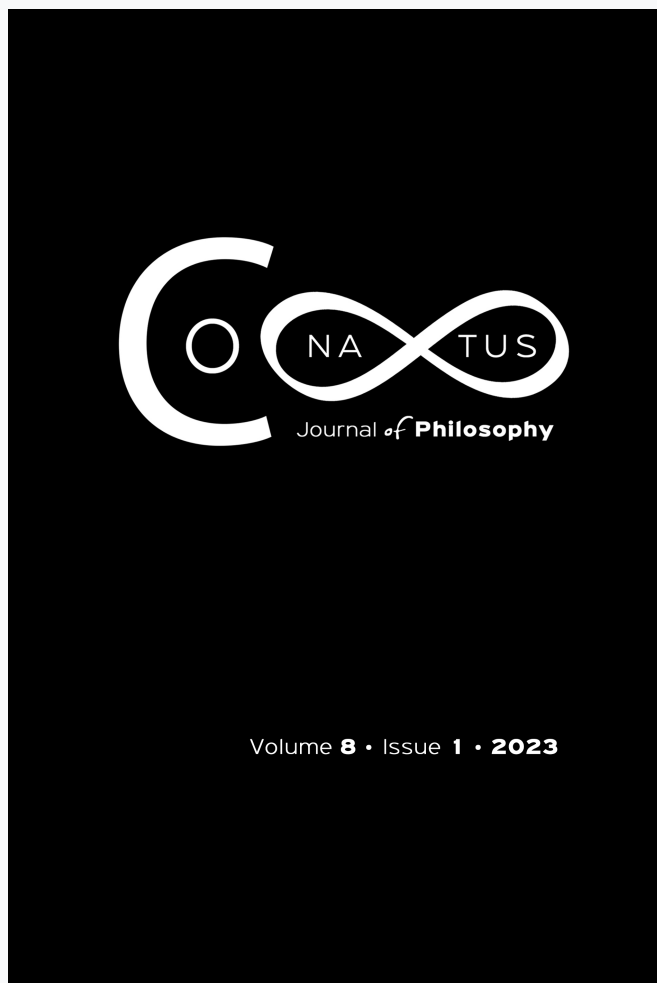


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# Thematic Analysis and its Interdisciplinary Interest: An Advantage or a Disadvantage for Holton's Purpose?\*

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## Abstract

*The term “thematic analysis” abounds in research articles and appears in the titles of books, without the authors of these writings being primarily concerned with defining what thematic analysis is. Thematic analysis is present in the current vocabulary of several disciplines and is presented as a working method of choice in psychology, sociology, or linguistics, to name but a few. This article seeks to situate thematic analysis in the thinking of Holton Gerald, who introduced it into the philosophy of science as a rational approach that can account for scientific discovery and progress. The aim of this article is to see whether the attested interdisciplinary interest nature of thematic analysis argues in favour or against Holton's claim of making it a credible and acceptable tool in philosophy of science.*

**Keywords:** *thematic analysis; interdisciplinary interest; themata; Holton; method*

## I. Introduction

Gerald James Holton has devoted much of his research in philosophy and history of science to themata.<sup>1</sup> He highlighted the importance of their role in scientific research and established thematic analysis as a way of accessing the mechanism of scientific

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<sup>1</sup> Most of Holton's publications are now openly available at this address: [https://dash.harvard.edu/discover?rpp=10&etal=0&group\\_by=none&page=1&filtertype\\_0=author&filter\\_relational\\_operator\\_0=contains&filter\\_0=Gerald+Holton](https://dash.harvard.edu/discover?rpp=10&etal=0&group_by=none&page=1&filtertype_0=author&filter_relational_operator_0=contains&filter_0=Gerald+Holton).

\* This article is an edited chapter from the author's PhD Thesis. Quotations from works originally written in French are the author's translations.

invention. What is thematic analysis? When do its origins go back to? What are its characteristics and what are its areas of application? If we truly want to comprehend what thematic analysis is as Holton meant it to be, another question that is just as important as the two previous questions must be answered. Indeed, should we view this relationship as advantageous or disadvantageous for Holton's purposes, given that it is clear from works on thematic analysis that one has a close relationship with a number of fields, including sociology, history, and psychology? This essay focuses almost entirely on providing answers to these various questions. That being said, we will only briefly discuss themata and assume that their effectiveness in the field of research is already a fact. The guiding idea of this article is as follows: answering the questions posed above will allow us to specify, enrich and render persuasive the key role that thematic analysis plays in the field of the philosophy of science. This is undoubtedly the challenge we must meet to give thematic analysis its credibility and its value as a rational method to the explanation of scientific research.

### I. What is thematic analysis? What are its origins?

To answer these questions, it is appropriate to be more precise, from the outset, about the terms "analysis" and "thematic." The word "analysis" should be understood here as a method of discovering and explaining elements of discourse (oral or written) or events, laws or principles that are likely to present various aspects precisely because of their complexity. As for the word "thematic," it should be noted that for the common sense, it is understood as the study of themes – a theme being sometimes: (i) what a work of art deals with, in opposition to the representation that the work makes of it;<sup>2</sup> (ii) the practice of translating from one's mother tongue into another language;<sup>3</sup> (iii) the idea developed in a speech, an article, a work, etc.;<sup>4</sup> (iv) "a unity of content (of a discourse, of a text) which can be isolated or identified by lexical means and which corresponds to constants of the imagination, of the symbolism."<sup>5</sup> But, here, the word "thematic" is rather related to what Holton calls themata. Through this concept of Greek origin

<sup>2</sup> Jean-Marie Schaeffer, "Thème," in *Encyclopédie Philosophique (M-Z): Les Notions Philosophiques. Tome 2* (Paris: Presses Universitaires de France, 1990), 2583.

<sup>3</sup> "Thème," in *Dictionnaire Français*, 2021, <https://www.linternaute.fr/dictionnaire/fr/definition/theme/>.

<sup>4</sup> Ibid.

<sup>5</sup> "Thème," in *Dictionnaire de La Langue Française* (Paris : Le Robert, 2005).

(*thema* in the singular, conception, what is posed, what is put forward), he designates the nourishing themes of thought that motivate as much as they restrain both the generation of ideas and the advancement of concepts. Themata turn out to be the preferred themes of an author, a scholar, or a philosopher, sometimes even taking on the appearance of an unconscious obsession that often has its roots in childhood.

Holton relies on themata, because of the importance of their function in the creative activity of science, to remind those who want to consider only “demonstrative reason” to explain scientific research that human thought is heterogeneous.<sup>6</sup> As is the case, Holton offers themata as a compelling argument that forces scientists to reckon with the “creative unconscious” or “creative imagination” when considering innovation and scientific progress. Holton makes this idea explicit by symbolising, in the first instance, by the two orthogonal (x and y) axes of a plane (xy) “the propositions concerning empirical facts” and “those concerning logic and mathematics” which form the basis of the usual scientific discourse. Subsequently, he points out that this representation is insufficient to account for scientific research unless the xy-plane is associated with the orthogonal z-axis of thematic content.<sup>7</sup> Moreover, Holton counts, in the field of physics, about fifty themata, and estimates that, throughout history, in all of science, their number would not exceed one hundred. The rise of a new *thema* is extremely rare, as is the withdrawal of a *thema* from the field of knowledge. Following Holton’s work, this observation leads us to regard themata as generally stable structures, constants of the scientific imagination, preconceived ideas or presuppositions (sometimes of a metaphysical nature) that operate in scientific research either in the shape of concepts (e.g. *simplicity*, *continuity-discontinuity*), or as a working method or as hypothetical propositions that guide scientists in their research activities. Now that the definition of the word “themata” has been clarified, what about the thematic analysis that emanates from themata and from which it is inseparable?

Thematic analysis is in fact related to analysis in general. A precise definition of thematic analysis can only be derived from our fundamental knowledge of analysis. And from an elementary point of view, analysis in general is a method (a process of dissecting a whole into its components and determining their connections). Thematic analysis is regarded as a method used in many academic fields, including

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<sup>6</sup> Ivana Marková, “Themata in Science and in Common Sense,” *Kairos* 19, no. 1 (2017): 68-92.

<sup>7</sup> Gerald Holton, *Einstein, History, and Other Passions: The Rebellion Against Science at the End of the Twentieth Century* (Cambridge, MA: Harvard University Press, 2000), 158.

sociology and musicology. More specifically, thematic analysis is used as a method of detecting central terms in order to understand what hides their frequency or their importance in the structuring or construction of a work, a text or a discourse. Here, the term “discourse” refers to discursive reasoning that is transmitted verbally or in writing. According to Holton, thematic analysis goes back, historically, to the very origins of science: “The method of dealing with complex entities by resolution or reduction found its use in science itself very early.”<sup>8</sup> It was the founding father of science among the Greeks, Thales, that insisted – after all – that a single entity explains everything! But before Holton gave thematic analysis its rightful place in the study of scientific activity in the 1970s and 80s, it had already begun to prove itself in other fields such as linguistics and cultural anthropology.

The use of thematic analysis with Holton is limited to the history and philosophy of science, meaning that it was practised independently of Holton or before Holton. This being the case, thematic analysis presented in this way, at first glance, is obviously similar to literary criticism, and it is easy to understand why an author like Jean-Paul Weber makes it an element of the “new criticism.”<sup>9</sup> This notion of “new criticism” is one of the most significant metamorphoses of literary criticism. It emerged in the French academic world and had as its leader Roland Barthes and as its symbol or starting point the publication of Barthes’ essay on Racine in 1963. The proponents of this approach stemming from structuralism advocate a set of innovative orientations, among others, the understanding of *the context of the emergence of the work and of the finished work*, in order to supplant “traditional criticism, obsessed with the text, closed to the horizons and depths of the thought that is expressed in it.”<sup>10</sup> Thematic analysis has, in its singularity, the vocation of meeting this deficiency of the traditional criticism. We therefore believe that by following the convergent efforts of Holton and Weber we will be able to shed some light on what thematic analysis is.

Finding the “specific terms” that make up the work under consideration is the goal of thematic analysis. The purpose of such an inquiry is to reveal these terms as “indicators” pertaining to the conditions of thought production and to rely on them in order to arrive at the unanticipated method of generating the knowledge that an

<sup>8</sup> Gerald Holton, *The Scientific Imagination* (Cambridge, MA: Harvard University, 1998), 6.

<sup>9</sup> Jean-Paul Weber, “L’analyse thématique: hier, aujourd’hui, demain,” *Études françaises* 2, no. 1 (1966) 29-72.

<sup>10</sup> *Ibid.*, 56.

author conveys. From this vantage point, thematic analysis goes beyond what Foucault's conception of hermeneutics in the field of literature means, namely to interpret and make understandable what the text says. By "specific terms" and "indicators" we mean the accumulation of words and/or ideas that the author or scientist who conceives a work or a theory cannot do without to the point of betraying a certain obsession. To understand what can motivate such commitments, a search in the author's or scientist's childhood is often evoked. We find an idea in favour of this thesis in the writings of Matthieu Quidu, who, in recent research on the themata of Holton with the focus on the academic works of STAPS<sup>11</sup> lecturers, puts forward the hypothesis that "a scientist would go for a given thematic option because it allows him to invest intimate meanings and values in reference to his singular history."<sup>12</sup>

The thesis expressed above as well as the specificity of the thematic analysis, which is to determine a term (or the terms) that dominates (dominate) or supports (support) the whole work of an author, of a scientist, to reach the source that resulted in the work, are well present in the work of Weber. Three considerations allow us to be aware of this. First of all, Weber identifies in the work of Edgar Poe, thanks to the thematic analysis, what he calls "an unconscious horological obsession," which causes all the works of the illustrious American writer of the 19th century to be marked by the question of time or by the representation of the clock.<sup>13</sup> This fact which "had not been pointed out by any of the many commentators of the poetic work"<sup>14</sup> and which Weber describes as "thematic obsession"<sup>15</sup> consequently attests that thematic analysis is not reducible to mere literary criticism. It is important to underline this insofar as, the essence of the thematic approach,

is the search, on the one hand, for images in the broadest sense of the word, on the other hand, for structures, explicit or implicit, pertaining to the haunting of which the lexicological surveys still only provide us with an aerial and imperfect view.<sup>16</sup>

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<sup>11</sup> Sciences and Techniques of Sports and Physical Activities.

<sup>12</sup> Matthieu Quidu, "Les thémata dans la recherche en STAPS: motivations et modalités d'intervention," *STAPS* 84, no. 2 (2009): 7-25.

<sup>13</sup> Weber, 36-38.

<sup>14</sup> *Ibid.*, 37.

<sup>15</sup> *Ibid.*, 38.

<sup>16</sup> *Ibid.*, 45.

In other words, the detection of recurring lexicology in an author is not enough to speak of “haunting” linked to the feeder *term* of his thought. Metaphors, aesthetic judgment and other subtleties used by the author must corroborate and clarify the thematic interpretation.<sup>17</sup>

With the above remarks, it is easy to understand why, in his publications, when dealing with themata, Holton brings out everything that is likely to affect private science and to reveal traits of the personality of scholars – this point is perceived and well highlighted by Paul Scheurer in his preface to one of the books through which Holton is known in the French-speaking world<sup>18</sup> and Marková.<sup>19</sup> This underlined attention proves the importance of the personal context of discovery in the orientation of the so-called scientific work and underlines, moreover, how much, in order to be understood, scientific work needs in return the light shed by the context of the emergence of thought. Hence, for Holton, the themata that structure the thought of a scientist characterize him and the study of his works makes it possible to identify and refine his thematic map. Scientist and themata mutually reveal each other in a certain way. He therefore calls the themata of a scientist “his fingerprints.”<sup>20</sup>

And, still in this direction, emerges from the works of Holton, the idea that it is also by an anchoring of an aesthetic order, deeply rooted in the psyche,<sup>21</sup> that one can manage to link with confidence and without difficulty a scientist to such and such themata – Galileo, Einstein, and Bohr, can be cited here as examples.<sup>22</sup> Also in this sense, we must understand that, apart from the clue constituted by a recurring lexicology, the implicit or explicit use of symbols and analogies comes into play in the deciphering of what one might call the thematic core of a scholar.

The words or language, as they are written or spoken, do not seem to play any role in my mechanism of thought. The psychical entities which seem to serve as elements in

<sup>17</sup> Holton, *The Rebellion Against Science*, 131-132.

<sup>18</sup> Gerald Holton, *L'invention scientifique: Thémata et interprétation*, trans. Paul Scheurer (Paris: Gallimard, 1982).

<sup>19</sup> Marková, 68-92.

<sup>20</sup> Holton, *The Rebellion Against Science*, 159.

<sup>21</sup> Gerald Holton, *Thematic Origins of Scientific Thought: Kepler to Einstein* (Cambridge, MA, and London), 26.

<sup>22</sup> Holton, *The Rebellion against Science*, 119-157.

thought are certain signs and more or less clear images which can be voluntarily produced and combined.<sup>23</sup>

The fact that a scientist such as Einstein could not develop theories and establish his thought without resorting to diagrams, to what is visual, is not a trivial fact in the case of this scientist, but a revealing element of his attachment to the thema of realism.

Then, extending his study to several other authors, Weber notices that the French poets Vigny and Racine share with Poe the same “horological obsession.” In their works, the words or ideas of hour, moment, instant, day, time, dial, hand, circle, swing, and many others of the same kind are omnipresent.<sup>24</sup> This enumeration, from which emerges a lexicological consistency, clarifies what we said above about the “specific terms” and “indicators” that thematic analysis flushes out and discerns to reach what would be the “obsession” of an author, that is, the generic term, surprisingly flexible and capable of designating and assuming the unity of the various uses of the author’s terminological system. When it comes to clarifying his thoughts, lending vigour or picturesqueness to his ideas, beliefs, or intuitions, an author will often turn to his favourite term or his thematic anchoring, which acts as a kind of universe of reference.<sup>25</sup>

Finally, the discovery, among Poe’s childhood memories, of the terror inspired in the author by a gigantic clock and mournful bells confirmed Weber in his conviction that thematic haunting must have its roots in the early life experiences of scholars, authors and artists.<sup>26</sup> Subsequently, he was led to the idea that “the act of literary creation can be identified and formulated with precision and rigor”<sup>27</sup> in the light of a theme – and why not this unique one?<sup>28</sup> – hidden in the recesses of the author’s childhood. “The theme that illuminates the works and lives of so many men of genius, in literature, arts, sciences, politics, undoubtedly shines deep in the unconscious of each of us.”<sup>29</sup> In this respect, isn’t thematic analysis reducible to psychoanalysis? Weber expressly rejected such a claim. For him, indeed, even if the

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<sup>23</sup> *Ibid.*, 89.

<sup>24</sup> Weber, 44.

<sup>25</sup> *Ibid.*, 47.

<sup>26</sup> *Ibid.*, 38.

<sup>27</sup> *Ibid.*, 31.

<sup>28</sup> *Ibid.*, 65.

<sup>29</sup> *Ibid.*, 67.



words consciousness and unconsciousness, traumas and personal reminiscences, commonly accepted as being those of psychoanalysis,<sup>30</sup> enter the lexicon of thematic analysis, they do not as much make of this a discipline analogous to psychoanalysis. “Thematic analysis is something else entirely: an objective, rigorous discipline, capable of progress, capable of being deepened and amended [...] in short, a science.”<sup>31</sup>

If the author initially put the two into perspective, it is because on the one hand, some of his detractors, notably Raymond Picard,<sup>32</sup> did not see any difference between the two and, on the other hand, it is for the purpose of demonstrating that in no case psychoanalysis can be superimposed on thematic analysis.

Thematic analysis is not psychoanalysis because it denies pansexuality and the death instincts, censorship, repression, the id, the ego and the superego, the symbolic code, the traditional complexes of Oedipus, of castration, of Electra, etc.; just as it denies Adler’s inferiority complex, in its generality; and, absolutely, Jung’s racial archetypes.<sup>33</sup>

It is the same refutation that he pursues when he points out: *firstly*, that Bergson has shown, in a very convincing way, that philosophical systems start from an “intuition” elaborated into a “system;”<sup>34</sup> *secondly*, that “the intuition of a system is nothing other than the *theme* of the philosopher.”<sup>35</sup> This is, the author hopes, an unassailable deduction to support the notion that thematic analysis, in its approach as well as in its aim, only affixes itself to the term (nurturer of thought), to its structures and modulations and to nothing else,<sup>36</sup> thus to the themata as Holton would say, to shed light on the way knowledge is generated.

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<sup>30</sup> Ibid., 40.

<sup>31</sup> Ibid., 31.

<sup>32</sup> Ibid., 39-40.

<sup>33</sup> Ibid., 41.

<sup>34</sup> Ibid.

<sup>35</sup> Ibid., 67.

<sup>36</sup> This point, which may seem paradoxical or ambiguous, is clarified by Jean-Paul Weber in these terms: “However, if the theme is always unique, [...] it can be offered according to an already complex structure, albeit a single one. In Vigny’s case, [we have] discerned a thematic structure, a thematic constellation, a thematic system where the Clock, a unique theme, is nuanced [presents a succession of faces or phases],” in Weber, “L’analyse thématique,” 65.

These observations on the possible convergence and the necessary distancing of thematic analysis and psychoanalysis are very much in line with the idea that Holton explores, in his approach, the factors of invention without discarding the psychological determinations of knowledge and without either falling into psychologism. And as Einstein observed, “science as coming into being, as a design, is as subjective and psychologically conditioned as any other human activity.”<sup>37</sup> Therefore, the understanding of the logic of invention, if it can exist, cannot avoid the path of psychology. From this point of view, Reichenbach<sup>38</sup> and Popper<sup>39</sup> are right. If thematic analysis rates as a method or an epistemological approach, it is because it does not fail to fulfil “by its own means” the psychological assistance considered essential for the task it makes use for. Thus, the claim that thematic analysis can rationally explain and account for science invention based on themata finds its legitimacy. Indeed, it turns out that thematic analysis can address this issue in a novel manner without resorting to psychologism. By “proper means” of thematic analysis, we mean its method. We will be more explicit about this in the following.

Furthermore, Holton’s presentation of Bohr’s option for the principle of complementarity in the quantum debate, going so far as to reveal its historical roots in Bohr’s childhood, is a perfect illustration of the link, in reality merely superficial, that thematic analysis and psychology weave without actually having one. Be that as it may, “All psychology is of a piece with metaphysical postulates;”<sup>40</sup> and Holton’s quest aims only at these assumptions. In this respect, we should simply point out here that a close examination of the Bohr case with regard to *the principle of complementarity* provides a better understanding of how the attachment to themata as an intellectual framework dictated by the creative imagination can, in certain cases, stem from an indelible imprint left, from the childhood, on the unconscious and the memory of the scientist.

Already, our progress in the field of thematic analysis allows us to retain that, particularly in philosophy of science, thematic analysis presents itself as a philosophical method, worthy of being one which sets itself the task of going back to the presuppositions on which science

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<sup>37</sup> Text quoted by Holton in his book *L’invention scientifique*, 12.

<sup>38</sup> Hans Reichenbach, *Experience and Prediction: An Analysis of the Foundations and the Structure of Knowledge* (Chicago, and London: Phoenix Books, The University of Chicago, 1938), 6-7.

<sup>39</sup> Karl Popper, *The Logic of Scientific Discovery* (London, and New York: Routledge, 2005).

<sup>40</sup> Gaston Bachelard, *The Philosophy of No: A Philosophy of the New Scientific Mind*, trans. G. C. Waterston (New York: The Orion Press, 1968), 11.

is grounded (themata) to increase our understanding of the process of bringing about scientific theories. From now on, it is quite natural to note that thematic analysis has moved imperceptibly from the literary domain to the domain of knowledge, of science. This successful transfer initiated by Holton – whose first works were presented to the general public in 1962<sup>41</sup> – proves that thematic analysis is an approach that is in no way arbitrary or psychologising. Even if the themata, regarded as active and necessary for scientific thought, turn out to be occult or are entities hidden by the researchers, it can be said that the relevance of the results that thematic analysis has already achieved in philosophy of science on the question of the mechanism of research contributes greatly to its reliability.<sup>42</sup>

In fact, thematic analysis is a scientific discipline, equipped with a set of rigorous methods. These methods, as we shall see later in this paper, are based, in a singular way, on the study of historical cases, but also current ones (“the process”) with the aim of researching and identifying general themes, structures generally stable (themata), which are found in the preoccupation of different scholars (those by whom science is made) and in the field of research in general. In addition to this goal, thematic analysis, as a tool for apprehending terms deemed capable of regulating scientific activity, has the effect of identifying the role of these themes in the progress of science. Thematic analysis, writes Holton,

is in the first instance the identification of the particular map of the various themata which, like fingerprints, can characterize an individual scientist, or a part of the scientific community, at a given time.<sup>43</sup>

By indicating that the scientific work has a background that provides it with its principle of intelligibility, thematic analysis implies, above all, the recognition that sciences have a hidden side and a history. By tracing this history, it serves as a tool to identify the complex entities (themata, nourishing themes of thought) which influence, in the form of constraints, the work of the scientist to the point of being decisive in the direction of possible discoveries or constitute a factor in the failure of the research.

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<sup>41</sup> Gerald Holton, “Über die Hypothesen, welche der Naturwissenschaft zu Grunde liegen,” *Erano-Jahrbuch* 31 (1963): 351-425.

<sup>42</sup> Holton, *Thematic Origins of Scientific Thought*, 57.

<sup>43</sup> Holton, *The Rebellion Against Science*, 159.

## II. Thematic analysis: Its characteristics and fields of application

Thematic analysis, which aims to be an intra-disciplinary method, has found a place in the realm of philosophy as a scientific process, because it has a method (which covers a series of processes) and an object (a goal to be reached). Its method, within the singular framework of philosophy, is based on a very large amount of information collected in the “private science” from *texts, testimonies, letters, laboratory notebooks* and, if necessary, *by observing through the keyhole in laboratories*. If the thematic analysis is intra-disciplinary, it is also, in a certain sense, interdisciplinary interest this explains why it is sometimes confused with literary criticism, sometimes with psychoanalysis, sometimes with anthropology and so on. Indeed, it is stressed that the task of investigation assigned to thematic analysis by Holton “is part of a genetic epistemology, concerned with the psychological – and social – determinations of our knowledge, based on a meticulous undertaking of historical criticism.”<sup>44</sup> If the thematic analysis studies “private science” as the outcome of several processes, it is to achieve a satisfactory understanding of the mechanism of research, the way the human mind proceeds to invent, to discover new ideas, and to generate science. Ultimately, one can say that thematic analysis has as its *target* the understanding of scientific work in its nascent state<sup>45</sup> and as a *method* to achieve this, investigation, which consists of questioning science in its past, and always in its fundamental elements – in search of what science conceals that is unacknowledged or unavowable in the face of the demands of logic. The difficulty, but especially the interest of such an enterprise did not escape Einstein. The latter, according to Holton, repeatedly stressed that the study of the nascent state of science is one of those we should allow ourselves to undertake.<sup>46</sup>

Based on views held to be fundamental, thematic analysis takes up the challenge and, in so doing, contrasts with a certain philosophical trend which conceives of science as a method of investigation that must transcend the historical and cultural order in order to remain pure. Thematic analysis invalidates such a conception and addresses the scientific work from a genetic perspective by questioning, as we have underlined, “private science,” in accordance with its aim, which

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<sup>44</sup> Gerald Holton, *L'imagination scientifique*, trans. Jean-François Roberts (Paris: Gallimard, 1981).

<sup>45</sup> Holton, *Thematic Origins of Scientific Thought*, 17; Holton, *The Scientific Imagination*, 4.

<sup>46</sup> Holton, *Thematic Origins of Scientific Thought*, 17.

is to account for the current practice of the scientist. In this logic, thematic analysis provides, to those who write the history of science, the means to focus more on laboratory work, by being attentive to the “unconfessed or unconscious guiding presupposition a scientist adopts *without* being forced to do so by either data or current theory,”<sup>47</sup> but it also shapes mentalities, that of the researcher and that of the scientific community.

We must, before going further, emphasise that for thematic analysis, the important thing lies in the examination of the sources and the ways allowing the discovery of new knowledge. Thus, if the thematic analysis is interested in the question of discovery, of scientific invention, it is to access all the creative resources that the researcher mobilises, consciously or unconsciously, to come up with knowledge, *a priori*, without any direct concern for logic or rigor – these only formally entering into consideration *a posteriori* for justification. In fact, the approach of thematic analysis takes the form of an investigation to have a closer look at the fundamental concepts or *themata* on which science is based and which are supposed to be the instance of explanation of the mechanism of invention.

Thematic analysis, as an approach that focuses more on *themata* than on the scientific community and its rules (rules in the sense of standards that govern scientific publications), has been used a lot for some time in disciplines such as *ethology*, *ethnology*, *anthropology*, *art criticism*, *musicology*, but also in *chemistry* as in *biology*, specifies the one (Holton) who introduced it in epistemology to study science, beginning with the science he practises, i.e. physics. If one uses thematic analysis in different disciplines and in the historiographical approach as far as science is concerned, it is because it has certain advantages. This approach, which we owe in epistemology to Holton, has registered to its account the outstanding achievement of bringing us into a radically new conception of the nature of science. It renders illusory the neo-positivist idea (shared by Popper) which leads one to believe that knowledge established by science could be analysed without relating it to the practices and presuppositions that make it possible and envelop it.

The realization of the thematic origins of scientific thought has corrected an appealing but simplistic notion about scientific method that was current in earlier times, and still infects some pedagogic presentations– the notion that the

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<sup>47</sup> Holton, *The Rebellion Against Science*, 118.

individual scientist always must, and can, start out utterly free from all preconceptions.<sup>48</sup>

In fact, as we will see in the next step of our work, it is the process of producing scientific knowledge itself, which takes on a very different and much more open face than the image of science given by logical positivism.

It should be noted that the broad scope of application of thematic analysis cannot be the only argument put forward to give credit to this approach. For it remains that the recognition of its relevance in epistemology depends as much on the convincing results it has produced as on the rationality of its method.

As a good physicist and historian, Holton practices a rigorous method, which is to put forward nothing that is not supported by a text or a document, which are themselves well committed to the context.<sup>49</sup>

Thematic analysis, as Holton asserts, is neither an ideology, nor a metaphysical school, nor a plea for irrationality.<sup>50</sup> Concerned with elucidating the mechanism put into play by researchers in the development of theories, it claims its scientific character by virtue of its rigorous approach which results in the conscientious and impartial study of the sources of research, of the nascent phase of science. As an approach geared towards screening for the presence of preconceptions of the creative imagination, thematic analysis postulates that all science rests on a limited number of general themes, often implicit, the so-called themata.<sup>51</sup> We have already mentioned earlier, in the rapid presentation made of the themata in this paper, their number with precision.

Thematic analysis thus perceived henceforth, while being an approach in its own right in the disciplines it invests – including philosophy of science – is, basically, the ninth tool for analysing a scientific work in the Holtonian historiography where any “product

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<sup>48</sup> Ibid., 119.

<sup>49</sup> Paul Scheurer, “Preface to Holton,” in *L'invention scientifique: Themata et interprétation*, trans. P. Scheurer (Paris: Gallimard, 1982), 8.

<sup>50</sup> Holton, *Thematic Origins of Scientific Thought*, 44.

<sup>51</sup> Ibid., 29.

of scientific work”<sup>52</sup> is considered as “an event.”<sup>53</sup> It is therefore important to proceed with an exploration or at least an evocation of these components which, according to Holton, make it possible to identify all aspects of a scientific work.<sup>54</sup> By means of this exploration, research as such (and not directly the concept of thematic analysis, which has already been clarified) can – and this is what we are aiming for – receive additional precision.

So in addition to thematic analysis, we owe to Holton the idea which consists in considering that the review of a scientific work, in order to be complete, i.e. providing “the list of active forces present in the creation of any work of scholarship, of literature, or of art,”<sup>55</sup> must include: (1) an inventory that takes stock of the state of the scientific content of the event at a given time, in common terms at that time as much as in the terms that are now ours; (2) a study of the time trajectory of the state of public (“shared”) scientific knowledge that leads, to the extent possible, to the time chosen for the event, or even beyond; (3) a study of the personal aspects, perhaps even unappreciated or ignored by the person concerned, in any case less institutional, more ephemeral of the E activity at a given time *t* (the aim is to retrace the context of discovery); (4) here, “private science” is involved and a presentation, as for “public science,” of the temporal trajectory of personal scientific activity under study is established; (5) the work consists here in remaining in the “private science” and in examining in a specific way the psychobibliographical evolution of the scientist studied. Much is made of the “relationship between a person’s scientific work and his intimate lifestyle;” (6) a sociological study to identify the issues and influences (induced for example by the education system on the training of scientists) that drive the researcher to embark on research; (7) a consideration of the cultural and political factors that influence the work of scientists; (8) where relevant, for clarification on the scientific work, an analysis of its philosophical component, in particular the epistemological assumptions and the logical structure of the work studied.<sup>56</sup>

Obviously, in the enumeration made, it is the aspect (3) which is *significant* for our topic. We highlight “significant” for two reasons.

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<sup>52</sup> The terminology refers to: published dissertation, laboratory notes, transcript of an interview, exchange of correspondence. See Holton, *L’imagination scientifique*, 21.

<sup>53</sup> Holton, *The Rebellion Against Science*, 109.

<sup>54</sup> Holton, *Thematic Origins of Scientific Thought*, 37.

<sup>55</sup> Holton, *The Rebellion Against Science*, 107.

<sup>56</sup> *Ibid.*, 108-121.

The first is the need to avoid having the word “significant” construed as something it is not, i.e. “exclusive” or the only thing to do. The second reason is to make it clear that while this aspect (3) makes thematic analysis a theory that focuses on the “personal struggle”<sup>57</sup> that leads to discovery, thematic analysis in turn postulates that scientific discovery as dependent on the social or cultural context of the research. In the same dynamic, we should also note that the study of scientific activity involves taking into account such diverse issues that one individual cannot display sufficient competence to overcome them all.<sup>58</sup> “It is unlikely that all nine can be described at once or by the same person engaged in the study of [a] case.”<sup>59</sup> Furthermore, we are entitled to note that these different components listed by Holton reveal more clearly that the reflection on thematic analysis and that on a philosophy of interdisciplinarity cannot be separated. Also, it is appropriate to examine thematic analysis from this angle in order to further clarify its specificity and the relative autonomy it has in relation, in particular, to psychology, sociology and history.

### III. At the heart of the nerve centre of thematic analysis: Multidisciplinarity

The thematic analysis is presented as “[an] investigation [which] is in line with a genetic epistemology, concerned with the psychological – and social – determinations of our knowledge, based on a meticulous undertaking of historical criticism.”<sup>60</sup> This characterization of thematic analysis has the advantage of situating it in the network of sciences to which it is related in a certain way or from which it borrows results in order to achieve its goal, namely, to make scientific discovery intelligible. Under these conditions, the term “discovery” cannot seem self-evident. Only, in this context where it was necessary to prove the legitimacy of a logic of discovery in order to give our present study a certain credibility, it was more a question of giving reason for this logic denied by the logical positivists and Popper. If, on occasion, we have nevertheless tried to define what a “scientific discovery” is, we must note, however, that the different definition approaches mentioned remain deficient in an aspect whose relevance becomes obvious once

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<sup>57</sup> Holton, *The Scientific Imagination*, 4; Holton, *Thematic Origins of Scientific Thought*, 17.

<sup>58</sup> Anne-Françoise Schmid, and Jean-Marie Legary, *Philosophie de l'interdisciplinarité* (Paris: Petra, 2004), 227.

<sup>59</sup> Holton, *The Rebellion Against Science*, 107.

<sup>60</sup> Holton, *L'imagination scientifique*.



underlined the risk of wrongly confusing “discovery and other possible categorizations, such as learning, replication, plagiarism, presentation of the self-evident, fraud, fantasy, and so on.”<sup>61</sup>

The risk thus underlined is not only to be feared; it does indeed exist. The book written by science journalists William Broad and Nicholas Wade titled *Betrayers of the Truth: Fraud and Deceit in the Halls of Science*<sup>62</sup> provides the best illustration of this, ranking, among many other examples, the oil droplet experiment that won Millikan the Nobel Prize in Physics among the cases of scientific fraud. While it is true that by mentioning this specific case, we are at odds with the point of view of the two journalists-authors,<sup>63</sup> it is not excluded that there may also be good reasons for taking a discovery to be either a fraud or a fiction, without this being an error of appreciation or an ill-intentioned reading of the cases examined.<sup>64</sup> In fact, the clarification of the criteria (moreover, tacit) which justify the attribution of the term “discovery” to an “event E” enters into the set of preliminary notions necessary for the study of the particular issue addressed by thematic analysis – *that is scientific discovery*. Looking closely at these criteria also becomes imperative if we take into account this warning that Holton gives about thematic analysis, where the risk of confusion pointed out by Brannigan (above) is not excluded either:

The investigation of preconceptions in and concerning science connects rather directly with a number of other modern studies, including that of human cognition and perception, learning, motivation, and even career selection.<sup>65</sup>

According to Brannigan, the task of elucidation that would avoid unfortunate confusions in the work of scientists falls within the scope of a systematic sociological analysis of scientific discourse. Also, starting from the common meaning of “discovery,” he identifies the fundamental criteria that underlie the definition as well as the claim

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<sup>61</sup> Augustine Brannigan, *The Social Basis of Scientific Discoveries* (Cambridge: Cambridge University Press, 2009), 9.

<sup>62</sup> William J. Broad, and Wade Nicholas, *Betrayers of the Truth: Fraud and Deceit in the Halls of Science* (London: Century Publishing, 1983).

<sup>63</sup> Both authors use Holton’s study of the Millikan-Ehrenhaft controversy as a pretext to label Millikan’s work a fraud. This inference does not correspond to what Holton wanted to show.

<sup>64</sup> Philippe Alfonsi, *Au Nom de La Science* (Paris: Bernard Barrault, 1989).

<sup>65</sup> Holton, *The Scientific Imagination*, 10.

and the constitution of discoveries. The criteria are four in all: “namely, the feasibility of a knowledge-claim, its validity, the kind of motivation involved, and the degree of originality,” notifies Michel Mulkey in the preface to.<sup>66</sup> From this point on, we can understand that if thematic analysis is linked to sociology, it is above all insofar as it serves as a support in the constitution of the corpus of discoveries likely to be analysed, that is, those meeting the criteria of a scientific discovery. This support from sociology becomes essential when it comes to applying thematic analysis to the activities of a scientist *in situ* (i.e., in the very place where the phenomenon is examined) or to researches that are not yet marked by time and recorded in the historiography as part of the recognized discoveries.

We should not lose sight of the fact that the cases studied by Holton are all of this latter category, that is, recognized discoveries. And if, nevertheless, he speaks of the nascent phase of theories as the primary object of thematic analysis, it is precisely because of the possible recourse that historiography offers to reach the various types of documents (protocols of experience in the raw state [with errors] and laboratory reports, letters, etc. often concealed in public science), where are recorded the trial and error, the hesitations, the fruitless and fruitful attempts that testify to the practices by which scientists elaborate theories and achieve discoveries. As a result, the link between thematic analysis and history is the most unassailable: it passes through historiography and allows the “thematic analyst”<sup>67</sup> to grasp the processes of reasoning by which ideas are originally generated, that is, what scientists actually did in formulating new theories, whether the endeavour was successful or not.

In this respect, thematic analysis “seems,” *a priori*, to fall under two major challenges formulated by Brannigan in his conception of the study of scientific discovery. What exactly is the content of these two reservations? Before presenting this content, it is important to observe that by using “seems” or even *a priori*, we are in the dynamics of a hypothesis that remains to be verified. In this sense, we have reasons to argue that if we do not open the debate with Brannigan to clarify the relevance of his reservations, not for themselves nor in general, but in a specific way in relation to the work of Holton, they risk discrediting thematic analysis as an epistemological approach to discovery. Indeed, the author affirms that if his comments directly concern “the explanations of discovery offered by several prominent

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<sup>66</sup> Brannigan, 9.

<sup>67</sup> One who makes a thematic analysis.

writers: Norwood Russell Hanson and Richard Blackwell, Thomas S. Kuhn, and Arthur Koestler,<sup>68</sup> these writers, mentioned by name, “are only representatives of a much larger class of writers.”<sup>69</sup> However, following him in the presentation of his thesis, there is an *elementary criterion* which makes inclusion in this list likely: it is about the “rejection” of Reichenbach’s doctrine (the sharp separation between “context of discovery” and “context of justification”) and, the *fact* of making oneself, by this means, “guilty” of seeking to describe the means by which scientists concretely made their historic discoveries.<sup>70</sup>

Let us note, before continuing, that if we describe the aforementioned inclusion *criterion* as *elementary*, it is to signify that it is to be taken, with reference to the language of logic, not as a *sufficient condition*, but as a *necessary condition*. The question then is whether the second list opened by the author, with the *minima* thus laid down to find one’s way around, includes Holton. This crucial concern for our paper finds its answer in the elucidation of the content of the two challenges mentioned above and which remain to be stated in their formulation. Thus, we are brought back to the question left in abeyance to deal with it.

In fact, the first thesis to be discussed in Brannigan’s paper can be grasped as follows: an approach to discovery that consists of taking examples of discoveries in history is mentalist. According to the author, a mentalist is any presentation that explains “discoveries by showing how, as a result of interaction with the environment, new ideas get into the researcher’s head.”<sup>71</sup> In other words, such an approach can only provide psychological explanations for the discovery<sup>72</sup> and, for this reason, will necessarily be reductionist, that is, will “equate the task of explaining discovery with the task of explaining how an idea gets into an individual’s mind.”<sup>73</sup> In a nutshell, the authors of these attempts think they are explaining the reason for the discovery, but what they are proposing does not correspond to what they intend to do. And the author concludes that their inability to account for discovery is their major *flaw*.<sup>74</sup> Added to this defect in their enterprise,

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<sup>68</sup> Brannigan, 12.

<sup>69</sup> Ibid.

<sup>70</sup> Ibid.

<sup>71</sup> Ibid., 46.

<sup>72</sup> Ibid., 12, 33-45.

<sup>73</sup> Ibid., 12.

<sup>74</sup> Ibid., 34.

according to Brannigan, is another which justifies the lack of interest accorded to the context of discovery by authors inclined towards the rationality of scientific work.<sup>75</sup> The flaw that is being emphasised here is the mistake of considering any psychological approach as a description of a scientific finding when it explains how a person comes up with a novel concept.<sup>76</sup>

In view of this presentation, it is apparent that the premise, namely “an approach to discovery that is to take examples of discoveries in history,” brings Holton into the list opened by Brannigan. On the other hand, the conclusion he draws from this premise does not apply to Holton’s thematic analysis. Indeed, the link between thematic analysis and psychology has been discussed enough above and all the observations made in the context of this discussion invalidate Brannigan’s inference. Without going back here on this development, it seems to us sufficient to mention, to complete – and to reinforce or nuance in the sense of making clearer – what has been said, that Holton believes that the contribution of psychology is likely to be valuable in the context of thematic analysis. It is therefore appropriate to let him speak:

We need to know more about the origins of themata. It is rather clear to me that an approach stressing the connections between cognitive psychology and individual scientific work is a proper starting point.<sup>77</sup>

Another statement from Holton going into this direction, and which deserves to be heard here, is the one that follows – formulated as a guideline to be adopted in using the study of the results of psychological research to illuminate questions which affect science from a socio-psychological point of view: “Emile Durkheim warned, ‘[e]very time that a social phenomenon is explained by a psychological phenomenon, we may be sure that the explanation is false.’”<sup>78</sup>

Clearly, Holton’s thematic analysis stands out from psychology. This is, all things considered, only an adjuvant whose contribution – to be taken with caution by the analyst – is perceived as an element left as a promise of insertion in the construction of a more evolved repertoire of all the themata working in science.

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<sup>75</sup> Ibid., 33.

<sup>76</sup> Ibid.

<sup>77</sup> Holton, *The Scientific Imagination*, 22-23.

<sup>78</sup> Ibid., 240.

What about Brannigan's second thesis compared to Holton's thematic analysis? According to the second thesis, which in fact extends the previous one, an approach that applies *indiscriminately to successes and failures or scientific errors*, exposes to two risks. First of all, in either case, the choice can only be made in history. And therefore, in the case of historically recognized specimens, – that is to say – successful cases, the risk to be feared would be, according to Brannigan, that of being influenced by a whole range of methodological biases. For example, in the study of the successful company, the specificity of the researcher will be highlighted to explain his success where others failed.<sup>79</sup> However, by proceeding in this way, the backlash, adds the author, is that we falsify the very idea of discovery by “assigning its origins to whatever other singularity is associated with the event or the individual.”<sup>80</sup> With regard to an unsuccessful undertaking, i.e. in the case of failure or scientific error, the examination becomes an inspection of the psychological forces that produced it, and the tendency, according to Brannigan, is to focus on the *pathological* aspect of faulty or bizarre scientific work.<sup>81</sup> In the end, the danger highlighted by the author around his second thesis is above all that of the objectivity of the study. Behind this nodal point of this second position of Brannigan, three questions deserve to be raised and treated with regard to the arguments of the author. The first is this: apart from the psychological aspect that it brings back, how can this thesis be perceived as a reservation against Holton's thematic analysis as well? Is this reservation admissible? This is the second question. It stems from the previous one indeed and can prove to be fundamental depending on the answer that will be given to the first one. Finally, the third question may be the following: are the terms in which the problem of objectivity is posed here valid for the analysis? Holton's theme?

The answer to the first question leads us to one of Holton's warnings about themata and his thematic analysis:

The study of the role of themata in the work of scientists can be equally interesting whether the work led to “success”

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<sup>79</sup> Brannigan, 39-40.

<sup>80</sup> Ibid., 39. It should be noted that if the author is opposed to the idea that the successful researcher possesses a specificity, it is because, according to the sociological analysis which seems to him to better account for the discovery, “genius is an inoperative contingency to scientific success.” Discoveries are more the result of the evolution of culture than of the individual genius of a man. Ibid., 47.

<sup>81</sup> Ibid., 40.

or to “failure” – the commitment to a set of themata does not make a scientist necessarily right or wrong.<sup>82</sup>

There is therefore no doubt that thematic analysis applies to both successes and failures to account for “scientific discovery.” From this point of view, we can say that it is concerned with Brannigan’s discourse and, as a result, the second question that we have formulated takes on its full meaning and, at the same time, a fundamental character for the status of thematic analysis. However, and above all, a question arises: if the explanation of scientific discovery is not based on the successes and failures that punctuate the history of science, what then would be the use of the standards of admissibility of a discovery or the standards of scientificity conveyed by the four criteria that Brannigan himself uses to characterize a discovery? In a word, isn’t the validity of the attempt to explain scientific discovery, in itself, subordinated to the quality of the matter which is the object of the study, a quality to be understood in the sense of discoveries that have acquired the status of discovery? Is it not by taking an interest in these discoveries that those who undertake to unravel the “mystery” of the discovery are led towards the research that can claim this title, but which has not succeeded in finding the reasons for the failure? Successes and failures seem to us to be able to mutually shed some light on each other, or at least on the research itself.

In fact, the clarification of the terminology “scientific discovery” with Brannigan seems to us to be the primary question to be addressed insofar as it constitutes the focus of light that illuminates with its beams the second reserve expressed by this author. Moreover, he does not hesitate to bring back, as we have underlined above, the debate which occupies us at this level of elucidation of concepts, by positing the conception of discovery as being one of the main causes of the error of taking the description of how an idea arises in the mind of an individual as the explanation of the discovery. The discussion that we are opening here can only achieve its objectives (allowing us to follow Brannigan in his understanding of scientific discovery in order to be able to answer our questions) if we conduct it in relation to the four criteria discussed above and to which we should return.<sup>83</sup>

For Brannigan, discovery is inseparable from its social foundation. He therefore specifies that the scientist’s discovery

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<sup>82</sup> Holton, *The Scientific Imagination*, 22.

<sup>83</sup> See page 45 of this paper.

must be inspected not for its content or psychological origins, but for the context which makes it a possibility or a candidate in the first place. This candidacy status of events is what I mean by the social basis of discovery.<sup>84</sup>

If the discovery is to be taken as an event, it is a question, on the one hand, of it belonging to “kind of events which could be the outcome of a motivated course of action designed for their attainment”<sup>85</sup> and, on the other hand, of it being an original, i.e. new and not a mere reproduction. The novelty required for a discovery makes it possible to distinguish it from mere learning or plagiarism as long as it prevents people from “knowingly discover what others already have reported as true.”<sup>86</sup>

The notion of discovery, as Brannigan understands it, can be seen to have a double aspect (which we share): institutional and cognitive. It is these two aspects that, together, justify about a discovery which has the status of discovery, the possibility of a claim to knowledge, its validity, the type of motivation it brings into play and its degree of originality (we recognize Brannigan’s four criteria here). Consequently, these four criteria constitute the procedures for legitimizing and promoting discoveries which allow, in the context of science, the results of a research to cross, in law if not in fact, the barrier that separates what is a discovery and what is not. In fact, we can logically only speak of discovery after the fact (post hoc) and of research at all stages of the process leading to a discovery. Under these conditions, it is surprising that Brannigan rejects any post hoc approach to the question of discovery on the pretext that by proceeding in this way “the status of an event as a discovery is already settled before the question of how it occurs is announced.”<sup>87</sup>

Such reasoning gives the impression that for the author, what is at stake in the study of scientific discovery is to set out into unknown territory like an explorer with a specific objective that can be summed up as follows: not to have the only means in the field other than criteria, to retain what seems to meet one’s criteria and share the judgment that one makes of it. In this perspective, the explanation of discovery turns into solipsism with the risk of relativism that often

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<sup>84</sup> Brannigan, 66.

<sup>85</sup> Ibid.

<sup>86</sup> Ibid.

<sup>87</sup> Ibid., 40.

follows. We therefore believe that the position taken by Brannigan is not only open to criticism, but also untenable. And we can therefore draw the conclusion that the reservation of Brannigan's second thesis cannot, even less, invalidate thematic analysis as a rational approach to scientific discovery. The second question we asked ourselves at the outset of our analysis of Brannigan's second thesis thus finds its answer. What about the third and final question that the thesis raised?

We must remember that Brannigan's second thesis questioned the objectivity of the post hoc study of the discovery. And the question is whether this suspicion is justified. In this respect, two observations seem necessary to us, to clarify our answer to this question. The first observation is the following: the terms in which the author poses the problem of objectivity are oriented differently than those by which we want to apprehend objectivity. His concern relates to the objectivity of the approach to account for the discovery, whereas we situate our questioning at the very level of the science itself. However, all things considered, and this is where our second observation comes in, these various questions about objectivity do not only pinpoint the absence of an absolute guarantee or the fallibility and human nature of scientific work. Moreover, they plead for a better understanding of scientific activity, and therefore against the perfect images that textbooks give us of science and which are only a narrow and mechanical vision of scientific work. Further to these considerations on the scientific work, we have no better answer to give to the question of objectivity raised by Brannigan, than these relevant remarks of Popper, speaking of the rigor of the physicist: "we cannot remove at the same time his humanity. Likewise, we cannot forbid or infer his value judgments without destroying him both as a man and *as a man of science*."<sup>88</sup>

#### IV. Conclusion

At the end of this presentation, which was opened by the question: "Thematic analysis and interdisciplinary interest: an advantage or a disadvantage for Holton's purpose?" are we in a position to give an unequivocal answer? It appears we are. Indeed, there is no doubt that the interdisciplinary interest in which thematic analysis is immersed is an asset (the results of other sciences are used for its cause) and also a disadvantage (thematic analysis can easily be mistaken for a psychological approach, which it is not in the frame in which Holton places it).

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<sup>88</sup> Theodor Adorno, and Karl Popper, *De Vienne à Francfort: la querelle allemande des sciences sociales* (Brussels: Complexe, 1979), 84.



Thus, with regard to thematic analysis, presented as a tool for accessing the mechanism of scientific research, we are now assured that it is not a psychological approach to scientific discovery, but does actually constitute a credible tool in the field of philosophy of science. In this respect, we retain that the thematic analysis has the specific purpose of laying bare what the act of invention is basically reduced to, namely: the primacy of the action, often imperceptible and unacknowledged, of a researcher's themata over the principles of rationality in the ingenious work of the creative imagination. And in fact, thematic analysis reaches the first breeding ground of scientific activity where it becomes possible to explain the rise of discoveries and theories. If science displays a certain rationality, it nevertheless remains a work of the imagination and thematic analysis, without advocating psychologism in the philosophy of science, makes it possible to elucidate the act by which a theory comes to light. This is the conclusion that emerges at the end of this article.

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