

# John Dewey and the Logical Empiricist Unity of Science<sup>1</sup>

## *John Dewey e a Unidade Lógico-Empirista da Ciência*

Ivan Ferreira da Cunha

Universidade Federal de Santa Catarina – UFSC

clockwork.ivan@gmail.com

**Abstract:** The idea that there is a scientific way to deal with the problems of everyday life and the idea that such scientific way must be propagated and taught to the people, so that society may be improved, are central to the thought of John Dewey. These ideas are also at the core of the *International Encyclopedia of Unified Science* – a project that was advanced in the nineteen-thirties by the group of philosophers known as the Vienna Circle, or logical empiricists. Dewey made two contributions to that encyclopedia. However, some years later, mainly in co-authorship with Arthur Bentley, he presented a strong criticism of the points of view defended by members of that group and their associates, such as Rudolf Carnap and Charles Morris. The present article seeks to show this conflict, explaining the aims of the logical empiricist encyclopedia as well as Dewey's contributions and criticisms to it. Accordingly, this paper aims at reappraising the points of view involved, showing that Dewey was not right in his criticisms and that the idea of placing pragmatism and logical empiricism in continuity with each other should be seriously considered, given the objectives of both schools of thought.

**Key words:** John Dewey. Logical Empiricism. Philosophy of Logic. Philosophy of Science.

**Resumo:** *A ideia de que há um jeito científico de lidar com os problemas da vida cotidiana e a ideia de que tal jeito científico deve ser divulgado e ensinado às pessoas, de modo a melhorar a sociedade, são centrais no pensamento de John Dewey. Tais ideias estão também no núcleo da International Encyclopedia of Unified Science – um projeto desenvolvido na década de 1930 pelo grupo de filósofos conhecidos como o Círculo de Viena, ou lógico-empiristas. Dewey fez duas contribuições a essa enciclopédia. Porém, alguns anos depois, principalmente em co-autoria com Arthur Bentley, ele apresentou uma forte crítica aos pontos de vista defendidos pelos membros daquele grupo e seus associados, tais como Rudolf Carnap e Charles Morris. O presente artigo procura mostrar esse conflito, explicando os objetivos da enciclopédia lógico-empirista, assim como as contribuições e críticas feitas por Dewey a tal obra. Dessa forma, este artigo visa a reavaliar os pontos de vista envolvidos, mostrando que Dewey não estava certo em suas críticas e que a ideia de colocar o pragmatismo e o empirismo lógico em continuidade um com o outro deveria ser considerada seriamente, dados os objetivos das duas escolas de pensamento.*

**Palavras-chave:** John Dewey. Empirismo Lógico. Filosofia da Lógica. Filosofia da Ciência.

---

1 This paper was written during the author's doctoral course at UFSC, in Brazil, with a research stage at the University of Pennsylvania, USA, financed by CAPES foundation.

## Introduction

John Dewey had a relation with the Unity of Science Movement which could be described as unusual. The movement was organized in the late nineteen-thirties by former members of the Vienna Circle of Logical Empiricists, such as Rudolf Carnap, Otto Neurath, Herbert Feigl and Philipp Frank, as well as American philosophers such as Charles Morris and Ernst Nagel. The main publication set forth by the movement was the *International Encyclopedia of Unified Science*,<sup>2</sup> to which Dewey made two contributions: "Unity of Science as a Social Problem", which is a chapter in the opening number, and the book *Theory of Valuation*.

Soon after the publication of the first numbers of the *Encyclopedia*, Dewey became bitter about the project. This can be noticed in his correspondence and collaboration with Arthur Bentley,<sup>3</sup> which resulted in the book *Knowing and the Known*. Dewey didn't like some features of the proposals Carnap and Morris advanced as they seemed to endorse a duality between the meaning of linguistic expressions and the use that is made of such expressions. The Deweyan reader who faces these criticisms may feel uncomfortable with the *Encyclopedia*, since the impression that emerges from Dewey's comments is that he deeply regretted taking part in that enterprise.

I intend to show that Dewey's criticisms are due to a misunderstanding. In order to try to untie this situation, this paper will present the project of the *Encyclopedia*, as well as how Dewey, Carnap, and Morris took part in it. This will allow us to reappraise Dewey's criticism of the *Encyclopedia*, as well as the encyclopedic ideal.

## Neurath's mosaic

Otto Neurath started to organize the Unity of Science Movement around the mid-thirties in some papers and pamphlets.<sup>4</sup> The movement sought to gather scholars from all over the world and from the most diverse lines of research in a cooperative enterprise that aimed at propagating the so-called scientific world-conception (*wissenschaftliche Weltauffassung*), which is basically the idea that there is a scientific way to look at the world and to deal with problems. This was already the objective of the Vienna Circle itself, as stated in their manifesto.<sup>5</sup> Neurath's proposal was an attempt to spread such values among people and so contribute to the progress of humankind. The movement was represented in some congresses, but the project was delayed due to the persecution Vienna Circle members suffered with the rise of Nazism. In the late thirties, the then-exiled participants of the movement were able to advance the project in the United States.

The *Encyclopedia* started to be published in the USA in 1938 with the aim of bringing together those intellectuals who adopted the scientific world-conception and of establishing a fortress against the political situation, which was extremely adverse to the ideals of a scientific way of life. The first number of the *Encyclopedia*, entitled

---

2 NEURATH; CARNAP; MORRIS, 1955, 1970; henceforth, *Encyclopedia*.

3 For the correspondence, see DEWEY, 1999.

4 Those can be found in NEURATH, 1983.

5 See HAHN; NEURATH; CARNAP, [1929].

*Encyclopedia and Unified Science*, was signed by Neurath, Dewey, Carnap, Morris, Niels Bohr, and Bertrand Russell, each of whom wrote one chapter (NEURATH *et al.*, [1938]).

In the first chapter, Neurath presents what he calls encyclopedic integration as the ideal which will unify science in his project. He brings this ideal from the French Enlightenment Encyclopedia. Neurath remarks that an encyclopedia is not supposed to present *the* system of sciences, but rather a plural and diverse “mosaic” of all the knowledge obtained throughout history. In Neurath’s words, “in the *Encyclopedia of Unified Science* this historical situation and its consequences will be demonstrated by showing the formation of the mosaic of scientific activities” (NEURATH, [1938], p. 5).

The comparison to a mosaic is interesting: Neurath intends the *Encyclopedia* not to be composed of pieces which are perfectly uniform compared to each other. He wants irregular stones to be put together in the same frame, and the resulting image is to be created only when one looks from a certain distance. As an example of this kind of plural mosaic, Neurath points out that d’Alembert in the Introduction to the French Encyclopedia opposed some of Rousseau’s ideas, but, at the same time, expressed himself as pleased with the fact that Rousseau was also a collaborator in their encyclopedia (NEURATH, [1938], p. 2). So, Neurath wants the *Encyclopedia* to present a collection of articles discussing science and philosophy of science, in its different branches, becoming a compendium of the scientific attitude of his age.

Neurath explains that he is no longer adopting the old Vienna Circle method of logical analysis of language for the unification of science. He says that it is possible to build a coherent system for non-scientific proposals – and, therefore, the unity of science must be reached in another way. The way Neurath proposes is this encyclopedic integration: science is unified because of an attitude, which is to be the mosaic image formed by the *Encyclopedia*, and not because all the statements of science can be formulated in a perfect logical system. Indeed, Neurath says that “such is the idea of *the system* in contrast to the idea of *an encyclopedia*; the anticipated completeness of *the system* is opposed to the stressed incompleteness of an encyclopedia” (NEURATH, [1938], p. 21).

This scientific attitude is what brings together works as diverse as science fiction and the logic of science. Thinking about science, using science to deal with life: this is the attitude Neurath wanted to promote, and this is the aim he wanted the *Encyclopedia* to have, even if the contributors disagreed among themselves about some topics here and there. The important point is that they were collaborating toward the progress of science and the scientific world-conception, helping to build a big picture of what science means.

## Dewey, Morris and Carnap

In a first glance, Neurath’s project seems to fit perfectly in Dewey’s ideas. Indeed, in his chapter in *Encyclopedia and Unified Science*, Dewey points out that the *Encyclopedia* will bring great benefit to society, as the project will integrate those people that support the scientific attitude and will make scientific culture stronger and more present in education.

Nevertheless, according to Dewey, science is to be understood not only as the contents of the scientific theories, but also as the method, as the attitude which is

prior to those contents. In this sense, science is not the exclusive preserve of those who are called scientists; as he says, “the body of knowledge and ideas [...] is the fruit of a method which is followed by the wider body of persons who deal intelligently and openly with objects and energies of the common environment” (DEWEY, [1938] 1955, p. 29). Dewey points out that there are problems that do not arise simply in the actual course of life – such problems are the result of dealing with life in an unscientific or pseudo-scientific way. Therefore, a good way for simplifying life is to make the scientific culture stronger, as it suffers opposition “on the part of those influenced by prejudice, dogma, class interest, external authority, nationalistic and racial sentiment, and similar powerful agencies”. It is in this light that Dewey considers that “the problem of the unity of science constitutes a fundamentally important social problem” (DEWEY, [1938] 1955, p. 32-3).

Making people more educated scientifically would avoid such kind of problems, as people would be more suspicious as to magically easy solutions for their problems – Nazism and racial segregation, for instance, were figured out in a so-called scientific world-conception, but such stances show themselves to be non-sense in a well understood conception of science. Dewey’s proposal is that people should be properly educated in science so that they understand differences in matters like that.

Improvement of society, in Dewey’s view, requires improvement of education, since the enemies of science gain considerable force as the scientific attitude is poorly taught in all levels of the educational system, especially in the elementary level, when children are extremely curious and when their fundamental ways of acting are formed. Instead, science is taught as bodies of subject-matter and not as a habit of thought and conduct (DEWEY, [1938] 1955, p. 35-7).<sup>6</sup> The improvement of education that Dewey wanted could only be obtained by promoting a scientific culture. The *Encyclopedia*, as it had the aim of propagating such culture and uniting the people involved in it, would be a very important achievement for society in Dewey’s opinion.

Facing this aspect of Dewey’s proposal and the way he stressed it in his chapter in the opening number of the *Encyclopedia*, our affirmation above, that some years later Dewey regretted having participated in that project, may sound absurd. The fact is that he didn’t directly oppose Neurath’s proposals: his problem was rather with Carnap and Morris. But, as we are going to see, in attacking Carnap and Morris, Dewey left the encyclopedic ideal aside.

By that time, Carnap was working on logical constructions aimed at allowing all branches of science to be expressed in one language system. Carnap was continuing the work of the Vienna Circle, as it stood before the dispersion of the mid-thirties. He was working with science as a body of contents, which was just the approach Dewey had worries about. It is important to remark here, however, that neither Dewey nor Carnap said that their way of analyzing science was the only one allowed. Indeed, both of them in their chapters in *Encyclopedia and Unified Science* assert that they are taking one of many possible approaches to the study of science. And, as we saw, this was expected in a mosaic construction like Neurath proposed.

---

6 Of course, Dewey is talking about the educational system in the United States by the late thirties. Whether such problems persist or are found in other places is a question I would like to leave open in this paper.

Another point to consider is that Carnap's constructions were being guided by his principle of linguistic tolerance, which roughly says that many logical systems are possible for a given aim, depending only upon the conventions adopted.<sup>7</sup> This principle grants Neurath's provision that the unity of science is not to be reached by means of a logical system that is *the* only correct one: Carnap's principle of tolerance establishes that there is no *one* correct logical system, but always many possible constructions. His chapter in the opening number of the *Encyclopedia* discusses tools and strategies that can be used in logical analyses of science – and makes it clear, from the very first sentence of the text, that “the task of analyzing science may be approached from various angles” (CARNAP, [1938], p. 42).

In his chapter, Morris presented his scientific empiricism – a meta-philosophical approach that sought to bring together pragmatism and logical empiricism, by showing that those are complementary schools of thought with similar aims (MORRIS, [1938a]). This was supposed to be the cement that would bond together all the irregular pieces of the *Encyclopedia* mosaic. Morris advanced his point of view in the same year, with the second number of the *Encyclopedia*, his *Foundations of the Theory of Signs*. In this book, he proposed the science of semiotics, an approach to the study of language that analyzes the process of signification into three dimensions: syntactic, semantic, and pragmatic. Syntax studies the relations a sign has with other signs, Semantics studies the relation of signs with the object they signify, and Pragmatics studies the relation between signs and their users (MORRIS, [1938b], p. 79-91).

Dewey didn't like Morris's semiotics at all. He thought it contained misunderstandings of the ideas of Charles Peirce. But, it seems, the main reason for Dewey's rejection of Morris's proposal was the three-folded character of philosophy-semiotics and the consequent division of labor. According to Dewey, meaning, or the relation of a sign with the object it signifies, is established in the use of the sign by the people who are using it. So, the separation between semantics and pragmatics is dangerous and artificial, as it appears to be merely dissolving the problem instead of facing it. And even more: such separation could entail a division of labor, in which the semanticist would concentrate on the abstract meaning problem and the pragmatist (or, “*pragmaticist*”) would work with the sociological and psychological character of the use of signs. In other words, the problem would never be dealt with in a proper way, that is, in the continuum between the use of signs and the reference to objects (DEWEY, 1946, p. 85-92).

Morris reacted to the criticisms in an effort to fix the problems with his semiotics. But it is important to notice that Morris never proposed this hard and fast severance of pragmatics and semantics. He proposed merely that the two areas could be thought separately in an abstract way, but he never said that it was forbidden to study both areas in continuity. Indeed, Carnap's works on pure semantics by the early forties – which Dewey and Bentley saw as the fulfillment of the above-mentioned division of labor – presents exactly the instrumental character of the abstraction of semantics from pragmatics and syntax (CARNAP, 1942, p. 3-15). As a heuristic procedure, this should not be ruled out so abruptly.

---

7 Carnap stated this principle in CARNAP, [1934], p. 51-2.

Arthur Bentley joined Dewey in his criticisms, but his efforts were directed mainly at the semantical studies done by Carnap, among other logicians, such as Ernest Nagel, C. I. Lewis and Alfred Tarski. In the paper “Vagueness in Logic”, written by Bentley, endorsed by Dewey,<sup>8</sup> and published in their joint book *Knowing and the Known*, there is an attack on every kind of logical investigation that is made in a modern, mathematical, way. The impression one gets from those texts – besides that Bentley didn’t understand the terminology used by Carnap and other logicians – is that every formal logician is doing it wrong and that the only right way to research logic is by means of attaching it to a theory of knowledge and inquiry, which appears to be, in Bentley’s criticism, the only possible (or, permitted) application of logic (BENTLEY, [1945]).

Such criticisms were not very well received by the community of logicians, since, by the late forties and the fifties, semantics already had an important application outside of theory of knowledge: in the promising area of artificial intelligence and computers. In his review of Bentley’s and Dewey’s works, Alonzo Church points out that logic was, by then, having a development similar to that of mathematics, when researches in the so-called area of pure mathematics started to be made (CHURCH, 1945, p. 133). Indeed, forbidding pure semantical research sounds pretty much like forbidding pure mathematical research – something which may sound insane, since it is well known that many ideas developed in “pure” programs soon became “applied” mathematics.

It is important to emphasize that, although Charles Morris never proposed the dualism Dewey accused him of, he sought to fix the misunderstanding in the book *Signs, Language, and Behavior* and in the paper “Signs About Signs About Signs”.<sup>9</sup> Dewey and Bentley never accepted his reformulations, which may be evidence of a personal problem that they had with Morris. In Dewey’s correspondence, it is possible to find evidence that he was not much willing to solve the misunderstanding with Morris. In a letter to Morris, Dewey says (DEWEY to MORRIS, IN: DEWEY, 1999, item 14423):

I am not at all sure how likely we should be to get anywhere in an oral discussion – not because of ‘hard feelings’ but because [...] it seems to be that your position is badly confused and in need of a clarification that only you can provide. I haven’t seen your new book but judging from an analysis sent me by Bentley, in an article that will come out in [*Philosophy and Phenomenological Research*],<sup>10</sup> it is even more confused than the article about which I wrote my letter in the *Journal*.

Therefore, Dewey had not read Morris’s book but he was trusting in Bentley’s opinion about it. Bentley on the other hand was criticizing the logicians based on prejudice, as pointed out by Church. He was also not much eager towards coming into agreement,

---

8 See DEWEY; BENTLEY, [1949], p. 7.

9 That is, respectively, MORRIS, [1946] and (1948).

10 Dewey is talking about BENTLEY (1947), which also appeared as the chapter 9 of *Knowing and the Known*.

as one may notice in his 1944 correspondence with Ernest Nagel, then the editor of *The Journal of Philosophy*, where “Vagueness in Logic” and other chapters of *Knowing and the Known* first appeared. Nagel suggested some corrections in Bentley’s papers in order to smoothen his criticisms and misunderstanding.<sup>11</sup> Bentley then replies that he had already softened his positions to a scholarly level. Among many of his verbiages, Bentley says (BENTLEY to Nagel, IN: DEWEY, 1999, item 19978):

Take the Carnap case. What I should have said was that it was as hard to corner him as to catch a greased pig, or that a high school student turning in a report on his work on a terminological level as low as Carnap’s would have been kicked out, even from a high school.

About Morris, Bentley said in a letter to Felix Kauffmann: “I placed one sentence in a footnote to a recent paper, about Morris’ signs. I used no adjective, but the fact I stated, in my judgment, should be sufficient to bar Morris from admission to a high school” (BENTLEY to Kauffmann, IN: DEWEY, 1999, item 19928).

Even though those criticisms were presented in private letters, they may well serve to help us understand what Bentley thought about Carnap and Morris. And what can be easily noticed is that Bentley was not a good reader, in the sense that he was not much disposed to understand the points Carnap and Morris were trying to make; or, if he had such intention, this didn’t become clear in his criticisms which are far from what can be called *constructive criticism*. Consequently, Bentley could not be considered a good source of information on the *Encyclopedia* authors, and Dewey should not have trusted him on this matter.

## The resulting mosaic

The image we see when looking at the *Encyclopedia* mosaic, therefore, by the late forties, is perhaps of starker disagreement than Neurath had planned. The *Encyclopedia* had the aim of uniting people who worked with science in order to create a mosaic-like image of the scientific attitude of an age. The unity of science, which was supposed to be the *raison d’être* of the movement, was supposed to be attained in this mosaic. But what we see from one side is that some members of the movement were still trying to create another kind of unity – Carnap was apparently trying to create the artificial language in which all science statements could be formulated, and Morris was developing a broader science that would include and unify all other studies about science. From the other side, we see Dewey – associated with Bentley – seeking to disqualify Carnap’s and Morris’s works, overlooking the ideal of irregular pieces brought together to form a big picture that would contribute to the advancement of society.

Nevertheless, this was not the most serious difficulty the *Encyclopedia* faced. As George Reisch (2005) points out, the political situation of cold war in the United States also damaged the project. Carnap and Philipp Frank used to hold leftist standpoints in Europe, and were investigated by the FBI in the post-war period. With

---

11 See DEWEY, 1999, item 19977.



Neurath deceased, and Morris worried about Dewey's rejection, it is not surprising that the *Encyclopedia* project required thirty years to have its first development phase published – and it was terminated after that.

The surprising part is that in 1962, the *Encyclopedia* published, in volume two number two, probably the most important work in twentieth century philosophy of science: *The Structure of Scientific Revolutions*, by Thomas Kuhn.<sup>12</sup> This book provided philosophers with tools for a pragmatic – historical and sociological – study of science. It linked discoveries in psychology, linguistics, logic, and history to present a different way of researching and understanding science. Kuhn provides us even with a tool for understanding some of Bentley's criticisms to the formal logicians:<sup>13</sup> he was a researcher who was not very familiar with the vocabulary of the new paradigm; that's why Bentley and Dewey felt so desperate about some terms Carnap and Morris didn't define explicitly in their texts.

The resulting image that the *Encyclopedia* mosaic presents after all is of a revolution happening within philosophy of science itself. This idea deserves deeper development, but not here. So far, I have shown that Dewey's criticisms seem to be unjustified, that is, the ideas he was criticizing cannot be charged of the accusations he makes. Now, we are going to see how Dewey's criticisms may be overthrown from the point of view of Dewey's own proposals.

## Experience and nature

In the book *Experience and Nature*, Dewey said that the method, *i.e.*, the way of reasoning, used in the natural sciences brings together experience and nature. The subject-matter of those sciences is nature – and the scientists base all their investigation in experience. Dewey's argument is basically that the natural sciences have a good method because they do not separate those two concepts. Philosophy, in Dewey's view, should adopt a method that worked in a similar fashion. To make his point, Dewey describes the work of a natural scientist as follows (DEWEY, [1925], p. 11):

the investigator assumes as a matter of course that experience [...] is the avenue that leads to the facts and laws of nature. He uses reason and calculation freely; he could not get along without them. But he sees to it that ventures of this theoretical sort start from and terminate in directly experienced subject-matter.

In other words, natural science begins with experience, takes a roundabout way through reasoning and calculation, gets to the facts and laws of nature, and then comes back to experience. About this contact between experience and theory, continuing the part just quoted, Dewey says that “theory may intervene in a long course of reasoning, many portions of which are remote from what is directly experienced. But the vine of pendant theory is attached at both ends to the pillars of observed subject-matter” (DEWEY, [1925], p. 11).

---

12 That's KUHN (1970).

13 Such criticisms may be found in BENTLEY, [1945]; see, as an illustration, p. 25-6, in which Bentley polemicalizes about Carnap's definition of 'language'.



This is the overall appearance of the method Dewey wants to apply to philosophy: in his view, philosophy should start with a problem that is experienced, develop a line of reasoning that often goes beyond direct experience, and in the end presents something that can again be experienced. This process of investigation was examined by Dewey in another book, *Logic: The Theory of Inquiry*, in which he analyzes the process into steps. Roughly, those steps are: (1) an indeterminate situation, (2) the institution of a problem, (3) the determination of a solution, (4) reasoning, and (5) the operational resolution (DEWEY, [1938] 2008, p. 109-20).

This method of inquiry can as well be observed in the mathematics, but not so directly. In *Reconstruction in Philosophy*, Dewey says that if one takes a historic approach to mathematics, one sees that the discipline is as empirical as any other human activity. In his words, the structure of mathematics “is a product of long historic growth, in which all kinds of experiments have been tried [...]; a history in which matter and methods have been constantly selected and worked over on the basis of empirical success and failure” (DEWEY, [1920], p. 159).

If such a method is permitted in mathematics and philosophy, why not in logic? With the development of linear algebra between the seventeenth and the nineteenth centuries, many logical problems came to be experienced by theorists, who developed a complicated system of reasoning that occasionally produced operational resolutions and applications for the world of experienced things. Logic, understood as a theory of inquiry, as with Dewey, is an important field of research – just as important as any other. But it doesn't mean that logical tools are only applicable to the theory of inquiry itself.

In *Experience and Nature*, Dewey continues the passages quoted above by saying that “this experienced material is the same for the scientific man and the man in the street. The latter cannot follow the intervening reasoning without special preparation. But stars, rocks, trees, and creeping things are the same material of experience for both” (DEWEY, [1925], p. 11). Bentley and Dewey sound like the men in the street who do not appreciate Carnap's reasoning in pure semantics, but would be able to experience things like computers and electronic domestic appliances that are built using tools developed by the kind of logic they were criticizing.

## Concluding remarks

What we have seen may lead us to conclude, in the first place, that there are no reasonable arguments in *Knowing and the Known* for a Deweyan scholar to reject modern mathematical logic: Dewey's and Bentley's criticism doesn't do justice to Carnap's and Morris's proposals. If such a scholar wishes to reject that tool, then it should be done with proper arguments, as, for example, that modern logic is not a good instrument for analyzing inquiry processes,<sup>14</sup> even though it may have other applications. A second point is that the *Encyclopedia* is a project that should not be left aside in Deweyan studies: as we tried to show, the program of the *Encyclopedia* fits very well with the analyses Dewey makes of science and society.

---

14 Even this claim is highly disputable, although this is not going to be discussed here.

Following the other side of our argument, the works of John Dewey offer a very good counterpart for the logical empiricist kind of philosophy of science, since Dewey performs pragmatic analyses of social contexts – something that logical empiricists usually lack – and also presents great tools for studies of valuation and the context of inquiry.

The main objective of the *Encyclopedia* seems to have been lost in the middle of controversy. Bringing together people that share the scientific attitude toward life in order to promote and popularize that attitude is an objective of greater value than the divergences about how science is to be unified. This objective is at the heart of both classical pragmatist and logical empiricist philosophies and should receive more attention. And in this direction, portraits of science are always important – no matter the nature of the resulting picture.

The unity of science is a problem which has not been much discussed as a central issue in recent philosophy of science. And so is the matter of the importance of uniting people that share the scientific way of seeing the world and of solving problems. If we think that science is a living subject, and that such is the way for improving society, then we must realize that understanding the pieces of the patchwork of science<sup>15</sup> is a never ending work – and it should never end, since making the world more scientific and society more intelligent must be the goal of anyone concerned with humankind.

## References

- BENTLEY, Arthur F. [1945] [1949] (2008). “Vagueness in Logic”. IN: DEWEY; BENTLEY, [1949], p. 8-45.
- \_\_\_\_\_. (1947). “The New Semiotic”. IN: *Philosophy and Phenomenological Research*, 8 (Sep. 1947), p. 107-31.
- CARNAP, Rudolf. [1934] (2002). *The Logical Syntax of Language*. Translated by Amealthe Smeathon (Countess von Zeppelin). Chicago and La Salle: Open Court.
- \_\_\_\_\_. [1938] (1955). “Logical Foundations of the Unity of Science”. IN: NEURATH *et al*, [1938] 1955, p. 42-62.
- \_\_\_\_\_. [1942] (1958). “Introduction to Semantics”. IN: *Introduction to Semantics and Formalization of Logic*. Cambridge, Massachusetts: Harvard University Press, 1958.
- CARTWRIGHT, Nancy. (1999). *The Dappled World – A Study of the Boundaries of Science*. Cambridge: Cambridge University Press.
- CHURCH, Alonzo. (1945). “Review”. IN: *The Journal of Symbolic Logic*, volume 10, nº 4, p. 132-3.
- DEWEY, John. [1920] (2008). “Reconstruction in Philosophy”. *The Middle Works of John Dewey*, volume 12. Carbondale: Southern Illinois University Press.

---

15 I'm using Nancy Cartwright illustration (see CARTWRIGHT, 1999).

\_\_\_\_\_. [1925] (2008). "Experience and Nature". *The Later Works of John Dewey*, volume 1. Carbondale: Southern Illinois University Press.

\_\_\_\_\_. [1938] (1955). "Unity of Science as a Social Problem". IN: NEURATH *et al*, [1938] 1955, p. 29-38.

\_\_\_\_\_. [1938] (2008). "Logic: The Theory of Inquiry". *The Later Works of John Dewey*, volume 12. Carbondale: Southern Illinois University Press.

\_\_\_\_\_. [1939] (1970). "Theory of Valuation". IN: NEURATH; CARNAP; MORRIS, 1970, p. 379-447.

\_\_\_\_\_. (1946). "Peirce's Theory of Linguistic Signs, Thought, and Meaning". IN: *The Journal of Philosophy*, Volume 43, n° 4, p. 85-95.

\_\_\_\_\_. (1999). *The Correspondence of John Dewey, 1871-1952 (I-III)*. Electronic Edition. Charlottesville, Virginia: InteLex Past Masters.

DEWEY, John; BENTLEY, Arthur F. [1949] (2008). "Knowing and the Known". *The Later Works of John Dewey*, volume 16. Carbondale: Southern Illinois University Press.

HAHN, Hans; CARNAP, Rudolf; NEURATH, Otto. [1929] (1996). "The Scientific Conception of the World: The Vienna Circle". IN: SARKAR, Sahotra. *The Emergence of Logical Empiricism*. New York and London: Garland Publications, p. 321-40.

KUHN, Thomas. (1970). *The Structure of Scientific Revolutions*. Second Edition, Enlarged. IN: NEURATH; CARNAP; MORRIS, 1970, p. 53-272.

MORRIS, Charles W. [1938a] (1955). "Scientific Empiricism". IN: NEURATH *et al*, p. 63-75.

\_\_\_\_\_. [1938b] (1955). *Foundations of the Theory of Signs*. IN: NEURATH; CARNAP; MORRIS, 1955, p. 77-137.

\_\_\_\_\_. [1946] (1955). *Signs, Language, and Behavior*. New York: Braziller.

\_\_\_\_\_. (1948). "Signs About Signs About Signs". IN: *Philosophy and Phenomenological Research*, Volume 9, n° 1, p. 115-133.

NEURATH, Otto. [1938] (1955). "Unified Science as Encyclopedic Integration". IN: NEURATH *et al*, p. 1-27.

\_\_\_\_\_. (1983). *Philosophical Papers 1913-1946*. Edited and Translated by Robert S. Cohen and Marie Neurath. Dordrecht: D. Reidel.

NEURATH, Otto; BOHR, Niels; DEWEY, John; RUSSELL, Bertrand; CARNAP, Rudolf; MORRIS, Charles W. [1938] (1955). *Encyclopedia and Unified Science*. IN: NEURATH; CARNAP; MORRIS, 1955, p. 1-76.

NEURATH, Otto; CARNAP, Rudolf; MORRIS, Charles W. (org.). (1955). *International Encyclopedia of Unified Science*. Volume 1, Nos. 1-10. Chicago: Chicago University Press.

\_\_\_\_\_. (1970). *International Encyclopedia of Unified Science*. Volume 2, Nos. 1-9. Chicago: University of Chicago Press.

REISCH, George A. (2005). *How the Cold War Transformed Philosophy of Science*. Cambridge: Cambridge University Press.

### **Endereço/ Address**

Ivan Ferreira da Cunha  
Rua Engenheiro Costa Barros, 1520,  
Bloco 2, apto. 43  
Curitiba – PR  
CEP: 82940-010

Data de envio: 15-06-2012

Data de aprovação: 27-09-2012