



Interdisciplinarity in Norbert Wiener, a mathematician-philosopher of our time



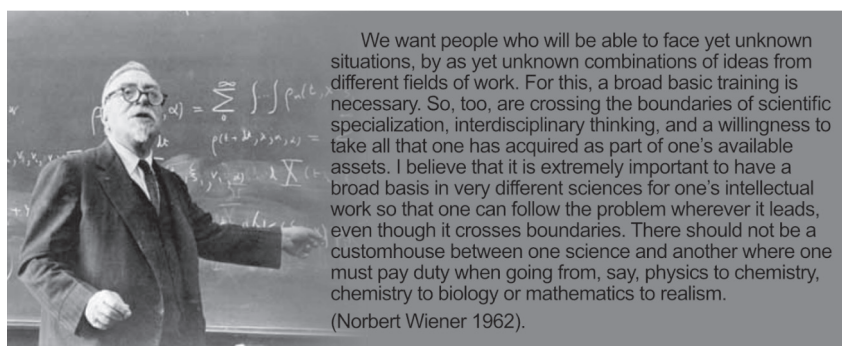
Leone Montagnini

Biblioteche di Roma, Italy

HIGHLIGHTS

- The really recent history of the term “interdisciplinarity”
- The US interdisciplinary movement in the Twentieth century
- Norbert Wiener's stance on interdisciplinarity
- New ideas need of small interdisciplinary groups with broad interdisciplinary basis
- “We need to cultivate fertility of thought as we have cultivated efficiency in administration” [N. Wiener]

GRAPHICAL ABSTRACT



ARTICLE INFO

Keywords:

Norbert Wiener
Royce's seminar
Rosenblueth's supper club
Interdisciplinarity
Creativity in science
Big science

ABSTRACT

The paper focuses on interdisciplinarity in Norbert Wiener looking at his scientific work from a unitary point of view. It begins with a bird's-eye view of the history of the term “interdisciplinarity”, pointing out how the word was the result of a movement of ideas that took place in US science along the whole Twentieth century. This way, the Wiener's conceptions and practices concerning interdisciplinarity are compared with their historical context, showing analogies and peculiarities. For Wiener, interdisciplinary research by very small groups whose members have a very broad interdisciplinary basis is an essential prerequisite for new fundamental ideas for invention and discoveries. On the contrary, in his opinion, mass attacks by large well financed interdisciplinary research groups with a big number of overspecialized member is useful only in a second phase in which invention and discoveries need to be implemented by designers and developers. Finally, through a conceptual matching between Wiener's ideas and the ones of José Ortega y Gasset, it appears how the Wienerian small interdisciplinary group would fit better with the Kuhnian revolutionary phase in science, while the big interdisciplinary group would fit better to the Kuhnian normal science.

1. Introduction

This paper develops the talk I gave in Cortona on September 21, 2016, when I was honored to receive the Diana Marina Mercurio Prize by SIBPA for my work on Norbert Wiener's thought. The original title I gave to the speech was “Norbert Wiener, a mathematician-philosopher of our time”, which is also the subtitle of my book [1], on the whole

intellectual figure of Wiener. In preparing the speech I considered it was better to focus on the “interdisciplinarity in Norbert Wiener”, because it was both a central theme in his intellectual path, and one of the most important aspects for the scientific enterprise today. I wrote several papers in the past on various aspects impinging on interdisciplinarity in Wiener as well as on early cybernetics (see [2–6]). In my speech and in what follows I focused on a theme I had actually partially neglected, but

E-mail address: leonemontagnini@katamail.com.

<http://dx.doi.org/10.1016/j.bpc.2017.06.009>

Received 25 May 2017; Received in revised form 21 June 2017; Accepted 21 June 2017

Available online 28 June 2017

0301-4622/ © 2017 Elsevier B.V. All rights reserved.

which had been firmly sustained by Wiener concerning small interdisciplinary research groups consisting of members with very broad and deep interdisciplinary basis. This point appears crucial just to understand the reasons of the abandon of cybernetics as a paradigm. Vittorio Somenzi, a philosopher of science who pioneered Italian cybernetics, in 1978 argued that

the difficulties encountered in the full implementation of the [cybernetics] projects proposed around 1948 are partly attributable to their excessively interdisciplinary nature. Only exceptional scholars, such as A. M. Turing, J. von Neumann, and N. Wiener, who have disappeared in the meantime, might embrace, through a complete domain of contemporary mathematics and logic, the rich phenomenology offered by a set of sciences seemingly devoid of any common ground such as electronics and genetics, chemistry and psychology, economics and glottology. On the other hand, the trend towards specialization, typical of modern research and teaching structures, is a hindrance not only to the training of professionals who can only devote themselves to the comparative study of certain elements of numerous and varied sciences but also to the creation and mutual co-ordination of groups of specialists who develop a language and a common program of the kind offered by information theory and cybernetics [7, p. 430]¹.

Along with Aldo De Luca, I think that the end of cybernetics is not only imputable to the shortage of “exceptional scholars” alone [2], but Somenzi’s argument cannot be neglect considering that it is consistent with the methodological standards Norbert Wiener required throughout his research, including those pieces of work related to cybernetics. For this paper, I did an additional research about the history of the term “interdisciplinarity” and the interdisciplinary movement from which that term originated; a social wave representing the historical context Wiener engaged himself with in an original way.

2. History of the term “interdisciplinarity”

The concept of interdisciplinarity is really pivotal in Norbert Wiener’s scientific path as well as in the science he was one of the main founders of, cybernetics, albeit for historical reasons this word appears in his work only in the sixties, in particular in one of his talks published in 1962 [10, p. 20]; at least, as far as I’m aware, it is the only occurrence of the term. Actually the word “interdisciplinarity” and the terminological constellation surrounding it is quite recent. As philologist Roberta Frank [11] showed, its first appearance was in the adjectival form “interdisciplinary”, dating back very likely to 1926, in the context of American social sciences, a context where it remained confined in a quite ostentatious way until the Second World War. “Interdisciplinary” was used by Robert Sessions Woodworth [12], a professor of psychology at Columbia University and a member of the Social Science Research Council (SSRC), a council gathering representatives of American national associations from seven socio-human sciences: economy, sociology, statistics, political science, anthropology, history and psychology [13, p. 20, note 21]. Without stressing the novelty in any way, Woodworth introduced the word in a programmatic document for the SSRC, stating that the Council would be “charged with the duty of considering where the best chances were for coordinated or *interdisciplinary* work.” ([12] cited by [11, p. 73], italics added). In the following years “interdisciplinary” occurred with low frequency, and always in socio-human contexts. *Webster’s Ninth New Collegiate Dictionary* registered the newborn word quoting a 1937 issue of the *Journal of Educational Sociology* [11, p. 74].

¹ The statement, appeared on the 4th supplement to *Enciclopedia Italiana*, replaced a very enthusiastic paper on cybernetics the author had written for the 3rd supplement [8]. It was recalled as one of the reasons of the end of classical cybernetics also by [9, p. 244–245], who worked at the cybernetics program started in Naples by Eduardo Renato Caianiello.

After the war, there was a fast, widespread usage of the term “interdisciplinary” in America outside social sciences, landing in France in 1959. Even during the sixties and the seventies its usage is testified, as well as in other names with a different prefix: “inter” with “multi”, “pluri”, “trans”. The widespread usage in French society is testified by *Le Figaro* (8 September 1970) headlining with horror: “Pluridisciplinarité et interdisciplinarité: deux termes barbares, même s’ils sont d’actualité” [Multidisciplinarity and interdisciplinarity: two barbaric terms, even if they are current] ([14, p. 277], cited by [11, p. 75]).

Actually, precisely in France, at the University of Nice, in 1970 a “Seminar on Interdisciplinarity in Universities” had been organized by the Centre for Educational Research and Innovation of the Organisation for Economic Cooperation and Development, in collaboration with the French Ministry of Education [15]. Reading the bibliography of the report we learn that during the second half of the Sixties in the USA an actual field of interdisciplinary studies had been born which rapidly propagated internationally. The report itself represents a landmark in this production. It contained the results of a survey on interdisciplinary teaching and research activities carried out in that period by several universities of Western Europe and North America.

The report included a first attempt to clarify the terminological galaxy which, meanwhile, had emerged around “interdisciplinary”, using also the prefixes “multi”, “pluri” and “trans”. It made the point that both *Multidisciplinary* and *Pluridisciplinary* stood for a “Juxtaposition of various disciplines”, the former concerning disciplines “with no apparent connection between them”, the latter concerning disciplines provided with more related as e.g. “French + Latin + Greek”, that is “classical humanities” or “Mathematics + physics”. [15, p. 25]. Interdisciplinary in particular meant “the interaction among two or more different disciplines”. A sort of interaction at different degrees of integration: “from simple communication of ideas to the mutual integration of organizing concepts, methodology, procedures, epistemology, terminology, data, and organisation of research and education in a fairly large field. An interdisciplinary group consists of persons trained in different fields of knowledge (disciplines) with different concepts, methods, and data and terms organised into a common effort on a common problem with continuous intercommunication among the participants from the different disciplines” [15, p. 25–26].

The last term, *Transdisciplinary*, meant - according to a definition made by someone called Linton [likely the anthropologist Ralph Linton] - “Establishing a common system of axioms for a set of disciplines” [15, p. 26].

In the following years, with the transition from the adjective to the substantive, and the disappearance of “pluri” in favor of “multi” this taxonomy took root in literature, as Marco Elio Tabacchi and Settimo Termini clearly showed in the paper in which this same article will appear (the “SIBPAXXIII” Special Issue).

3. The American interdisciplinary movement before interdisciplinarity

As the process towards progressive specialization went on, also the need for synthesis between the different disciplines arose simultaneously, and this happened long before the appearance and widespread usage of the word “interdisciplinarity”. Particularly in the United States, the need for collaboration among disciplines become one of the major tasks of the national scientific organizations since the very beginning of the Twentieth century. Not by chance, as we have seen, the term “interdisciplinary” had germinated precisely in one of those organizations, the Social Science Research Council. The historian Rexmond Cochrane, who was appointed to write a history of the first century (1863–1963) of the National Academy of Sciences, wrote: “The words “interdiscipline” and “multidiscipline” did not appear in dictionaries until the 1960s, but the crossing of disciplines, as a potentially valuable tool of science had been advocated by George Ellery Hale as

Download English Version:

<https://daneshyari.com/en/article/5370623>

Download Persian Version:

<https://daneshyari.com/article/5370623>

[Daneshyari.com](https://daneshyari.com)