristotelian languages by calling the mode of aggregation the entelechy of the stream of states. Like Aristotelianism, neutral monism finds the unity of consciousness in the embodiment of a form or structure or relation, but unlike Aristotelianism, it maintains that the matter shaped by this form is not the body, but the stream of consciousness itself (20h, 271).

Yet another reference to Aristotle's notion of form can be found in *Dualism*, which ends up by stating that—in addition to the classical mind/matter dualism—there is another dualism, perhaps less stressed but no less ancient, “between form and matter” (18h, 367), which had already been conjectured by Anaxagoras. Such a dualism, Wiener explains, had been developed by Plato and Aristotle. These seem to be the roots of the subsequent reflections by Wiener about information as a radically different reality from matter and energy.

In a sense, these articles are a portrait of a young philosopher, an expert of the issues debated in Europe and the United States at the time. They are clear and affirmed an anti-dualistic approach, which still gave a nod to Bergson. In the article *Dualism*, we may read that:

[Bergson is] the most interesting form of latter-day dualism [...] based on a sharp contrast between the mental, possessing the continuity of memory which allows the present as it were to contain the past, and the material, the subject-matter of physical science, forming a cinematographic succession of spatial arrangements of particles. (18h, 367)

The adjective “interesting” used to refer to Bergson's ideas also comes back in the article *Soul*:

Among the more interesting of the current views concerning the nature of the soul is that which assimilates the soul to the phenomena of life in general. While this is the tendency of all vitalists, it reaches the highest degree of metaphysical development in the philosophy of Henri Bergson (20h, 270).

Wiener sees a change in Bergson's thought as regards the dualistic distinction of earlier writings like *Matter and Memory* (1911 [1896]). In *Dualism* Wiener argues:

In his earlier writings, the distinctness of these two worlds is emphatically asserted, but more recently he has come to regard matter as an arrested, atrophied manifestation of the same vital impulse that constitutes life and mind. Bergson thus forsakes dualism for monism (18h, 367).

We also find a short but incisive article entitled *Mechanism and vitalism* (19e). Mechanism is seen as “a tendency to reduce biology as well as chemistry, astronomy, optics, etc., to a mechanical basis and to explain all biological phenomena in terms of motions of particles” (19e, 527). The enthusiasm for this approach, in Wiener’s opinion, is justified by the fact that “the Newtonian mechanics has long constituted an ideal for all the natural sciences on account of the elegance of its form and the clearness of its definitions” (19e, 527). On the other hand, Wiener remarks, living organisms “manifest a distinct and highly complicated structure”, and as a consequence the mechanical explanations are of “an extremely sketchy nature” (19e, 527). On the contrary vitalists such as Driesch and Bergson deal with “consciousness”, “purpose, desire, sensation”, “indeterminism”, as “not merely non-mechanical, but counter to the current of mechanism, involving either indeterminism, or determination through factors which have no mechanical correlates” (19e, 527–8). Wiener does think that:

The methods of the vitalist are generally so crude and his definitions so vague that there is no great body of biological knowledge which has been gained from the vitalistic standpoint. The terminology of vitalism abounds in such expressions as *élan vital*, or ‘entelechy’, which are only defined *per ignotius* (19e, 528).

Therefore, for Wiener, up to that point in time, neither of the two approaches had really given significant results in biology. He concluded:

In short, whether a complete mechanization of biology be possible or not, biological investigation has been fertile precisely in so far as it has subjected itself to the norms, if not to the concepts, of physical science. It would consequently seem that mechanism is methodologically correct, even if it be metaphysically wrong (19e, 528).

In this strong conclusion, also a little difficult to interpret, Wiener clearly demonstrates a lack of enthusiasm for mechanism. In his opinion “mechanism is metaphysically wrong”. Why? Maybe because in Newtonian science there is no room for indeterminism, or indeed for consciousness or purposive behaviours. However, Wiener insists on his stance, already stated in *Relativism*: we have to work with the only science we have.

In *Mechanism and vitalism*, one sentence struck me as even more significant. Wiener states that: “biology as it exists is permeated through and through by *anthropomorphic concepts*” (19e 527–8). Wiener understood that the solution to the mechanism/vitalism dispute consisted in considering the need to reduce vital phenomena, not so much in Newtonian terms as “motions of particles”, as in finding ways to “deanthropomorphize” phenomena related to life and mind, traditionally considered as an exclusively human field, bringing these phenomena back under the aegis of a unified science. This would be one of the main goals of Wiener’s future cybernetics. And maybe here one could find a solution to myriad dualisms that still today hamper the advancement of science in certain fields.

One fingerprint left on Wiener by Royce concerns the way in which he tackles the theme of the infinite in the *Encyclopedia Americana*. More than half the article *Infinity* is dedicated to discussing Royce’s “Complementary Essay”. After supporting Royce’s stand against Bradley, Wiener ends by saying:

The Roycean theory of the infinite is based on the analogy of cardinal infinitude, and presupposes that there is such a thing as a complete universe. Certain paradoxes discovered by Russell and Burali-Forti tell very strongly against the existence of a complete unity embracing all lesser unities. Royce's work possesses value rather as an account of the potential infinity of a universe capable of indefinite enlargement than as a description of a given complete infinite. Furthermore, it is clear that systems of much less extent than the Roycean infinite may possess the self-reflecting property of cardinal infinity (19c, 122).

Wiener just entering MIT therefore shows that he took Royce's metaphysical arguments very seriously, although he considers, in the light of his now mature knowledge of mathematical logic and of the research conducted alongside Russell, that the Roycean absolute—understood as one infinite manifold—cannot be considered other than as a “regulative idea”, and that the self-imaging property of cardinal infinity can, beyond logic, be detected only in local areas of the real. This was an insight that shortly afterwards would lead him to discover the “Wiener process”.

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Harmonies of Disorder

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