



HAL
open science

Lévy-Bruhl's theory on prelogical mentality and its influence on the field of history and philosophy of science: Léon Brunschvicg (1869-1944) / Abel Rey (1873-1940).

Eric Vandendriessche

► To cite this version:

Eric Vandendriessche. Lévy-Bruhl's theory on prelogical mentality and its influence on the field of history and philosophy of science: Léon Brunschvicg (1869-1944) / Abel Rey (1873-1940).. 2025. hal-03096073

HAL Id: hal-03096073

<https://hal.science/hal-03096073v1>

Preprint submitted on 3 Jan 2025

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0 International License

Lévy-Bruhl’s theory on prelogical mentality and its influence in the field of history and philosophy of science: Léon Brunschvicg (1869-1944) / Abel Rey (1873-1940)

Eric VANDENDRIESSCHE (Aix-Marseille University, CNRS, CREDO, Marseille, France)

Abstract: In the first decades of the 20th century, French philosopher and sociologist Lucien Lévy-Bruhl developed the theory of a “prelogical mentality”, which he attributed to members of “primitive” societies. In particular, he argued that these peoples had a lesser ability to abstract and generalize, and that their way of thinking was not governed by the same logical principles as ours. This chapter aims at evaluating to what extent this theory of a “prelogical mentality” has significantly influenced scholarly discussions in the field of history and philosophy of science (Léon Brunschvicg, Abel Rey, etc.), when comparing—between “civilizations”—the emergence of “science” and of mathematics in particular.

Keywords: L. Lévy-Bruhl, prelogical mentality, L. Brunschvicg, A. Rey, mathematics, logic, abstraction, numeracy

Introduction

In the first decades of the 20th century, the theory developed by French philosopher and sociologist Lucien Lévy-Bruhl (1857-1939)—in two books *Les fonctions mentales dans les sociétés inférieures* (The mental functions in inferior societies, 1910) and *La mentalité primitive* (Primitive mind, 1922)—, predicates the existence of distinct “mentalities” (*i.e.* “ways of feeling, thinking and acting [*les façons de sentir, de penser et d’agir*]” ; Lévy-Bruhl, 1923: 631), differing from one society to another. In these two books, with this idea in mind, Lévy-Bruhl focused more particularly on the so-called “primitive or inferior societies”, whose mentality is supposed to be sufficiently distant from our own to disclose significant distinctive features, at a logical level in particular. As pointed out by historian of science Geoffrey Lloyd (1990) three decades ago, “although Levy-Bruhl’s ideas met with a good deal of criticism, they have proved highly influential”. This “idea of distinct mentalities has continued to be widely used, primarily but not exclusively in France, in a variety of contexts, by historians, psychologists, philosophers, social anthropologists, classicists and sinologists” (Lloyd, 1990: 2-3).

It is first in *Les fonctions mentales* (1910) that Lévy-Bruhl developed more specifically the theory of a “prelogical mentality”, attributed to inferior/primitive societies, in which a characteristic form of thought or logic would be expressed by the members of these societies.

In particular, he argued that the latter prelogical mentality entails that these primitive peoples have a lesser ability to abstract and generalize, since their way of thinking is not governed by the same logical principles as ours.

This chapter aims to better evaluate to what extent Lévy-Bruhl's theory of a prelogical mentality would have significantly influenced scholarly discussions and studies in the field of history and philosophy of science—over the first half of the twentieth century, and notably in France. And, more specifically, the discussions and studies on the forms of thought or logic as they occurred when comparing between civilizations the emergence and the development of science, including mathematics. To do this, we will first outline Lévy-Bruhl's theory on “primitive mentality”, and the “law of participation” which—according to him—governs it. More generally, we will see how Lévy-Bruhl's position can be analyzed as an epistemological breakthrough, rooted in Auguste Comte's positive philosophy, and in opposition to the animism/evolutionist theory developed by the “English School of anthropology” at the end of the 19th century. Furthermore, even though the influence of the French Durkheimian sociology of the time is perceptible in Lévy-Bruhl's work, through the use of the key concept of “collective representation” in particular, we will highlight some significant points of divergence. Finally, we will conclude this first part (section 1) by discussing an important chapter of *Les fonctions mentales*, which aims to reveal how the prelogical mentality would have impacted—according to Lévy-Bruhl—the elaboration of more “concrete” numerical systems developed in primitive societies, in comparison to our more abstract numerical system.

Secondly, we will focus on the intellectual productions of two influential authors in the field of history and philosophy of science in the first half of the 20th century. Both authors refer to Lévy-Bruhl's theory on “prelogical mentality”, in their reflection on the development of mathematical concepts (and particularly those related to numbers) in different cultural and social contexts. The first one is philosopher Léon Brunschvicg (1869-1944), who succeeded Lévy-Bruhl (in 1927) to the Chair of history of modern philosophy at Sorbonne University, and was a member of the French “Académie des sciences morales et politiques” (from 1932 onward). The second author is historian and philosopher Abel Rey (1873-1940), who played a major role in the development of the history of science in France. He became Professor of history and philosophy of science at Sorbonne University in 1930, and founded (in 1932) the “Institut d'histoire des sciences et techniques” and its journal of history of science *Thalès*. Analyzing some of these authors' publications, written in dialogue with other scholars of the time, will enable us to draw a better picture of how Lévy-Bruhl's theory on primitive mentality has been used and interpreted in the field of history and philosophy of science, when searching for distinctive features in the way science has emerged in different cultural and social contexts.

1. Lévy-Bruhl's theory of a prelogical/primitive mentality

1.1 Lévy-Bruhl's intellectual path towards the study of “primitive mentality”

In 1923, Lévy-Bruhl presented his study of primitive mentality in the “French Society of Philosophy” seminar (Lévy-Bruhl et al., 1923). He began his presentation with an anecdote, which reveals the intellectual path that led him to undertake his research on the forms of

“thought” or “logic” as they would occur in “inferior societies”. As is mentioned in the *Bulletin* of the latter seminar (1923: 634), the starting point had been that one day Lévy-Bruhl received the French translation of three volumes published by a Chinese historian¹. Even though—according to him—the “translation was impeccable”, faithfully following the ideas developed in the original text, Lévy-Bruhl mentioned that he could not properly understand how the author’s ideas were linked to one another—even after repeated readings. Therefore, he started wondering whether Chinese logic coincides with our own “logic” (*i.e.* Western logic). With this in mind, he began to read Chinese books dealing with religion and philosophy. He quickly realized, however, that his efforts were doomed to failure, without being able to read the original texts. This would have implied learning the Chinese language, and, subsequently—given his age—he gave up on this project, and chose to address the issue of the existence of different “forms of logic” (or “ways of thinking”) depending on the societies in which they develop, focusing on “primitive” ones. His readings of Chinese literature led him to

[...] the hypothesis of a logic different from our logic that would have emerged and developed in societies differing from our society. Was it possible to test this hypothesis by studying the facts? Assyria, Egypt, India would entail the same difficulties as China. Couldn’t I instead consider the so-called primitive societies? I found two important advantages in doing so. Firstly, the documents would be directly accessible to me: these were relations written in languages that were not a barrier to my understanding such as Chinese, Egyptian hieroglyphics, as well as cuneiform texts. Secondly, although many historical issues are difficult to overlook when dealing with the civilizations of Egypt, Western Asia or the Far East, do not actually arise in the case of indigenous societies from America, Africa, *et al.*, which have existed for centuries, approximately, or even completely, without any contact with more advanced civilizations. Obviously, if there is a logic different from our logic, that is where I had the best odds of discovering and analyzing it easily.²

The documentation analyzed by Lévy-Bruhl in his work suggests that the “documents” (said to be “directly accessible to him”) in question in this excerpt were mostly those published since the mid-19th century in the fledgling discipline of anthropology in Europe and the United States. As previously mentioned, Lévy-Bruhl believed that he could not analyze Chinese or Mesopotamian mentalities without learning their languages. It is thus difficult to understand

¹ It is said that the three volumes were sent to him by sinologist Edouard Chavannes (1865-1918). Although I was not able to identify the author of these three volumes, we may think that the documents in question are the French translation by Chavannes of the three first volumes of *Mémoires historiques de Se-ma Ts’ien*, Ernest Leroux Editeur, 1898.

² (Lévy-Bruhl et al., 1923: 634)—my translation. Original text: [...] l’hypothèse d’une logique différente de la nôtre, née et développée dans des sociétés elles-mêmes différentes. Était-il possible de la soumettre à l’épreuve des faits ? L’Assyrie, l’Égypte, l’Inde me présentaient à peu près les mêmes difficultés que la Chine. Mais ne pouvais-je me tourner du côté des sociétés dites primitives ? J’y trouvais deux avantages importants. En premier lieu, les documents me seraient directement accessibles : c’étaient des relations écrites en des langues qui ne constituaient pas pour moi des barrières comme le chinois, ou les hiéroglyphes égyptiens, ou les textes cunéiformes. Et, d’autre part, bien des problèmes historiques qu’il est difficile de négliger au sujet des civilisations de l’Égypte, de l’Asie antérieure ou de l’Extrême-Orient ne se posent pas s’il s’agit des sociétés indigènes de l’Amérique, de l’Afrique, et des autres qui ont vécu, pendant de longs siècles, à peu près, ou même tout à fait sans contact avec des civilisations plus avancées. Évidemment, s’il existe une logique différente de la nôtre, c’est là que j’avais le plus de chance de la découvrir, et le plus de facilité pour l’analyser (Lévy-Bruhl & al., 1923: 634).

why Lévy-Bruhl seemed to consider that he would be able to analyze the mentality of primitive peoples without being able to understand any of their various (vernacular) languages. There is another point—related to the ethnographical sources used in anthropological research at the time—, which is not (to my knowledge) discussed in Lévy-Bruhl’s work. Before the elaboration of a new methodology in anthropology by Bronislaw Malinowski (1922, 1929) in particular—*i.e.* observer-participant methodology—, anthropological research was mainly conducted not on first-hand sources, but on data collected by missionaries, explorers, etc. (*cf.* Tylor, 1871). Why did Lévy-Bruhl consider these ethnographical sources (and anthropological publications drawing on them) both directly “accessible” and “accurate” for his project’s purposes thus remains a question.³

It is therefore through the comparison of the two contrasted cases, on the one hand, primitive societies, and, on the other, societies derived from the “Mediterranean civilization” from which “rationalistic philosophy” and “positive science” have emerged, that Lévy-Bruhl intends to bring to light the essential features of the mentality of primitive societies. In his 1910 book *Les fonctions mentales dans les sociétés inférieures* (translated into English by Lilian A. Clare, under the title *How Natives Think*, authorized translation, 1926; and reprinted in 1966)⁴, Lévy-Bruhl explains :

For the first rough attempt at comparative study there is an evident advantage in making choice of the two mental types available, between which the difference is *greatest*. The essential dissimilarities between such will be most marked, and as a consequence they 'will be least likely to escape attention. Moreover, in starting with these we shall be most easily able to approach the study of the intermediary or transitional types⁵ (Lévy-Bruhl, 1966: 19).

Although Lévy-Bruhl does not say so explicitly, it is very likely that the “the intermediary or transitional types” in question relate to extra-European societies or civilizations (China, India, Mesopotamia) mentioned in the previous quotation from the French Society of Philosophy Bulletin. As we will see further on in this chapter, this issue has been addressed thereafter by scholars in the field of History and Philosophy of science, using Lévy-Bruhl’s philosophical theory on “primitive mentality”, as a theoretical/conceptual tool for comparing the development of Science between Western and Eastern civilizations.

³ If we follow Thomas Hirsch (2013), it seems, however, that Lévy-Bruhl came thereafter to consider the practice of (long-term) field-work (*terrain*), and the collect of first-hand ethnographic data, as an important issue for the fledgling ethnological science. This can be notably perceived in his 1925 “presentation of the new Institute of Ethnology”, in which he presented the development of field-work methodology as one of the “main objects/goals of the Institute” (Hirsch 2013, referring to Lévy-Bruhl 1925 : 235, 236).

⁴ Since the 1966 re-edition of Lévy-Bruhl’s book *How Native Think* (1926) contains the same authorized English translation (by Lilian A. Clare) of *Les fonctions mentales dans les sociétés inférieures* (1910), we will refer, in the following, to the latter 1966 re-edition, that the reader shall consult more easily.

⁵ Original text: Il y a un avantage évident, pour une première ébauche d’étude comparative, à choisir les deux types mentaux, accessibles à nos investigations, entre lesquels la distance est *maxima*. C’est entre eux que les différences essentielles seront le mieux marquées, et qu’elles auront, par conséquent, le moins de chances d’échapper à notre attention. En outre, c’est en partant d’eux que l’on pourra le plus aisément aborder ensuite l’étude des formes intermédiaires ou de transition (Lévy-Bruhl, 1910: 21).

Where does this idea of introducing a “metric” within societies’ mental types come from? Difficult to say, since, to my knowledge, Lévy-Bruhl does not mention any influences regarding this specific issue. However, as we will see below in section 1.2, this idea is at odds with anthropological evolutionist theories of his time, developed by anthropologist Edwar Tylor (1832-1917) and his successors, as well as Durkheimians later on. Postulating that human societies/cultures evolve through different stages of development⁶, while working in the framework of the hypothesis of the unity of human mental functions.

Despite this, Lévy-Bruhl (1910) adopts, however, a Durkheimian orientation in his research on primitive mentality⁷ (Keck, 2008: 141-170; Merllié, 2012: 432). The influence of Emile Durkheim’s (1858-1917) work can be perceived in the first pages of *Les fonctions mentales* (1910). The borrowed concept of “collective representation”, introduced by Durkheim a decade earlier (1898), being used as a key concept in Lévy-Bruhl’s work:

The representations which are termed collective, defined as a whole without entering into detail, may be recognized by the following signs. They are common to the members of a given social group; they are transmitted from one generation to another; they impress themselves upon its individual members, and awaken in them sentiments of respect, fear, adoration, and so on, according to the circumstances of the case. Their existence does not depend upon the individual; not that they imply a collective unity distinct from the individuals composing the social group, but because they present themselves in aspects which cannot be accounted for by considering individuals merely as such⁸ (Lévy-Bruhl, 1966: 3).

⁶ In anthropology, Evolutionist theory has first been elaborated by the “English anthropological school” (as Lévy-Bruhl calls it), and developed by Edward Tylor in his book *Primitive Culture*, 1871 in particular. This theory defends the thesis that human cultures evolve in a unilineal/linear manner through three stages of development: savagery, barbarism, and civilization. Basically, the lowest stage (savagery) is defined as “that in which man subsists on wild plants and animals, neither tilling the soil nor domesticating creatures for his food. [Tylor considers] that men reach the barbarian stage when they take to agriculture, and pass from the barbaric to the civilized stage by acquiring the art of writing” (Powell, 1885: 175). To Tylor, the stage of savagery corresponds in a considerable degree to that of modern savage tribes, who, in spite of their difference and distance, have in common certain elements of civilization, which seem remains of an early state of the human race at large. [Therefore, the] “European may find among the Greenlanders or Maoris many a trait for reconstructing the picture of his own primitive ancestors” (Tylor, 1871: 21).

⁷ As Frédéric Keck (2008) mentions, it is in *La morale et la science des mœurs* (1903) that Lévy-Bruhl intended to “make his own contribution to durkheimian sociology”. “But in wanting to defend the “science of morals” programme, against philosophers attached to the idea of “theoretical morality”, Lévy-Bruhl adopted a philosophical turn that singularly distorts Durkheim’s viewpoint: because instead of analyzing the morphological foundations of the various forms of morals, through demography, economics or laws, Lévy-Bruhl explains/elucidates the difficulties experienced by the scholar in adopting the idea of a purely objective science of morals” (Keck, 2008: 145-146).

Original text : Mais en voulant défendre le programme de la « science des mœurs » face aux philosophes attachés à l’idée de « morale théorique », Lévy-Bruhl adopte une tournure philosophique qui déforme singulièrement le propos de Durkheim : car au lieu d’analyser les bases morphologiques des différentes formes de morales, à travers la démographie, l’économie ou le droit, il explicite les difficultés qu’éprouve le savant à adopter l’idée d’une science des mœurs purement objective » (Keck, 2008: 145-146).

⁸ Original text: Les représentations appelées collectives, à ne les définir qu’en gros et sans approfondir, peuvent se reconnaître aux signes suivants : elles sont communes aux membres d’un groupe social donné ; elles s’y transmettent de génération en génération ; elles s’y imposent aux individus et elles éveillent chez eux, selon les cas, des sentiments de respect, de crainte, d’adoration, etc., pour leurs objets. Elles ne dépendent pas de l’individu pour exister. Non qu’elles impliquent un sujet collectif distinct des individus qui composent le groupe social, mais parce qu’elles se présentent avec des caractères dont on ne peut rendre raison par la seule considération des individus comme tels (Lévy-Bruhl, 1910: 1).

Although Lévy-Bruhl does not refer to it explicitly, these considerations on collective representations seem to have been borrowed from Durkheim's article "Représentations individuelles et représentations collectives" (1898). The objective of Durkheim's paper was to show that the collective representations go far beyond the mental life of each individual of a given society, and cannot be understood by only studying the mental life of individuals of that society. Therefore, according to Durkheim, these collectively shared representations have their own laws that need to be studied in and of themselves, and this could not be achieved only with an "internal analysis" (Durkheim, 1898: 302). Lévy-Bruhl agrees with this latter point as shown in the following quotation:

To be able to understand the processes by which institutions have been established (especially among undeveloped peoples), we must first rid our minds of the prejudice which consists in believing that collective representations in general, and those of inferior races in particular, obey the laws of a psychology based upon the analysis of the individual subject. Collective representations have their own laws, and these (at any rate in dealing with primitives) cannot be discovered by studying the "adult, civilized, white man"⁹ (Lévy-Bruhl, 1966: 3-4).

Lévy-Bruhl and Durkheim also shared the idea that collective representations "make individuals act and think in a determined way" (*font agir et penser les individus d'une manière déterminée*, Keck, 2008 : 141). However, Lévy-Bruhl has taken this idea much further, when wondering whether "the collective representations of the communities in question [the primitive societies] arise out of higher mental functions identical with our own, or must they be referred to a mentality which differs from ours to an extent yet to be determined".¹⁰ Lévy-Bruhl thus linked the "collective representations" and human "higher mental functions", since these representations would reflect the individual's mental activity, completely impregnated by the collective representations, all the more so that the society is primitive (1910: 16). To my knowledge, Durkheim does not make such a link.¹¹ By contrast, the collective representations (different from the individual ones) are introduced by Durkheim as a helpful conceptual tool to grasp the "social morphology" of a given society (Durkheim, 1912: 22).

Before turning to the Lévy-Bruhl's analysis of the "primitive mentality", let us describe and comment Lévy-Bruhl's position regarding the positive philosophy and evolutionist theories, whose critique serves as a starting point for his own studies so-called "lower societies".

⁹ Pour comprendre le mécanisme des institutions (surtout dans les sociétés inférieures), il faut d'abord se défaire du préjugé qui consiste à croire que les représentations collectives en général, et celles des sociétés inférieures en particulier, obéissent aux lois de la psychologie fondée sur l'analyse du sujet individuel. Les représentations collectives ont leurs lois propres, qui ne peuvent se découvrir — surtout s'il s'agit de primitifs — par l'étude de l'individu « blanc, adulte et civilisé » (Lévy-Bruhl, 1910: 2).

¹⁰ Original text: Les représentations collectives des sociétés considérées proviennent-elles de fonctions mentales supérieures identiques aux nôtres, ou doivent-elles être rapportées à une mentalité qui diffère de la notre, dans une mesure à déterminer (Lévy-Bruhl, 1910: 7).

¹¹ As we will see below, Durkheim and Lévy-Bruhl had also divergent positions regarding both evolutionist anthropological theories and the analysis of ethnographic facts collated in so-called primitive societies. In particular, Durkheim disagreed with Lévy-Bruhl's analysis of certain collective representations showing that the laws governing them do not follow the same logic as ours; cf. section 1.4, footnotes 28 & 36).

1.2. Positive philosophy and evolutionist anthropological theories: Lévy-Bruhl's position

As emphasized by French anthropologist Frédéric Keck (2008, 2010), Lévy-Bruhl's scientific/philosophical project—studying the primitive mentality—is rooted in Auguste Comte's positive philosophy, of which Lévy-Bruhl was (at that time) “one of the best commentators”¹². In his introduction to *Les fonctions mentales* (Lévy-Bruhl, 1910: 5-7), the author develops his position regarding Auguste Comte's positive philosophy and the fundamental role that Comte assigned to the “sociological method”. Lévy-Bruhl outlines that Comte divides the study of the “higher mental functions” between biology and sociology. According to Lévy-Bruhl, Comte's famous assertion “Humanity is not to be defined through man, but on the contrary, man through humanity” emphasizes that “the higher mental functions remain unintelligible as long as they are studied from the individual one”. Lévy-Bruhl thus shares with Comte the idea that “in a man's mental life everything which is not merely the reaction of the organism to the stimuli it receives is necessarily of a social character” (1966: 5). And, therefore, it is through the study of social facts that we should gain a better understanding of the human mind. However, in Lévy-Bruhl's view, this idea, although “a fertile one” (*féconde*), “did not bear fruit immediately, either in Comte or in his more or less direct followers”:

In Comte it found the way barred, so to speak, by a sociology that he believed he had constructed in its entirety, but which actually was a philosophy of history. He thought he had shown that the law of the three stages exactly expresses the intellectual evolution of humanity considered as a whole, and also that of any particular community. In establishing the science of the higher mental functions, therefore, he does not consider it necessary to begin with a comparative study of these functions in different types of human societies (1966: 5-6).¹³

Here the reference is to Comte's key claim in his philosophical theory which holds that the development of sciences (or the evolution of knowledge) is governed by the law of three states (theological, metaphysical, positive), which occur successively—but at different rates—in all human societies, and correspond to different stages of the development of human intelligence (Comte 1905 [1830], 2-4). However, —as emphasized by Lévy-Bruhl—, in order to elaborate his doctrine, Comte draws only on the development of the “Mediterranean civilization, but without suspecting a priori that the laws thus discovered may not hold good of all the races of humanity” (1966: 6).¹⁴ Therefore, Lévy-Bruhl concludes

¹² (Lévy-Bruhl, 1900). Regarding Comte's influence on Lévy-Bruhl's philosophical project, see also (Déprez, 2010: 35-38).

¹³ Original text: Chez Comte, elle a trouvé pour ainsi dire la route barrée par une sociologie qu'il avait cru pouvoir construire de toutes pièces, et qui était, en réalité, une philosophie de l'histoire. Il pense avoir démontré que la loi des trois états exprime exactement l'évolution intellectuelle de l'humanité considérée comme un tout, et aussi celle d'une société particulière quelle qu'elle soit : il n'a donc pas besoin, pour fonder la science des fonctions mentales supérieures, de commencer par une étude comparative de ces fonctions dans les différents types de sociétés humaines (Lévy-Bruhl, 1910: 4).

¹⁴ (Lévy-Bruhl, 1966: 6). Extracted from the original text: “il a construit sa doctrine d'après le développement de la civilisation méditerranéenne ; mais il ne doute pas, a priori, que les lois ainsi découvertes ne soient valables pour toutes les sociétés humaines.” (Lévy-Bruhl, 1910: 5).

In one sense, then, Comte is the initiator of a positive science of the mental functions, and to a large extent the merit of having conceived it and of having shown it to be a sociological science ought to be accorded him. But he did not undertake the investigation of phenomena which such a science demands. He did not even attempt it [...] (1966: 6)¹⁵.

In contrast, according to Lévy-Bruhl, such a research had been undertaken by the “English anthropological school” (*école anthropologique anglaise*), and in particular, by Edward B. Tylor (1832-1917)—one of the founders of cultural anthropology—, through a “meticulous study of mental phenomena in differing types of human societies [...] with the straightforward aim of discerning and classifying facts” (1966: 6). Lévy-Bruhl recognizes that Tylor’s book *Primitive Culture* (1871) marked a crucial turning point in the history of anthropology (1910: 6), and that Tylor and his successors were “the necessary precursors of the positive science of the higher mental functions” (1966: 6). Nevertheless, he believes that this novel anthropological perspective—known as Evolutionism—failed for two main reasons.

Firstly, for Lévy-Bruhl, the social facts—*i.e.* institutions, beliefs, practices, etc.—under study imply “collective representations” that Tylor intends to understand through hypotheses regarding the mental mechanism of the individual human mind. However, as previously mentioned, in Lévy-Bruhl’s view, “contemporary sociology” had demonstrated that social facts have their own laws whose study of the “individual” will never allow to grasp (1910: 14).

Secondly, Lévy-Bruhl’s major critique regarding Tylor’s theory concerns the postulate that, at the logical level, the human mind is the same for all individuals, whatever the social context. This premise taken for granted, this theory would still need to explain how primitive people, whose mental functions are considered identical to ours, have produced such peculiar collective representations observed by ethnographers (the Amazonian Bororo asserting that they are *arara* parakeets for instance, *cf.* section 1.3). Lévy-Bruhl asserts that it is for this purpose that the “English anthropological school” has formulated the hypothesis of “animism” *i.e.* a concept of “soul”, first analyzed by Tylor as the early sign of religiosity.¹⁶ Through a “rational primitive

To my knowledge, Comte does not refer explicitly to the so-called primitive societies studied by 19th century anthropologists. They could however be associated with the theological state, and more specifically to the first stage of the latter, called “fetishism” (consisting mainly in attributing to all external bodies (*corps extérieurs*) a life similar to ours, Comte 1995 [1844]: 45). See also (Vandendriessche & Petit 2017: 195-196).

¹⁵ Original text: Comte est donc bien, en un sens, l’initiateur d’une science positive des fonctions mentales, et, pour une grande part, le mérite de l’avoir conçue et d’avoir montré que c’est une science sociologique doit lui être reconnu. Mais il n’a pas entrepris les recherches de faits que cette science exige. Il ne les a pas même amorcées [...] (Lévy-Bruhl, 1910: 5).

¹⁶ Lévy-Bruhl (1966) underlines : It is the representation of the “soul,” the starting-point of the doctrine known as animism, the principles of which Tylor formulates thus: “It seems as though thinking men, as yet at a low level of culture, were deeply impressed by two groups of biological problems. In the first place, what is it that makes the difference between the living body and the dead one? What causes waking, sleep, trance, disease, death? In the second place, what are those human shapes which appear in dreams and visions? Looking at these two groups of phenomena, the ancient savage philosophers probably made their first step to the obvious inference that every man has two things belonging to him, namely, his life and his phantom. These two are evidently in close connection with the body, the life as enabling him to feel and think and act, the phantom as being his image or second self; both, also, are perceived to be things separable from the body, the life as able to go away and leave it insensible or dead, the phantom as appearing to people at a distance from it. The second step . . . merely the combining the life and the phantom. As both belong to the body, why should they not also belong to one another, and be manifestations of one and the same soul?” (Lévy-Bruhl, 1966: 65).

philosophy”, primitive peoples would have elaborated such a concept of “soul”, attributed by the primitives to all beings (human and non-human), in order to explain the natural phenomena affecting their senses (Lévy-Bruhl, 1910: 8). It would be under this hypothesis that the English anthropological school would have tried to explain the resemblance of institutions, beliefs, and practices in various primitive societies. However, according to Lévy-Bruhl, the former postulate regarding the unity of the human higher mental functions (whatever the stage of development from savagery to civilization), would have been taken by these scholars as a genuine “axiom” which

serves them as demonstration. The fact that myths and collective representations like those on which totemism is based, such as the belief in spirits, in separate and external souls, and in sympathetic magic, are to be found in all human aggregates, is a necessary result of the structure of the “human mind.” The laws governing the association of ideas, and the natural and irresistible application of the law of causality, combined with animism, would be certain to engender these collective representations and their connections. It is only the spontaneous working of an unvarying logical and psychological process. Nothing is easier to explain if we once admit, as the English anthropological school implicitly does, that this process is the same in undeveloped peoples as it is with us (1966: 9-10).¹⁷

Lévy-Bruhl further criticizes the hypothesis of a “primitive philosophy” which would have led primitives to rational explanations of phenomena encountered in the world. According to him, there is no room for questions such as “how?” and “why?” in the primitive mind, mostly governed by collective representations (1910: 17). Beyond this critique, Lévy-Bruhl doubts of the truthfulness of the concept of “animism” which in Lévy-Bruhl’s view is in contradiction with a number of ethnographic observations. To make this point, he brings to light cases in which the primitives refer to the plurality of the “soul” instead of its unity (1910: 83-92).

Lévy-Bruhl (1910)’s original quotation : C’est la représentation de « l’âme », point de départ de la doctrine connue sous le nom d’animisme, dont M. Tylor expose le principe en ces termes : « Il semble que les hommes capables de pensée, mais encore à un degré inférieur de civilisation, aient été profondément impressionnés par deux groupes de problèmes biologiques. En premier lieu, qu’est-ce qui fait la différence entre un corps qui vit et un autre qui est mort ; quelle est la cause du sommeil, de la veille, de l’évanouissement, de la maladie, de la mort ? En second lieu, que sont ces formes humaines qui apparaissent dans les rêves et dans les visions ? Considérant ces deux groupes de phénomènes, les philosophes sauvages de jadis firent sans doute leur premier pas en concluant que tout homme a évidemment deux choses qui lui appartiennent, sa vie et son fantôme. L’une et l’autre sont manifestement en rapport étroit avec le corps : la vie, en le rendant capable de sentir, de penser et d’agir; le fantôme, en étant son image ou son second moi ; tous deux, aussi, sont représentés comme des choses séparables du corps, la vie comme pouvant s’en aller et laisser le corps insensible ou mort, le fantôme comme apparaissant à des gens très éloignés de ce corps. Le second pas... consiste simplement à combiner la vie et le fantôme. Puisque tous deux appartiennent au corps, pourquoi n’appartiendraient-ils pas aussi l’un à l’autre, ne seraient-ils pas des manifestations d’une seule et même âme ? (Lévy-Bruhl, 1910: 81-82).

¹⁷ Original text: L’axiome lui tient lieu de démonstration. Que dans les sociétés humaines il se soit produit des mythes, des représentations collectives comme celles qui sont à la base du totémisme, comme la croyance aux esprits, à l’âme extérieure, à la magie sympathique, etc., cela découle nécessairement de la structure de l’« esprit humain ». Les lois de l’association des idées, l’usage naturel et irrésistible du principe de causalité devaient engendrer, avec l’animisme, ces représentations collectives et leurs liaisons. Il n’y a là que le jeu spontané d’un mécanisme logique et psychologique invariable. Rien ne s’explique mieux, pourvu que l’on admette, comme le fait implicitement l’école anthropologique anglaise, que ce mécanisme ne diffère pas dans les sociétés inférieures de ce qu’il est chez nous (Lévy-Bruhl, 1910: 9).

Finally, the postulate that “the individual primitive mind is similar to ours”, without ever raising the issue of its validity, entails—for Lévy-Bruhl—that the “English anthropological school”’s conclusions are simply “probable” (1910: 11).

It is therefore through a positive and sociological approach, and at odds with evolutionary theories, that Lévy-Bruhl intends to conduct a comparative analysis of ethnological facts, as they are described in the major 19th century anthropological works (Tylor, 1871; Boas, 1890; Haddon 1890, Frazer 1911-1915, K. von den Steinen 1894, *et al.*). His goal is to understand the logic of the “primitive mentality” and “establish how it is organized” (Keck, 2010: 15).

1.3 *Mystical and prelogical primitive mentality*

Lévy-Bruhl sought for a “general law” that governs the logical links between the primitive collective representations, under which either living beings or inanimate objects, as well as ‘man-made’ objects, would be perceived as permeated with mystical properties and relationships by the primitives:

Let us then no longer endeavour to account for these connections either by the mental weakness of primitives, or by the association of ideas, or by a naive application of the principle of causality, or yet by the fallacy *post hoc, ergo propter hoc*; in short, let us abandon the attempt to refer their mental activity to an inferior variety of our own. Rather let us consider these connections in themselves, and see whether they do not depend upon a general law, a common foundation for those mystic relations which primitive mentality so frequently senses in beings and objects. Now there is one element which is never lacking in such relations. In varying forms and degrees they all involve a “participation” between persons or objects which form part of a collective representation (1966: 61).¹⁸

In *Les fonctions mentales*, Lévy-Bruhl illustrates the “law of participation”¹⁹ through the example, borrowed from ethnologist Karl Von den Steinen (1855-1929), of the Amazonian Bororo who claim that “Bororo are Arara (red parakeets)”:

¹⁸ Original text: N’essayons donc plus de rendre compte de ces liaisons soit par la faiblesse d’esprit des primitifs, soit par l’association des idées, soit par un usage naïf du principe de causalité, soit par le sophisme *post hoc, ergo propter hoc*; bref, de vouloir ramener leur activité mentale à une forme inférieure de la nôtre. Considérons plutôt ces liaisons en elles-mêmes, et cherchons si elles ne dépendent pas d’une loi générale, fondement commun de ces rapports mystiques que la mentalité des primitifs appréhende si souvent entre les êtres et les objets. Or il y a un élément qui ne fait jamais défaut dans ces rapports. Sous des formes et à des degrés divers, tous impliquent une « participation » entre les êtres ou les objets liés dans une représentation collective. C’est pourquoi, faute d’un meilleur terme, j’appellerai loi de participation le principe propre de la mentalité « primitive » qui régit les liaisons et les préliations de ces représentations (Lévy-Bruhl, 1910: 76).

¹⁹ As noticed by Keck (2005), Lévy-Bruhl explicitly borrows the concept of “participation” from French philosopher Nicolas Malebranche (1638-1715) who introduced the latter concept as a “mode of causality, added up to the mechanical causality [...] for constituting a moral order (or grace): this is the meaning of the “occasionalist” thesis according to which the causalities that are observable in nature are only secondary causalities in relation to the primary causality, that of God. [...] The notion of participation thus allows Lévy-Bruhl to describe, without leaving the field of visibility which is the only thing given to/for the scientist, a causal regime that duplicates things into something else than themselves. Making them perceive as animated by a causality different from the one that governs natural things. Saying that things participate with each other in the primitive mentality entails that a social causality connects them by invisible forms, of which it is nevertheless possible to

This does not merely signify that after their death they become araras, nor that araras are metamorphosed Bororos, and must be treated as such. It is something entirely different. “The Bororos,” says Von den Steinen, who would not believe it, but finally had to give in to their explicit affirmations, “give one rigidly to understand that they are araras at the present time, just as if a caterpillar declared itself to be a butterfly.” It is not a name they give themselves, nor a relationship that they claim. What they desire to express by it is actual identity (1966: 62).²⁰

If we follow Keck (2010: 58)’s interpretation, in Lévy-Bruhl’s view, the Bororo’s statement (asserting that they are araras through an “essential identity”) does not refrain from contradiction, in the sense that the statement does not strictly follow/violates the principle of non-contradiction. In other words, it states that “A is non-A”; however, a man cannot be a bird. Therefore, the statement must be governed by/follow a different principle of logic, what Lévy-Bruhl calls “participation”, according to which “A participates with non-A” (men participate with the spirit of the bird with whom they perceive a relation of kinship). Lévy-Bruhl introduces the term “prelogical” to characterize such a phenomenon. To him, this mentality can thus be described as “mystical”, as well as “prelogical”: “mystical” if we look at the content of the collective representations, and “prelogical” if we look at the relationships between beings

describe the organization. That is to say, we can see everything in society (as Malebranche said that we can see everything in God), without delimiting an order of things that is specifically social, since these are all things that can alternatively be seen as natural (as things are) and as social (as they participate with each other in an order of social causality).” (Keck, 2005: 317)—my translation. Original text: [Le concept de participation désigne plus particulièrement chez Malebranche] un mode de causalité qui s’ajoute à la causalité mécanique (ou de la nature) pour constituer un ordre moral (ou de la grâce) : c’est le sens de la thèse « occasionnaliste » selon laquelle les causalités observables dans la nature ne sont que des causalités secondes par rapport à la seule causalité première, celle de Dieu. [...] La notion de participation permet ainsi à Lévy-Bruhl de décrire, sans quitter le champ de visibilité qui est la seule donnée pour le savant, un régime de causalité qui dédouble les choses en autre chose qu’elles-mêmes, et les fait percevoir comme animées d’une causalité différente de celle qui régit les choses naturelles. Dire que les choses participent les unes aux autres dans la mentalité primitive, c’est dire qu’une causalité sociale les relie par des formes invisibles, dont il est pourtant possible de décrire l’organisation ; c’est dire que nous pouvons tout voir dans la société (comme Malebranche disait que nous pouvons tout voir en Dieu), sans délimiter pour autant un ordre de choses qui serait spécifiquement social, puisque ce sont toutes choses qui peuvent être vues alternativement comme naturelles (en tant qu’elles sont des choses) et comme sociales (en tant qu’elles participent les unes aux autres dans un ordre de causalité sociale).

See also (Lévy-Bruhl, 1910: 105 and 397).

²⁰ Original text: Cela ne signifie pas seulement qu’après leur mort ils deviennent des araras, ni non plus (que les araras sont des Bororô métamorphosés, et doivent être traités comme tels. Il s’agit de bien autre chose. “Les Bororô”, dit M. von den Steinen, [...], “donnent froidement à entendre qu’ils sont actuellement des araras, exactement comme si une chenille disait qu’elle est un papillon”. Ce n’est pas un nom qu’ils se donnent, ce n’est pas une parenté qu’ils proclament. Ce qu’ils veulent faire entendre, c’est une identité essentielle (Lévy-Bruhl, 1910: 77-78).

and/or objects that the collective representations assert/put forward²¹. In short, as summarized by Philosopher Cristina Chimisso²² (2008), Lévy-Bruhl

believed that primitives exhibit a prelogical mentality, which did not mean either alogical or antilogical, but rather that they were not concerned with avoiding contradiction. Specific to their mentality was rather the so-called law of participation. According to this law, beings can be at the same time themselves and something else; moreover, without ceasing to remain what they are, they can emit and receive mystic powers, virtues and qualities, which can be felt elsewhere (Chimisso, 2008: 66).

Chimisso further emphasizes that Lévy-Bruhl “departed from the more common sociological model of evolution” (*cf.* footnote 6). His hypothesis is that the “primitive/prelogical mentality” is “just different, rather than an earlier stage of modern mental activity” (Chimisso, 2008: 66)²³. According to Keck (2010), the use of the term “prelogical” to characterize the primitive mentality gave rise “to the greatest misunderstandings”. The latter term “was losing the strength of Lévy-Bruhl’s anti-evolutionist stance, looking at primitive societies, not as a kind of childhood mistake, but characterized by a social operational mode of thought [...]”. Using the term “prelogical”, Lévy-Bruhl wanted to describe “another logic” other than the “logic of signs”: this “other logic” is still present in every human mind, but its expression became less visible, so that a detour through primitive societies allows us to bring it to light. So, in Keck’s view, under the appearance of a classic evolutionism, “it is a surprisingly relativist project that emerged to pluralize the logical activity itself by renewing it to its social genesis”²⁴.

²¹ As noticed by Claude Rosental (2002), Lévy-Bruhl’s concept of prelogical mentality is based on a representation of Logic which strongly contrasts with the approaches developed at the time by researchers in this discipline. “Lévy-Bruhl’s conception of logic appears above all characterized by the existence of a set of logical principles, in the first rank of which is the ‘principle of contradiction’ [...]. In fact, the author remains extremely vague about the nature and the list of the elements likely to form this set, in addition to this principle of contradiction (the definition of which is itself never provided). No reference is made to the work of logicians that could clarify this point, even though we find here, to a certain extent, early 20th century Husserl’s insistence on logical principles, and especially on the principle of contradiction, as the foundation of logic” (Rosental, 2002: 80)—my translation. Original text: La logique telle que Lévy-Bruhl l’a conçue apparaît avant tout caractérisée par l’existence d’un ensemble de principes logiques, au premier rang desquels se trouve “le principe de contradiction” [...]. En fait, l’auteur demeure extrêmement flou sur la nature ou la liste des éléments susceptibles de former cet ensemble, en complément de ce dernier principe (dont la définition n’est du reste elle-même jamais fournie). Aucune référence à des travaux de logiciens ne vient apporter d’éclaircissements sur ce point, même si finalement l’on retrouve ici, dans une certaine mesure, l’insistance de Husserl du début des années 1900 sur les principes logiques, et tout particulièrement sur le principe de contradiction, en tant que fondement de la logique.

²² In 2008, Italian philosopher Cristina Chimisso published the important book *Writing the History of the Mind: Philosophy and Science in France, 1900 to 1960s*. Naturally, Lévy-Bruhl, Brunshvic and Rey are omnipresent in this book, and a few sections are devoted more specifically to their analysis of the primitive mentality. In the following, I will regularly refer to the outcomes/results of this book.

²³ Lévy-Bruhl made clear that point in the 1923 “French Society of Philosophy” seminar. He claimed that this term, used for lack of a better one, does not mean that the primitive mentality constitutes a kind of anterior stage, over time, to the emergence of the logical thought. The primitive mentality is not antilogical; it is not alogical either. In calling it prelogical, I only want to make understand that it does not refrain, like ours, to avoid the contradiction. Original text : Ce terme, employé faute d’un meilleur, ne signifie pas que la mentalité primitive constitue une sorte de stade antérieur, dans le temps, à l’apparition de la pensée logique. La mentalité primitive n’est pas antilogique ; elle n’est pas non plus alogique. En l’appelant prélogique, j’ai seulement voulu faire entendre qu’elle ne s’astreint pas, comme la nôtre, à éviter la contradiction (Lévy-Bruhl et al., 1923, p. 631).

²⁴ Original text: [...] c’est un projet étonnamment relativiste qui se fait jour, visant à pluraliser l’activité logique elle-même en la reconduisant à sa genèse sociale (Keck, 2010: 14-15). Lévy-Bruhl’s claim regarding the variability

However, even though Lévy-Bruhl asserts that the mental activities/functions of the primitive people can be seen—in some ways—as “complex and developed” (1922:16), on the other hand, they are indeed presented—throughout his work—as characteristic of inferior/lower societies, compared to higher mental activities developed in the Western world. This creates a division between human societies, regarding the logic that governs their collective representations.

Although the books *Les fonctions mentales dans les sociétés inférieures* (1910) and *La mentalité primitive* (1922) are devoted to the same topic, they focus on different aspects of primitive mental functions, as explained in the preface of the 1922 book. As previously seen, the first book introduces the “law of participation” in relation to the “mystical” and “prelogical” aspects of the primitive mentality. The second book aims at investigating what is causality for the primitives, and the consequences following the idea they have of it (Lévy-Bruhl, 2010 [1922]: 58). According to Lévy-Bruhl, in our own mentality,

As we understand it, the connection between cause and effect necessarily unites phenomena in time, and conditions them in such a way that they are arranged in a series which cannot be reversed. [...] the certainty we have that these phenomena are always arranged in causal series, is the very foundation, to our minds, of the order of the universe, and, in short, of experience (Lévy-Bruhl, 1923: 90).²⁵

By contrast, since for the primitive mentality nearly everything that happens in the world is related to occult or mystical powers (witches, death, spirits, etc.),

[...] instead of both cause and effect being perceptible in time and nearly always in space, as in our case, primitive mentality admits only one of the two conditions to be perceptible at one time ; the other belongs to the sum-total of those entities which are invisible and imperceptible to sense (Lévy-Bruhl, 1923: 90).²⁶

For Lévy-Bruhl, all of these characteristic features of the primitive/prelogical mentality entail a lesser ability to abstract and generalize²⁷, and also conduct a deductive reasoning (1922: 505-

of human mentalities is also at odds with the durkheimian position. Durkheimians postulate the existence of one and only one human “mentality” which evolves in different ways as part of human evolution, whereas Lévy-Bruhl argues the radical discontinuity between two different mentalities (Keck, 2008: 141).

²⁵ Original text: Le lien causal, tel que nous l’entendons, unit les phénomènes dans le temps, d’une façon nécessaire, et les conditionne de telle sorte qu’ils se disposent en séries irréversibles. [...] la certitude où nous sommes que ces phénomènes se disposent toujours, en effet, en séries causales, fonde pour nous l’ordre du monde, et d’un mot l’expérience (Lévy-Bruhl, 1922: 85).

²⁶ [...] au lieu que, pour nous, la cause et l’effet sont donnés tous deux dans le temps et presque toujours dans l’espace, la mentalité primitive admet à chaque instant qu’un seul des deux termes soit perçu ; l’autre appartient à l’ensemble des êtres invisibles et non perceptibles.

²⁷ There is here another point of disagreement with Durkheim’s view. According to Lévy-Bruhl, “the collective representations of the primitives [...] differ profoundly from our ideas or concepts” (1966: 24). According to him, this would be due to their mystical characteristics, and consequent low potential of abstraction and generalization. By contrast, as argued by Dominique Merllié (2012), quoting some extracts of Durkheim’s book *Les formes élémentaires de la vie religieuse* (1912), Durkheim claims that the religious collective representations are “true concepts” (véritables concepts) ([Durheim, 1912], 618). The specificity of the concept is to be (relatively) immutable and universal or universalisable (Ibid., 618-619), which is only possible [according to Durkheim] if it is the “product of a collective elaboration” (produit d’une élaboration collective). Furthermore, Durkheim asserts

506), or—at least—a different manner of practicing abstraction. In the next section, we will examine an important chapter of the first book (1910), in which Lévy-Bruhl aims to highlight this lack of abstraction and generalization in the development of “concrete” numerical systems, as it would have occurred within various primitive societies.

1.4 Prelogical mentality and abstraction/generalization ability

In this chapter entitled “La mentalité prélogique dans ses rapports avec la numération” (Prelogical mentality in its relation to numeracy), Lévy-Bruhl alleges that the prelogical mentality would have had a significant impact on primitive societies’ numeracy:

The various methods of counting and calculating, of forming and using the names for numbers, will possibly enable us to see, actually at work, the mentality of primitives where it differs specifically from logical thought (1966: 159).²⁸

According to Lévy-Bruhl, the prelogical characteristics of their mentality is the reason why the primitives have not elaborated the concept of “abstract numbers”. They would use instead “concrete numeration systems”, without distancing them from the counted/enumerated objects.

It is usually admitted as a natural fact, requiring no examination, that numeration starts with the unit, and that the different numbers are formed by successive additions of units to each of the preceding numbers. This is, in fact, the most simple process, and the one which imposes itself upon logical thought when it becomes conscious of its functioning. [...] Prelogical mentality, however, **which has no abstract concepts** at command, does not proceed thus. It does not distinctly separate the number from the objects numbered (1966: 169)²⁹—my emphasis.

De facto, as shown in the above quotation, the discussion about “abstraction” goes beyond the elaboration of numbers, Lévy-Bruhl claiming that primitive peoples would not use abstract concepts in general. Lévy-Bruhl further claims that what the primitive man expresses is actually not “numbers”, but “number-sets”, whose “units” have not been isolated. In order to be able to

that “conceptual thinking is contemporary with humanity” (pensée conceptuelle est contemporaine de l’humanité) and “a man who would not think by concept would not be a man” (un homme qui ne penserait pas par concept ne serait pas un homme). [Explicitly responding to Lévy-Bruhl, Durkheim asserts that] to support the contrary, it is necessary to define the concept “with characteristics that are not essential to it” (avec des caractères qui ne lui sont pas essentiels): It has been identified “with a general idea precisely delimited and circumscribed” (avec une idée générale nettement délimitée et circonscrite) (Ibid., 626) [...] It is not because inferior societies have only “rudimentary generalization processes” (des procédés de généralisation rudimentaire) that people would not think “conceptually” (Ibid., 627) (Merllie, 2012: 434).

²⁸ Original text: Les diverses façons de compter et de calculer, de former les noms de nombre et d’en user, permettront peut-être de prendre, pour ainsi dire, sur le fait, la mentalité des sociétés inférieures dans ce qu’elle a de spécifiquement différent d’avec la pensée logique (Lévy-Bruhl, 1910: 204).

²⁹ Original text: On admet en général sans examen, et comme une chose naturelle, que la numération part de l’unité, et que les différents nombres se forment par l’addition successive de l’unité à chaque nombre précédent. C’est là en effet le procédé le plus simple, celui qui s’impose à la pensée logique quand elle prend conscience de son opération. [...] Mais la mentalité prélogique, qui ne dispose point de concepts abstraits, ne procède pas ainsi. Pour elle, le nombre ne se sépare pas nettement des objets nombrés (Lévy-Bruhl, 1910: 219).

represent the arithmetic sequence of whole numbers in their regular succession—from the unit—, it is necessary, in Lévy-Bruhl's view, to separate numerals from what is numbered:

this is precisely what it [the primitive mentality] does not do. It imagines, on the contrary, collections of entities or objects which are familiar to it both by nature and by number, the latter being felt and perceived, though not conceived in the abstract (1966: 169).³⁰

Lévy-Bruhl uses the example of numeral “classifiers” in support of the argument that numerals are not distinctly separated from the enumerated objects in primitive/concrete numerations. Classifiers are used in many languages—and actually not only in oral cultures, in Chinese, as well as in Japanese in particular. They are “suffixes”, attached to the numerals, specifying a particular class to which the counted objects belong. Lévy-Bruhl illustrates this phenomenon, mentioning the Kwakiutl numeral classifiers collected by anthropologist Franz Boas³¹, and published in the “Sixth report on the North Western Tribes of Canada” (1890). Among the Kwakiutl, “besides the class-suffixes for animate beings, round, long, flat objects, days, fathoms, these numerals may take any of the noun suffixes... The number of classes is thus unlimited. They are simply compounds of numerals and the noun-suffixes” (Boas, 1890: 106-107/655-6, quoted by Lévy-Bruhl, 1966: 172-173). Lévy-Bruhl argues that this extraordinary richness can easily be understood, given the characteristics of the concrete languages of primitive peoples, “pictorial” languages first and foremost (Lévy-Bruhl, 1910: 224 ; 1966: 173). Furthermore, he puts forward the idea that the elaboration of such classifier numerical systems could be linked to a particular form of abstraction that the prelogical mentality implies:

for as its abstractions are always specializing rather than generalizing, it does, at a certain degree of development, form numerals; but they are not abstract numbers such as we use. They are invariably the number-names of certain classes or persons or things (1966: 174-175).³²

Finally, in Lévy-Bruhl's view, the mentality of primitive peoples also implies that their numerals are not undifferentiated. Since the latter are—in the “collective representations”—, so closely linked to the mystical properties of the represented sets, they would be mystical realities themselves rather than arithmetic units (Lévy-Bruhl, 1910: 236-237). For Lévy-Bruhl, these mystical realities of numbers are clearly the expression of the prelogical mentality. He asserts that each number (in use in primitive societies) has its own individual physiognomy, and is represented—or even felt—for itself, without comparison with other numbers. In that way, numbers would not form a homogeneous series, and, consequently, would be totally unfit for the simplest arithmetical operations. The only operations to be performed are mystical

³⁰ Original text : C'est précisément ce qu'elle [la mentalité primitive] ne fait pas. Elle se représente au contraire des collections d'êtres ou d'objets, qui lui sont familières à la fois par leur nature et par leur nombre, celui-ci étant senti et perçu, mais non abstraitement conçu (Lévy-Bruhl, 1910: 219-220).

³¹ To my knowledge, ethnologist Franz Boas was the first anthropologist to refer to such numeral classifiers in use in oral cultures.

³² Original text: Comme ses abstractions sont toujours plutôt particularisantes que généralisantes, elle forme bien, à un certain degré de son développement, des noms de nombre; mais ce ne sont pas des noms de nombre in abstracto, comme ceux dont nous usons. Ce sont toujours les noms de nombre de certaines classes d'êtres ou d'objets (Lévy-Bruhl, 1910: 227).

operations themselves, and thus not subject to the principle of non-contradiction (Lévy-Bruhl, 1910: 236-237).

To give a concrete example of the non-respect of this principle, Lévy-Bruhl refers to the 1878 book *La religion védique, d'après les hymnes du rig-veda* (Vedic religion, according to rig-veda's hymn) by Abel Bergaigne, and more precisely to the chapter "L'arithmétique mythologique" (Mythological arithmetic). In this extract, Bergaigne asserts the "extraordinary facts" that different numbers can be nonetheless equal to one another:

The simultaneous and impartial use of three and seven . . . proves but one thing: their complete equivalence. . . . The various numbers we have found used for one another, because they all express, in different systems of division, the sum of the parts of the universe, have for the same reason been capable of being used, by a kind of pleonasm, side by side with each other. In fact, this has frequently been done. In this way, three is the same as seven, or as nine (Bergaigne, 1878: 148, quoted by Lévy-Bruhl 1966 : 195).

33

Lévy-Bruhl interprets this mystical equivalence between numbers as a "scandal for logical thinking", even though it seems quite natural for the "prelogical mentality". Since the latter is above all concerned with mystical participation:

[The prelogical mentality] does not regard these numbers in an abstract relation to other numbers, or with respect to the arithmetical law in which they originate. The primitive mind considers each as a reality grasped by itself, and not needing for its definition to be regarded as a functioning of other numbers. Thus every number has an inviolate individuality which allows it to correspond exactly with another number [...] (1966 : 195-196).³⁴

Lévy-Bruhl's theory has been vigorously criticized in the field of sociology/anthropology throughout the first decades of the 20th century. First, Emile Durkheim, from whom the former borrowed the concept of "collective representation", does not believe that a law of participation characterizes the so-called primitive mentality. To him, the latter and our own mentality are based on the same logic³⁵. Thereafter, Marcel Mauss criticizes Lévy-Bruhl's conceptualization

³³ Original text: L'emploi simultané et indifférent de trois et de sept... ne prouve qu'une chose: leur parfaite équivalence... Les divers nombres que nous avons vus employés les uns pour les autres, parce qu'ils expriment tous, dans différents systèmes de division, la somme des parties de l'univers, ont pu, pour la même raison, être employés, par une sorte de pléonasm, les uns à coté des autres. Et, en effet, ils l'ont été souvent. De la sorte, trois est la même chose que sept, ou que neuf (Bergaigne, 1878: 148; quoted by Lévy-Bruhl, 1910: 254).

³⁴ Original text: [La mentalité prélogique] ne considère pas ces nombres dans leur relation abstraite avec les autres nombres, ni dans la loi arithmétique qui les engendre. Chacun d'eux est, à ses yeux, une réalité qui est saisie en elle-même, et qui n'a pas besoin, pour se définir, d'être considérée en fonction des autres nombres. Chaque nombre a ainsi une individualité irréductible, qui lui permet de correspondre exactement à un autre nombre (Lévy-Bruhl: 1910: 254-255).

³⁵ Durkheim and Lévy-Bruhl's divergent viewpoints regarding the "primitive mentality" have been largely commented. The reader might refer to Horton 1973, Merlié 1998, 2012 in particular. Let me just mention here their disagreement regarding the law of participation and the subsequent "prelogical" aspect of the primitive mentality, as can be perceived in a few passages of *Les formes élémentaires de la vie religieuse* (Durkheim, 1912).

of the primitive mentality, that would just be a kind of “abstraction”, not taking into account the social milieus and institutions, essential for analyzing and understanding the collective representations.³⁶ Beyond the French school of sociology’s critiques, Lévy-Bruhl’s theory led to significant critiques by a number of anthropologists: Franz Boas (1858-1942), Bronislaw Malinowski (1884-1942), and Edward E. Evans-Pritchard (1902-1973) in particular³⁷.

While explaining that “the evolution of logic is closely related to the religions’ evolution and depends, like the latter, on social conditions” (1912: 336), Durkheim points out (in a footnote) that his 1912 book was already written when *Les fonctions mentales* was published. And, therefore, he decided to publish his manuscript in its original form, adding only a few comments, highlighting his disagreement with Lévy-Bruhl’s work. To Durkheim, the primitive mentality is indeed similar to our own mentality. Moreover, our “logic” would have risen from the logic underlying the primitive mentality (1912: 341). He illustrates what he refers to “our logic” asserting that the “explanations of contemporary science would be more objective, since they are more methodical, and based on more strictly controlled observations” (1912: 340-341). However, according to Durkheim, these explanations “do not differ in kind from those which satisfy the primitive mind”. Durkheim argues that today “as in the past, explaining is showing how one thing participates in one or more others.” While explicitly referring to Lévy-Bruhl’s approach, Durkheim writes: “It has been said that the participations [...] violate the principle of contradiction, [...] and that in this way are opposed to those that the scientific explanations involve. Asserting that a man is a kangaroo, or the sun is a bird, is it not to identify the same and the other? However, we do not think in another way when we say that heat is a movement, light is a vibration of the ether, etc. Every time we link heterogeneous terms by an internal link, we necessarily identify opposite terms. Certainly, the terms we link to one another in this way are not those the Australian brings together; we choose [these terms] according to other criteria and for other reasons; but the very approach by which the mind puts them in relation does not essentially differ” (1912: 341-342)—my translation.

Original text: On a dit que les participations [...] violent le principe de contradiction et que, par là, elles s’opposent à celles qu’impliquent les explications scientifiques. Poser qu’un homme est un kangourou, que le soleil est un oiseau, n’est-ce pas identifier le même et l’autre? Mais nous ne pensons pas d’une autre manière quand nous disons de la chaleur qu’elle est un mouvement, de la lumière qu’elle est une vibration de l’éther, etc. Toutes les fois que nous unissons par un lien interne des termes hétérogènes, nous identifions forcément des contraires. Sans doute, les termes que nous unissons ainsi ne sont pas ceux que rapproche l’Australien nous les choisissons [ces termes] d’après d’autres critères et pour d’autres raisons; mais la démarche même par laquelle l’esprit les met en rapports ne diffère pas essentiellement (Durkheim, 1912: 341-342).

³⁶ Mauss attended the “French Society of Philosophy” seminar devoted to Lévy-Bruhl’s theory on primitive mentality discussed above in section 1.1 (Lévy-Bruhl and al., 1923). On this occasion, Mauss elaborated a concise critique of this theory. First, Mauss criticizes Lévy-Bruhl’s work for not having analyzed in depth the mentality of modern societies, in order to be able to make a comparison with the so-called primitive mentality. Therefore, according to Mauss, Lévy-Bruhl “does not prove the assumed difference between the primitive mind and our mentality” (1923: 639). To him, the relationship between the primitive and modern societies “is much narrower than Lévy-Bruhl believes”. Furthermore, for Mauss, there are significant differences between the various societies that Lévy-Bruhl categorized as primitive societies. Through an evolutionist perspective, Mauss asserts that the Australian aboriginal societies would be the only societies that could be seen as primitive (1923: 640). He concludes that the primitive mentality as conceptualized by Lévy-Bruhl appears as a kind of abstraction, comparable to the theological state in Auguste Comte’s theory (cf. section 1.2). Secondly, according to Mauss (and more generally to the Durkheimians) collective representations are related to “social milieus and institutions”. It is therefore necessary to study in depth the latter to grasp and explain the collective representations of a given society. In Mauss’ view, it is what Lévy-Bruhl does not do. “Leaving aside what is emotional and motivating within collective institutions and ideas”, and, subsequently, “what the social group is” (as characterized by its “institutions, emotions and collective movements”), would have led Lévy-Bruhl to “incomplete descriptions” (1963: 641). Finally, Mauss criticizes Lévy-Bruhl’s assertion that the “participation” would be a “logical confusion”. Rather, it would imply an (intellectual) effort to make different things look alike (1963: 64-642).

³⁷ In his book “The mind of the primitive man” (1911), Boas asserts that Lévy-Bruhl’s conclusions (regarding the prelogical nature of the primitive mind) is “reached not from a study of individual behavior, but from the traditional beliefs and customs of primitive people. It is believed to explain the identification of man and animal, the principles of magic and the beliefs in the efficacy of ceremonies. It would seem that if we disregard the thinking of the individual in our society and pay attention only to current beliefs that we should reach the conclusion that the same attitudes prevail among ourselves that are characteristic of primitive man” (1911: 135). In the chapter “Magic Science and Religion” of the collective book edited by Joseph Needham (1925), Malinowski takes position against Lévy-Bruhl’s theory of “prelogical mentality” and its law of participation. According to him, there is no doubt that the inhabitants of the Trobriand Islands, where he carried out long term field research, have elaborated rational

In contrast, this theory of primitive mentality, and more generally the chapter discussed above, whose aim was to explore the impact of “prelogical mentality” on the development of mathematical knowledge, has had a significant influence in the field of history and philosophy of science. Especially on works that dealt with the emergence of science (including mathematics) between “societies” and/or “civilizations”.

2. Brunschvicg’s philosophy/history of mathematics and the prelogical mentality

As emphasized by Chimisso, Brunschvicg’s philosophy takes the “history of science” as its “object” of study, and therefore can be considered as “a reflection on the history of science” (Chimisso, 2008: 71). It is in that perspective that he wrote his book *Les étapes de la philosophie mathématique*. The use of the term “étapes” (stages) reflects Brunschvicg’s methodology, considering the philosophy of mathematics’ development as a unilinear phenomenon, and from an evolutionist perspective. One can also observe the ethnocentric outlook taken by Brunschvicg’s book, in the way in which he concentrates mostly on European traditions in mathematics. Among the few exceptions, there is the chapter devoted to Egyptian mathematics (entitled “Calcul égyptien”) that the author analyzes as mathematical practices that would be the first stage towards our own mathematics³⁸. The so-called “Hindu mathematics” appears twice in the book as part of discussions on (1) the Pythagoras’ theorem and (2) the emergence of negative numbers (Brunschvicg, 1912: 46 and 249). Moreover, both ancient Arab and Chinese mathematics traditions are very rarely mentioned in this text. Indeed, in Brunschvicg’s view,

the history of mathematical philosophy has begun with the Pythagorism that is one of the most brilliant doctrines, but also one of the less-known from antiquity. If we leave aside the speculations on the contribution that can be attributed to the successive representatives of the [Pythagorean] School in the constitution of the doctrine, or the often strange and mysterious connections through which purely scientific data were connected to the tradition of moral prescriptions or religious beliefs, a problem remains, for which it would be essential to draw on to a positive documentation. We would have to determine the progress of a technical nature to which the philosophy of the Pythagoreans is related. For this, we should be able to follow the Hellenic culture in the continuity of its growth, and to know what was borrowed from the civilizations of Asia and Egypt.³⁹

and abstract knowledge embedded in various activities—such as agriculture, canoe-building, sailing, etc. In Malinowski’s view, this “primitive knowledge can be regarded as a rudimentary form of science” (1925: 35-36). In his paper entitled “Lévy-Bruhl’s Theory of Primitive Mentality” (1934), Evans-Pritchard criticizes Lévy-Bruhl’s theory, challenging the idea that primitive thinking is not fully logical. As noticed by Claude Rosenthal, Evans-Pritchard asserts that primitive people have the same mental abilities than people from the Western world. In his view, the primitives are therefore particularly able to make correct inferences, and thus to think in a fully logical way (Rosenthal 2002: 84-85).

³⁸ This idea of a continuum between Egyptian mathematics and our own tradition of mathematics can also be found in Abel Rey’s work (*cf.* section 3).

³⁹ (Brunschvicg 1912: 3-4)—my translation. Original text: L’histoire de la philosophie mathématique s’ouvre avec le pythagorisme, qui est l’une des doctrines les plus éclatantes, mais aussi l’une des plus mal connues, de l’antiquité. Si nous laissons de côté les conjectures sur la part qui revient aux représentants successifs de l’École dans la constitution de la doctrine, ou les connexions souvent étranges et mystérieuses par lesquelles les données

To do this, Brunshvic suggests to go back to the “early signs which give evidence of the awakening in mankind of scientific thinking” (*premières lueurs qui manifestent dans l’humanité l’éveil de la pensée scientifique*). A difficult task, given the lack of historical sources. Indeed, having at our disposal sufficiently precise data “only in a few Egyptian documents from remote antiquity, of which the Rhind papyrus remains the most important”. To overcome this difficulty, Brunshvic claims that the study of “the primitive era of our civilization” could be substituted by research carried out on “inferior” societies.

Ethnography, exercising a form of vicarious function, helps us fill in a large part of the gaps in prehistory, and, through a hypothesis that is certainly unverifiable, but that has for it that it looks plausible, it should help to outline/retrieve the natural course of human evolution.⁴⁰

Brunshvic thus devotes one chapter to the issue of the early concepts of number (Chap 1: L’ethnographie et les premières opérations numériques / Ethnography and the first numerical operations). For that purpose, he draws on three books: (1) Tylor’s *Primitive Culture*⁴¹ (French translation by Pauline Brunet, 1973), (2) American mathematician Levi-Leonard Conant (1857-1916)’s book *The Number Concept: Its Origin and Development* (1896)⁴², and (3) Lévy-Bruhl’s

purement scientifiques se reliaient à la tradition des prescriptions morales ou des croyances religieuses, un problème subsiste où il serait essentiel d’avoir l’appui d’une documentation positive. Nous aurions à déterminer le progrès d’ordre technique auquel correspond la philosophie du pythagorisme; pour cela nous devrions pouvoir suivre la culture hellénique dans la continuité de sa croissance, savoir ce qu’elle a emprunté aux civilisations de l’Asie ou de l’Egypte (Brunshvic 1912: 3-4).

⁴⁰ (Brunshvic, 1912: 3-4)—my translation. Original text: L’ethnographie, exerçant une sorte de fonction vicariante, permet de combler en une large mesure les lacunes de la préhistoire, et, par une hypothèse qui est assurément invérifiable, mais qui du moins a pour elle la vraisemblance, de rétablir dans ses grandes lignes le cours naturel de l’évolution humaine (Brunshvic 1912: 3-4). Such an approach *i.e.* using ethnographical facts on indigenous societies to fill a lack of information in human evolution, has been for a long time left out by most anthropologists (Lévi-Strauss, 1952). However, the continuing influence of such ideas over the twentieth century is still perceptible nowadays in the field of history of mathematics, and particularly in the history of numbers (Struik 1948, Keller 2016...).

⁴¹ In his book *Primitive Culture: Researches Into the Development of Mythology, Philosophy, Religion, Language, Art and Custom* (1871), Edward Tylor devotes a whole chapter to the “Art of Counting” (chapter VII, vol. 1). There, he offers a synthesis of ethnographic data related to numerical systems developed in “primitive” societies. He is thus one of the first anthropologists to offer a comparative analysis of numerical systems, documented by ethnographers and missionaries in the societies that Tylor apprehends as “primitive” *i.e.*, in his view, at the first stage of human evolution. Among these societies, Tylor (1871: 241-244) distinguishes those in which large numbers are named and used (recognizing for some of them, especially among Tongans and several West African societies, the expression of “exceptional” skills in the use of numeration systems). By contrast, there are those in which few-number numerical systems (1, 2, 3...) have been developed, based/drawing on gestural methods (and digital/hand gestures in particular), allowing them to count well beyond the first whole numbers. Tylor argues that, in all cases, the names given to numbers in these “primitive” societies would have their origin in the vernacular terms which designate the body units/parts (finger, hand, foot, man ...) involved in these gestural numerations—that he analyzes as the first stage of the elaboration of genuine numerical systems (1871: 246-249).

⁴² Among mathematicians, although George Peacock (1791-1858) had analyzed various systems of numerals in use among “barbarous” peoples, in the introduction of his article “Arithmetic” (*Encyclopaedia Metropolitana* 1845) (Vandendriessche, 2022), Conant has been the first mathematician to devote a whole book to this topic. In this book, Conant offers a comparative study of primitive societies’ numerical systems, through the analysis of ethnographic sources originating from 19th century anthropology. Levi-Leonard Conant (1857-1916) has been significantly influenced by the anthropological evolutionist theories of his time (and particularly by anthropologist Edward Tylor’s work on *Primitive Cultures*, 1871). Conant therefore analyzed the numerical systems developed in the various primitive societies as proto-mathematics, involving a low level of abstraction. Like Tylor, he argues

book *Les fonctions mentales* (1910), and more particularly the chapter devoted to numerical systems discussed above.

Brunschvicg claims that he is “particularly indebted to Mr. Lévy-Bruhl who provided initial guidance that every ethnographic study should follow, insisting on the opposition between our logical practices and the primitive mentality”.⁴³ However, unlike Lévy-Bruhl’s relativist thesis, Brunschvicg’s reflection on numbers is clearly in line with Tylor and Conant’s anthropological evolutionist approach. Indeed, Brunschvicg selected some ethnographic data from these three predecessors’ books, in an attempt to retrace the early emergence of the concept of number in history. Nevertheless, Brunschvicg does not mention either the use of “classifiers”, nor the concept of “number-set”, central in Lévy-Bruhl’s reflection on the impact of the primitive mentality at work in the elaboration numbers (*cf.* section 1.4). Brunschvicg seeks rather highlight the major stages of the elaboration of numerical systems that he articulates through the concepts of “enumeration, ordinality, and cardinality”. Nevertheless, through different approaches, Brunschvicg and Lévy-Bruhl come together on the fact that the numbers in primitive societies are not actually numbers in the sense we understand them, since allegedly the primitives would not have (yet) elaborated the concept of “abstract” number.

Brunschvicg thus argues that there is an increasing complexity between the various numerical systems in use in the different primitive societies. It would be based respectively on three stages of development. At the first stage, according to this author, “numeration” appears simply as an “enumeration”. Here, Brunschvicg borrows Tylor’s example of Australian Aborigines from Adelaide who name their children in relation to their birth order (Tylor, 1973: 292). Given that these people do not have “cardinal numbers” beyond three, Brunschvicg asserts that the “Australian father of nine children will know if his family is complete without however having the representation of the number nine, nor the abstract idea of the cardinal number or even ordinal number”. Therefore, for Brunschvicg, it does not mean that this man counts up to nine, but instead, he pushes to the end the “qualitative distinction of terms”, forming what we might perceive as an orderly series. By means of an enumeration, the primitive mind would simply match a collection of objects with a list of names/terms/words (1912: 9). At this very first stage, numerical thinking would be “contained in things, rather than being present in the human mind”.

For Brunschvicg, the next stage would be the development of the concept of “order” of any collection (ordinal numbers). This would happen by “generalizing the idea of order, underlying the qualitative distinction of the terms of a [given] series, so that, instead of being applied to the same group of individuals, this distinction becomes a point of reference for the ordination of arbitrary objects”.⁴⁴ The use of an ordered sequence of objects, or body parts (fingers, hands,

that numbers, in these “primitive” societies, are most often named using terms referring to body parts, and therefore conceptually rooted in a concrete reality (Conant, 1896: 72-73).

⁴³ (Brunschvicg, 1912: 7)—my translation. Original text : [...] particulièrement redevable à Mr. Lévy-Bruhl qui a fourni l’indication initiale dont toute étude ethnographique doit procéder, en insistant sur l’opposition entre nos habitudes logiques et la mentalité primitive.

⁴⁴ (Brunschvicg, 1912: 9)—my translation. Original text : [...] généraliser l’idée de l’ordre qui est sous-entendue dans la distinction qualitative des termes de la série ; de telle sorte qu’au lieu de s’appliquer à un groupe d’individus toujours les mêmes, cette distinction devient un point de repère pour l’ordination d’objets quelconques.

arms, etc.), through an operation of correspondence, would allow the primitive to “supplement/substitute for the numerical calculation of civilized peoples. The numbers, given to him in a cardinal form, are then translated into a series whose successive terms refer to an ordinal system” (1912: 10), often formed by the fingers and toes. At this new stage, even though names are given to the terms of the ordinal series, they cannot be considered as genuine number names/numerals, but as a concrete equivalent of our numerical system. Therefore, according to Brunshvicg, “the expression of the number concept is not yet constituted” at this stage of development. This would finally happen through a process of transformation of the ordinal series into a cardinal collection, leading to the intuition of “set”, and therefore to the emergence of “cardinal numbers”. Regarding the latter stage, Brunshvicg argues that “hands” were most probably involved in this process of transformation: the fingers being able to play the dual role of “instruments for counting” and “objects to be counted” (1912: 16-17).

Although the methods of calculation or counting systems in use among primitives are “that have the humind mind as their seat” (*phénomènes dont les esprits humains sont le siege*, 1912: 4), these phenomena do not result, according to Brunshvicg, from conscious reflections (of the same human mind). Primitive peoples are engaged in exchange, computing operations, etc. without having any idea of equality rules, laws of additions or multiplications, that grant to their practice a “character of truth” (1912: 4). At the same time, Brunshvicg points out the ingenuity of the various numerical systems revealed by ethnographical sources; numerical systems based on various processes, involving combinations of additions, multiplications, duplications, or even divisions by two (“*dimidiation*”, 1912: 21). Brunshvicg further underlines that this diversity of operations

attests the intensity and fruitfulness of the intellectual activity. Here, primitives are inventors: going/to go forward into numerical ideas, to expand the circle of their rudimentary processes. Sure of their conjectures, they do what inventors do, that is to say, as best as they can. They use the most diverse means, without any concern for this scholastic aesthetic, that would generate the elegance of simplicity and uniformity.⁴⁵

Interestingly, Brunshvicg refers to Evarist Galois’s reflections on mathematical analysis, in order to compare the primitives’ elaboration of numbers (qualified as “elementary and disparate”) and “pure analysis” carried out by mathematicians. Quoting Paul Tannery’s edition of Galois’ work (Tannery, 1906: 259), Brunshvicg asserts that

among all knowledge forms, we know that pure analysis is the most immaterial, the most eminently logical, the only analysis that borrows nothing from the senses. Many people conclude that it is, as a whole, the most methodical and best coordinated. However, it is wrong... In vain would analysts conceal it: they do not make deductions, they combine and compare; when they get to the truth, it is by hitting from side to side, that they have

⁴⁵ (Brunshvicg, 1912: 21)—my translation. Original text: [...] attestent l’intensité et la fécondité de l’activité intellectuelle. Les primitifs sont ici des inventeurs : pour avancer dans l’ordre des idées numériques, pour élargir le cercle de leurs procédés rudimentaires, mais sûrs de supputation, ils font ce que font les inventeurs, c’est-à-dire qu’ils font comme ils peuvent. Ils recourent tour à tour aux moyens les plus divers, sans souci de cette esthétique scolastique qui fait naître l’élégance de la simplicité et de l’uniformité.

finally encountered it... All of this, [...], will amaze knowledgeable people who generally understand the term Mathematics as synonymous with regular.⁴⁶

In Brunshvicg's view, it is this "lack of methodical coordination and regularity" that also characterize the first operations on numbers, as they have been carried out in primitive societies. The latter phenomenon makes the "primitive mentality appear as prelogical". Even though Brunshvicg explicitly borrowed this concept from Lévy-Bruhl, he reinterprets it. We have seen above that, for Lévy-Bruhl, primitive numeration/arithmetic systems are governed by the "law of participation", and therefore do not refrain from contradiction (a given number can be perceived as identical to a different number, say 3 and 4, in certain circumstances through mystical representations). In Brunshvicg's reinterpretation, in the context of the elaboration of numerical systems, "prelogical" would "prelude to the rules of the logical discourse":

Mr. Lévy-Bruhl has emphatically insisted on the meaning of the prelogical, which is by no means the anti logical or the alogical. In fact, if we limit the consideration of the prelogical to the computation practices, we see that the prelogical preludes to the rules of logical discourse rather than to the rules of logical thought. The prelogical would not be prior to logic if, by logic, we understand the rational, as Galois does in the previous quotation. And, indeed, the field of computation is also the domain of individual practices, in which the primitive shows an intelligence similar to ours.⁴⁷

Furthermore, Brunshvicg disagrees with Lévy-Bruhl regarding the mystical aspects of numbers "that would be mystical realities rather than arithmetic units" (1910: 237). For Brunshvicg, computations carried out in primitive peoples do not imply

these singular forms of solidarity between beings and things which contrast so strongly with causality in space and time; on the contrary, what strikes the observer is the accuracy of the processes involved, which appear so rudimentary, from the point of view of our theories. On the other hand, mystical analogies play only a secondary role here. They are developed afterwards, in civilizations that are of a relatively higher type, already similar to those of at the beginning of the historical period. Numerical systems can lead to mystical analogies; however, they are not made through them.⁴⁸

⁴⁶ (Brunshvicg, 1912: 22)—my translation. Original text: De toutes les connaissances on sait que l'Analyse pure est la plus immatérielle, la plus éminemment logique, la seule qui n'emprunte rien aux manifestations des sens. Beaucoup en concluent qu'elle est, dans son ensemble, la plus méthodique et la mieux coordonnée. Mais c'est erreur... En vain les analystes voudraient-ils se le dissimuler : ils ne déduisent pas, ils combinent, ils comparent ; quand ils arrivent à la vérité, c'est en heurtant de côté et d'autre qu'ils y sont tombés... Tout cela, continue Galois, étonnera fort les gens du monde qui, en général, ont pris le mot Mathématique pour synonyme de régulier.

⁴⁷ (Brunshvicg, 1912: 22)—my translation. Original text: M. Lévy-Bruhl a fortement insisté sur la signification du prélogique, qui n'est nullement antilogique ou alogique. De fait, quand on limite la considération du prélogique à ce qui concerne le calcul, on voit que le prélogique prélude bien plutôt aux règles du discours logique qu'aux règles de la pensée logique. Le prélogique ne serait nullement antérieur au logique si, par logique, on entendait le rationnel, comme fait Galois dans le passage que nous venons de citer. Et en effet, le domaine du calcul est aussi le domaine de la pratique individuelle où le primitif fait preuve d'une intelligence analogue à la nôtre.

⁴⁸ (Brunshvicg, 1912: 23)—my translation. Original text: [...] ces formes singulières de solidarité entre les êtres et les choses qui contraste si fortement avec la causalité dans l'espace et le temps; au contraire, ce qui frappe l'observateur, c'est l'exactitude à laquelle atteignent des procédés qui, du point de vue de nos théories apparaissent si rudimentaires. D'autre part, les analogies mystiques ne jouent ici qu'un rôle secondaire; elles se développent

Brunschvicg thus builds on Lévy-Bruhl's approach of prelogical numeration with the project of describing the emergence of the (early) concept of number. By doing so, as noticed by Chimisso (2008: 71), Brunschvicg interprets Lévy-Bruhl's concept of "primitive mentality" (at least the one at work in the elaboration of numbers) as the mentality of the earliest human societies or human beginnings. It seems, however, that Brunschvicg's position on these issues has changed over the years. Two decades after the publication of *Les étapes de la philosophie mathématique*, Brunschvicg published a paper entitled "Nouvelles études sur l'âme primitive" (New studies on the primitive soul) (1932)⁴⁹, a significant part of which is devoted to the introduction of Lévy-Bruhl's work. In this paper, Brunschvicg explicitly approved Lévy-Bruhl's position of rejecting "two sociological dogmas: (1) the assumption that the mind and its categories are the same in all times and places; and (2) the interpretation of different ways of thinking simply as stages of a universal mental evolution" (Chimisso, 2008: 71). Regarding the second point, in 1932, Brunschvicg regrets the use of the term "primitives" to refer to the members of these "inferior societies" asserting that "no word could be more badly chosen. Deliberately entailing/provoking/misunderstanding? an opposite meaning, as if behind the contemporary Australians or Eskimos there is a lesser past than behind us, as if the ignorance of their own history—which, in fact, enslaved/enlaves them to it all the more—gave them a privilege of eternal youth and authentic naivety".⁵⁰

Brunschvicg is recognized as a major philosopher of the first half of the 20th century. His work has inspired many philosophers and historians. In particular, his book *Les étapes de la philosophie mathématique* has had a considerable impact in the field of history and philosophy of mathematics, frequently quoted—to this day—in many works published in this field. Two decades later, Abel Rey, another influential historian and philosopher of science, also used Lévy-Bruhl's concept of "prelogical mentality" when discussing the emergence of science, this time, particularly in Asia.⁵¹

3. Abel Rey and the concept of "outillage mental"

3.1 "Outillage mental" versus "mentality"

Throughout his works on the history of science, Rey "aimed at establishing which type of mentality had produced a certain type of knowledge". For instance, in the first volume of his *La Science dans l'Antiquité (La science orientale avant les Grecs, 1942)*, "he discussed when

après coup, dans les civilisations qui sont d'un type relativement élevé, déjà semblables à celles que l'on rencontre au seuil de la période historique. La numération peut y conduire; elle n'en procède pas.

⁴⁹ In this article, a whole section entitled "Le primitif sait-il compter ?" (1912: 176-180) is devoted to the numeracy in "primitive societies". This section is basically a summary of the text previously discussed in the present chapter.

⁵⁰ (Brunschvicg, 1932: 175)—my translation. Original text: [...] aucun mot ne pouvait être plus mal choisi, fait exprès pour provoquer le contre-sens, comme si derrière l'Australien ou l'Esquimau de nos jours il y avait un moindre passé que derrière nous, comme si l'ignorance de leur propre histoire, - qui, en fait, les y asservit d'autant plus, - leur conférait un privilège d'éternelle jeunesse et de naïveté authentique.

⁵¹ The reader will find a synthetic presentation of Abel Rey's work in (Chimisso, 2008: 93-100). Brunschvicg's conception of philosophy and the history of science differs from Rey's. While for Brunschvicg, Philosophy is a reflection on the History of Science, in Rey's view, Philosophy and the History of Science coincide (Chimisso, 2008: 95).

'scientific thought' emerged; he also judged the calculations performed by tribal civilizations to be different from modern versions, as the former were not the expression of a scientific mentality" (Chimisso, 2008: 98). We will return to this issue later. Indeed, the emergence of the concept of number is considered by Rey to be central to the emergence of Science.

To my knowledge, Rey's most extensive presentation of his conception of the "human mind" and its evolution is to be found in the article "L'évolution de la pensée" (The evolution of thought), in the *Encyclopédie française*, directed by historian Lucien Febvre (1878-1956), and first published in 1937. Rey wrote the first part of this Encyclopedia, with a text entitled *L'évolution de la pensée: de la pensée primitive à la pensée actuelle* (Evolution of the mind: from the primitive mind to the current mind). This text is divided in two sections. Section A entitled "La pensée primitive" (The primitive mind) and Section B entitled "La pensée logique" (The logical mind). As we will see below, this division reflects how Rey differentiates societies: there are those which are governed by "logical thought" (as in Hellenic culture) and the others. We shall also explain that his use of the term "evolution" (instead of "development") suggests in Rey's view there existed different trajectories in the development of the mind. Moreover, these different directions can be seen as divergent trajectories, as it is emphasized by the division of Section A into two chapters: chap. I "Problèmes d'évolution" (Problems of Evolution), and chap. II "Les sens divergents du développement de la pensée" (Divergent trajectories in the development of the mind).

The article "L'évolution de la pensée" (Evolution of the mind), is basically devoted to the study of the "outillage mental" (*i.e.* mental tools) used in various "civilizations", or "societies", in different periods and places. As far as I can tell, Rey does not precisely define what he calls "outillage mental" in his work. However, we may suppose that he borrows this concept from Febvre who had first introduced it in order to investigate the different human mentalities. As noticed by Jacques Revel (1986), to Febvre

the "outillage mental" of a civilization or an era [refers to] all categories of perception, conceptualization, expression and action that structure the individual or collective experience.⁵²

Febvre's definition of "outillage mental" is obviously an empirical and open definition, and it includes in particular "language, affects, and techniques" (Revel, 1986: 451). As already noticed by Chimisso, such a concept of "outillage mental" (used by other scholars at the time, and members of the "Ecole des Annales" in particular, *cf.* Righi, 2003), seems indeed very close to Lévy-Bruhl's concept of "mentality" (Chimisso, 2008: 98), that he defines as "ways of feeling, thinking and acting" (*cf.* section 1, Lévy-Bruhl, 1923: 631). Rey extensively quotes Lévy-Bruhl in both the first part of his *French Encyclopedia* article and his book *La science orientale avant les Grecs*. However, like Brunshvicg, and unlike Lévy-Bruhl (*cf.* Section 2,

⁵² (Revel, 1986: 451)—my translation. Original text: L'outillage mental d'une civilisation ou d'une époque [renvoie à] l'ensemble des catégories de perception, de conceptualisation, d'expression et d'action qui structurent l'expérience tant individuelle que collective (Revel 1986: 451).

and below), Rey considered the “prelogical mentality” as a prelude to the “scientific mentality”. We will come back to this point later on below.

In the first page of his *French Encyclopedia* article, Rey invokes the “forms of logic”, as well as the development of “positive science”, as a key point when comparing “Eastern” with “Western thought”. The latter

inherited from the Greco-Latin civilization, is characterized by its logical form and by this very complex creation, difficult to define, that we all agree on calling “positive science” [...] Positive science has taken all its value only since the end of the Middle Ages, at a time where it reached the same level that had been reached by Hellenic science. However, logic, a Greek invention/work as well, has remained (excluding some changes that occurred in the 19th century [...]) very similar to itself since Aristotle. This logic has been used in/left its hallmark on the expression of the current/common ideas. It has led to the development of philosophy and metaphysics. It clearly differentiates Western thought from Eastern thought. The latter does not seem (except when it was systematically influenced by the former, and only recently) to have organized itself through identical aspects, within the same framework.⁵³

In contrast with Lévy-Bruhl’s approach of logic (exclusively focused on the principle of non-contradiction), Rey refers to a more explicit conception of “logic” *i.e.* the logic of syllogism—even though both of them do not take into account the significant changes that have occurred in the field of logic at the beginning of the 20th century (Rosental, 2002). Furthermore, in both cases, “logic” is used as a way to differentiate humans: those thinking logically, and the others.

Rey further contends that “Oriental thought” can—in a way—be compared to “primitive thought”. Furthermore, Rey regarded Western and Eastern mentalities as having evolved in different directions from primitive thought. Chimisso writes

while western thought had opposed primitive thought in its main characteristics, for him, eastern thought had prolonged its most important aspects, such as the little attention paid to precision, clarity and distinction of ideas and, in general, to logic. As a consequence, Rey argued, while western thought is oriented towards intellectualism and rationalism, and is directed to the study of the world, eastern thought is impregnated by mysticism, sentiment and religion, and is directed towards interiority (Chimisso, 2008: 99).

⁵³ (Rey, 1937: 10-3)—my translation. Original text: Cette pensée occidentale, héritière de la civilisation gréco-latine, se caractérise par sa forme logique et par cette création très complexe et bien malaisée à définir dès maintenant, mais sur laquelle nous nous entendons assez en l’appelant « la science positive ». [...] La science positive n’a pris toute sa valeur que depuis la fin du Moyen-âge où elle s’insère à peu près au terme qu’avait atteint la science hellénique. Mais la logique, œuvre grecque elle aussi, est restée (exception faite des remaniements qu’elle a subis au XIX^e siècle [...]) à très peu près semblable à elle-même depuis Aristote. Elle a donné sa marque propre à l’expression des idées courantes. Elle a présidé à l’élaboration des philosophies et des métaphysiques. Elle différencie avec une assez grande netteté la pensée occidentale de la pensée orientale. Cette dernière ne semble pas (sauf lorsqu’elle a subi systématiquement l’influence de la première, et à une époque récente seulement) s’être organisée sous des aspects identiques et en des cadres arrêtés de même façon (Rey, 1937: 10-3).

This point is clearly developed (Rey, 1937), particularly in the sections “La pensée orientale et la pensée primitive” (Eastern thought and primitive thought) and “Rationalisme et mysticisme” (Rationalism and mysticism, Rey 1937: 10-3 and 10-4), as well as later in this text, in the last section “La pensée mystique de la Chine” (The mystical mind in China, Rey 1937: 12-9). We shall later return to this important section.

The primary objective of the first Chapter “Problems of evolution” in Rey’s *French encyclopedia* article is to afford an overview as well as make a synthesis of the main anthropological/sociological theories, elaborated since the 19th century, for studying “primitive” societies. Rey first refers to anthropologist James G. Frazer’s work.⁵⁴ Then, Rey turns to the French school of sociology (starting with Comte, Durkheim, Mauss, and Hubert), and its focus on religious practices, rather than magic, when it tries to identify within our own experience what could best evoke primitive conceptions (Rey, 1937: 10-6). Rey further underlines that, like Frazer, the sociologists of the French school have also emphasized the social character of primitive thought—as embedded in “collective representations”.

Rey thereafter introduces Lévy-Bruhl’s theory on “primitive mentality” and its law of “participation”, which would imply “relations of participation” (*rapports de participation*), different from “logical relations” (*rapports logiques*), since these “relations of participation” allow the “contradiction” (*admettent la contradiction*) (Rey, 1937: 10-7). Rey further emphasizes that the primitive mentality, as described by Lévy-Bruhl, is entirely “absorbed by the quality” (*absorbée tout entière dans la qualité*). Interestingly, Rey underlines that this phenomenon is perceptible in the numerations elaborated in primitive societies. Such numerations being, in his view, more “qualitative” than “quantitative” (Rey, 1937: 10-7). Here, Rey borrows Lévy-Bruhl’s view on primitive numbers as “number-sets” (*cf.* section 1.4); explaining that “three” would not be conceptualized as “a sum of three elements conceived as identical—a *sine qua non* condition of our additive operation”, but the “appreciation of a value” (*appréciation d’une valeur*); “the triad next to the dyad” characteristic of the “qualitative apprehension as a whole/block” (*apprehension qualitative en bloc*); the quality being an “indivisible/undecomposeable whole” (*un tout indécomposable*).

Rey further emphasizes the fact that Lévy-Bruhl’s theory is at odds with his predecessors’ theories on primitive mentality. Predecessors considering that the “primitive mind, although very different from our mind, would nevertheless allows us to surmise its beginnings” (*deviner les amorces de la nôtre*, Rey, 1937: 10-7). Rey insists on the point that this was not Lévy-Bruhl’s view (*cf.* section 1.2) which formulates a “contrary opinion”, claiming that our mentality has evolved in opposition with the primitive mentality, “far from elaborating its principles from it” (*loin d’en garder des principes*).

⁵⁴ *Cf.* the twelve volumes of *The Golden Bough* (Le Rameau d’or, 1911-1915) which analyzed primitive thought as governed by “magic” (“Caractère de la pensée magique”, Rey 1937: 10-5 and 10-6).

For his part, Rey reproaches Lévy-Bruhl for not having sufficiently considered the possible transition between “prelogical mentality” and “scientific mentality”⁵⁵ that Rey analyzes as two possible “stages” in the evolution of “human thought”:

There is thus, we believe, a considerable part of the primitive mental activity whose mental tools [“outillage mental”] are prelogical in that they are a presentiment of our logical mental tools [...]. In this, Lévy-Bruhl, obsessed by the opposition he sees between this block-thinking [“pensée en bloc”] and our analytical thinking, has perhaps insufficiently emphasized the plausible transition from one to the other, a complex and gradual passage, with a countless number of returns.⁵⁶

As far as I can see, the expression of “block-thinking” (*pensée-bloc*) is not used by Lévy-Bruhl himself. Rey introduces it as one of the main characteristics of the primitive mind. According to him, “primitive thought” (*pensée primitive*) is based on intuitive knowledge, unlike discursive knowledge. It works as a “synthetic block” that emerges without preliminary analysis (1937: 10-9). Furthermore, Rey asserts that the primitive mind is directed by “instinctive behavior”, and can be analyzed as “mystic” and “subjective” (1937: 10-9). Finally, Rey agrees with Lévy-Bruhl that the primitives’ immediate and intuitive ways of thinking are impermeable to “critique” and “experiment”. Subsequently, given the latter characteristics, primitive thought would be, for Rey, “more similar to that of an ‘animal society’ than to that of the discursive, critical and analytical way of science” (Chimisso, 2008: 98).⁵⁷

Interestingly, Rey expresses his disagreement with philosopher of science Emile Meyerson (1859-1933) who addressed a strong critique to Lévy-Bruhl’s theory of “prelogical mentality”. As Rey emphasizes, according to Meyerson “primitive thought would be exactly of the same structural type as our mentality, governed by the same reason, whose entire content is subordinated to the logical principle of identity” (Rey, 1937: 10-7).

Meyerson made his position clear in a session entitled “L’âme primitive” (The primitive soul), of the “French Society of Philosophy” seminar (*cf.* Lévy-Bruhl et al., 1929), once again devoted to Lévy-Bruhl’s work; and on his third book on the topic of primitive mentality (Lévy-Bruhl,

⁵⁵ This critique of Lévy-Bruhl’s allegedly discontinuist approach, which focuses on alterity rather than on the transition between different types of mentalities, does not seem to take in consideration/does not mention the last chapter of *Les Fonctions mentales*. Entitled “*Passage à des types supérieurs de mentalité*” (The Transition to the Higher Mental Types; Lévy-Bruhl, 1966: 323), this chapter’s title seems to prelude a reflection on the possible transitions between different types of mentalities. In fact, as Rey had probably noticed, it is not what Lévy-Bruhl does. Although he assumes that subsequent higher mental types derive from prelogical and mystic mentality, he does not attempt to analyze the whole process of such transformation/evolution. Lévy-Bruhl seeks to highlight the significant prevalence of the prelogical and mystical mentality, depending on the type or degree/level of advancement of a given society. In Lévy-Bruhl’s view, prelogical and mystical mentality continuing to be more or less perceptible, concomitantly with the development of a more advanced type of mentality, and the development of “logical thought”, even in the contemporary Western civilization (Lévy-Bruhl, 1966: 323-324).

⁵⁶ (Rey, 1937: 10-7 and 10-16)—my translation. Original text: Ainsi il y a, croyons-nous, une partie considérable de l’activité mentale primitive dont l’outillage est prélogique en ce sens qu’il est un pressentiment de notre outillage logique [...]. En cela, Lévy-Bruhl, obsédé par l’opposition qu’il voit entre cette pensée-bloc et notre pensée analytique, n’a peut-être pas suffisamment insisté sur le passage vraisemblable de l’une à l’autre, passage complexe et graduel, avec des retours sans nombre (Rey, 1937: 10-7 and 10-16).

⁵⁷ See also (Rey, 1937: 10-6).

1927) in particular. Meyerson was actually not able to attend the seminar. However, he sent a letter that has been published in the “Bulletin de la société française de philosophie” (Lévy-Bruhl, 1929: 693-698). This letter intends to demonstrate, by using Lévy-Bruhl’s work, that the scheme of “diversity identification” (*identification du divers*) which, according to Meyerson, governed the “paths of scientific thought” (*les voies de la pensée scientifique*) is “in no way limited to the mind of civilized people”⁵⁸. To do this, Meyerson comments on the key example of the Bororo and the *arara* (cf. section 1.3) and the prelogical mentality that this example allegedly brings to light. He asserts that if this statement is surprising for us, it is only due to the fact that “we are not used to linking in that way, these two concepts of man and arara, nor even, in general, any concepts of these two classes”⁵⁹. However, according to Meyerson, the logical form underlying this type of reasoning is also at work in scientific research (Lévy-Bruhl et al., 1929: 694-695). In Meyerson’s view

it is clear, with the term of *participation* itself, that what is really affirmed is a partial identity. A Bororo who maintains that he is an *arara* does not claim that he is absolutely identical to such a red parrot in all of their aspects. What he means is that he is similar in some respects, and participates in the arara’s characteristics.⁶⁰

This principle of “partial identity” that governs, in Meyerson’s view, the development of scientific thought (“cheminement de la pensée scientifique”), is thus also involved in such a (primitive) way of thinking. Consequently, the latter “does not differ from our own intellectual mold” (“ne sort pas pour cela du moule général de notre intellect”):

By asserting that he *participates* in the characteristics of the arara while remaining a man, [the primitive man] reasons like the chemist who joins by a sign of equality the substances present before and after a reaction, like the physicist who identifies two forms of energy without, however, losing sight of their fundamental diversity.⁶¹

⁵⁸ In the paper entitled “Le cheminement de la pensée selon Meyerson” (1932), French philosopher Dominique Parodi (1870-1955) explains that, in Meyerson’s view, the “process of thought remains thus the same, be it common knowledge or scientific knowledge, logic or physics, primitive thinking or the notion of participation as studied by M. Lévy-Bruhl, our thoughtful analysis and abstraction: it is always a matter of finding the way in which perceived objects or phenomena can be considered as partially identical, that is to say, partially explicable” (Parodi, 1932: 391)—my translation.

Original text: Le processus de la pensée reste donc le même, qu’il s’agisse de la connaissance commune ou de la connaissance scientifique, la logique ou de la physique, de la pensée du primitif et de notion de la participation telle que l’étudie M. Lévy-Bruhl, ou de notre analyse et de notre abstraction réfléchies : il s’agit toujours de trouver le biais par où des objets ou des phénomènes perçus pourront être considérés comme partiellement identiques, c’est-à-dire partiellement explicables (Parodi, 1932: 391).

⁵⁹ Original text: nous n’avons pas l’habitude de lier de cette manière, dans notre pensée, ces deux concepts de l’homme et de l’arara, ni même en général des concepts de ces deux classes (Lévy-bruhl et al., 1929: 694).

⁶⁰ (Lévy-Bruhl et al., 1929: 694)—my translation. Original text: [...] il est clair, et ressort de ce terme même de *participation*, que ce qui est affirmé réellement, c’est une identité partielle. Le Bororo qui maintient qu’il est un *arara* ne prétend pas qu’il est absolument identique à un tel perroquet rouge à tous les points de vue; ce qu’il veut dire c’est qu’il est un tel à certains égards, qu’il *participe* aux caractéristiques qui sont celles de l’arara.

⁶¹ (Lévy-Bruhl et al., 1929: 695)—my translation. Original text: En affirmant qu’il *participe* aux caractéristiques de l’arara tout en restant homme, il raisonne comme le chimiste qui réunit par un signe d’égalité les substances présentes avant et après la réaction, comme le physicien qui identifie deux formes de l’énergie dont il ne perd cependant aucunement de vue la diversité foncière (Lévy-Bruhl et al., 1929: 695).

Nonetheless, Meyerson does not believe that the primitive man reasons as well as the scientist, or that [the primitive man] is as right as the “chemist who writes the equation according to which sea salt is formed from its elements”. However, Meyerson asserts that between the primitive man and the chemist the difference is only a “difference of degree” or “content”, the essence of the reasoning, which here is its form, remaining the same (Lévy-Bruhl et al., 1929: 695).

As mentioned above, Rey does not agree with the latter position, and asserts that given the available documentation on primitive societies, Meyerson’s “deductive assimilation is hardly acceptable”. To Rey, “there may already be some logical element” in the primitive mind (since its early beginnings). However, as we will see in the next section, he believes that there is “another element”, either “in pure form or mixed with logical thought”, from which the human mind would have evolved sometimes in very different directions. Furthermore, according to him, “it hardly seems possible to deny that the primitive thought is essentially antilogical. Its structural basis must be sought in a synthesis in which logical analysis only plays a secondary part”.⁶²

The second chapter of Rey’s *French Encyclopedia* article is devoted to the development of the human mind from its primitive state/stage, and to the divergent directions followed from one civilization to another. As we will see below, this is done in an attempt to differentiate civilizations (Western and Eastern civilizations in particular), through a comparison of the origin of science and “scientific thought”.

3.2 Divergent developments of the “human mind”

In this chapter (as well as in the chapter “Eveil de la pensée scientifique”, in *La science orientale avant les Grecs*; Rey, 1942), Rey argues that the Western scientific mentality has emerged through a passage from a “qualitative” to a “quantitative” way of analyzing the “exterior world”. In his view, this passage can be clearly identified in the emergence of the concept of cardinal numbers that he perceives as the first step towards the achievement of “what we call positive science”.⁶³

⁶² (Rey, 1937: 10-8)—my translation. Original text: [...] il ne semble guère possible de nier que la pensée primitive soit essentiellement antélogique. Sa base structurelle doit être cherchée dans une synthèse qui ne laisse à l’analyse logique qu’une part secondaire.

⁶³ Rey asserts that practices such as basketry or net-making might have had, in the distant past, an impact on the elaboration of numerals/numbers: “Calculation can be perceived in the earliest techniques: in a way, net-making and basketry require elementary counting practices. Their development most probably implied a passage from a qualitative stage to a purely quantitative one. This passage might be related to the gradual dominance of the cardinal number over the ordinal number. At the stage we are now [in our advanced Western civilization], this passage has long been achieved. However, traces of such a passage have been found among contemporary primitive peoples (Lévy-Bruhl)” (Rey, 1937: 12-2 and 12-3)—my translation.

Original text: Le calcul se laisse soupçonner dès les plus lointaines techniques : le filet et la vannerie qui rendent nécessaire une manière de compter, quelle qu’elle soit. Son développement l’a fait passer vraisemblablement d’un stade presque qualitatif au stade purement quantitatif. Ce passage doit être lié à la prédominance progressive du nombre cardinal sur le nombre ordinal [...]. Au stade où nous sommes, ce passage est acquis depuis longtemps, mais nous avons retrouvé chez les primitifs actuels de traces de ce passage (Lévy-Bruhl).

Rey analyzes the mathematics developed by the “Chaldeo-Assyrians” (“under the first Babylonian dynasty (2100-1800), and among the Egyptians around the XIIe dynasty (1800)”), as mathematics carried out on the route leading to Greek mathematics, and further on to Western tradition in mathematics. In his view, the scientific value of some of these sources have sometimes been exaggerated (“particularly when scholars argued that these documents give evidence of knowledge related to algebra, quadratic equations, etc.”). However, to Rey, the “outillage mental” at stake in the development of these ancient mathematics would be akin to ours (1937: 12-3).

Indeed, he does not share the same viewpoint regarding ancient Chinese mathematics as shown by the following extract:

We have an example [of Chinese geometry] in the Chinese *Tchou-pei*—for which it is almost impossible to provide a date [...], although it is very likely prior to the beginnings of Greek geometry. In any case, the *Tchou-pei* was most likely written without being influenced by these beginnings. The influences would have been possible only in the opposite direction.

We find this example with the right-angled triangle whose sides are 3, 4 and 5, and most probably first, as involved in the problem of the duplication of a square [...]. Whether the problem be to determine the side length of a doubled square [...], or to prove that the square on the hypotenuse is the sum of the squares on the two sides of the right angle [...], the squares are arranged using ingenious constructions made on a backdrop of small unit-squares whose sum is known. By counting the unit-squares, through the layouts, one readily sees that the largest square, which wraps up all the others, encloses 49 of these unit-squares, while the square obliquely drawn within the first square contains 25 of them (we know thanks to Granet’s studies on the Chinese thought that for the Chinese, a result rounded off to the nearest unit is considered to be accurate/exact, and thus, 49 is taken as twice 25).⁶⁴

According to Rey, this testimony is extremely important for our understanding of the “history of the outillage mental over this period [ancient China], and the moment it highlights in the evolution of human thought”. Furthermore, he asserts that the “chronology is less important than it seems at first glance”. Whatever the date of the Chinese document, it characterizes, from

⁶⁴ (Rey, 1937: 12-3)—my translation. Original text: Nous en avons un exemple dans le *Tchou-pei* chinois, indatable, [...] tout en restant assez probablement antérieur aux débuts de la géométrie grecque. Il est, en tout cas, très probablement indépendant d’eux, les influences n’ayant guère pu s’exercer qu’en sens inverse. Nous trouvons cet exemple à propos du triangle rectangle de côtés 3, 4 et 5, et plus probablement d’abord à propos du problème de la duplication des carrés [...]. Qu’il s’agisse de trouver les côtés des carrés doubles les uns des autres [...], ou de prouver que le carré construit sur l’hypoténuse est la somme de deux carrés construits sur les côtés de l’angle droit [...], on agence ces carrés par des constructions ingénieuses, sur une toile de fond décomposée en petits carrés-unités dont on connaît la somme. En comptant les carrés-unités, à travers les agencements, on voit tout de suite que le plus grand, qui enveloppe tous les autres, enferme 49 de ces petits carrés, tandis que le carré obliquement construit dans l’intérieur du premier en compte 25 (nous savons par les études de GRANET sur la Pensée chinoise que, pour les Chinois, un résultat à une unité près est toujours considéré comme exact et que 49 est pris pour le double de 25) (Rey, 1937: 12-3).

the point of view of the formation of logical thought, a period of very primitive thought at work in technical geometry (*géométrie technique*)” (Rey, 1937: 12-3)⁶⁵.

This primitive way of practicing mathematics, to which, in Rey’s view, Chinese geometry attests, is thus characterized by a “lack of exactitude”: such mathematics not distinguishing “between an approximation considered as sufficient and exact value”, of irrational numbers in particular.⁶⁶ Subsequently, Rey concludes—as Lévy-Bruhl did in his analysis of primitive arithmetic—that “Chinese mathematics is not theoretical, but practical and mystical” (Rey, 1937: 12-3).

Finally, in the last pages of the same article, Rey makes clear the divergent directions in the development of human mentalities as it would have occurred, according to him, in China and Greece respectively. He explains that the development of the Western scientific mentality or “outillage mental” occurred through an opposition to the “mystical mentality”. By contrast, in his view, a “fusion” of the two mentalities (scientific and mystical) would have occurred in eastern societies (1937: 12-9). Interestingly, Rey sees technological/practical activities (or “techniques”) as having had a fundamental role in the development of logical/rational thought

⁶⁵ In this passage devoted to the so-called “Chinese thought” (*pensée chinoise*), Rey refers several times to Marcel Granet’s book *La pensée chinoise* (1934). Interestingly, some influence from Lévy-Bruhl’s work is perceptible in Granet’s studies, and in his paper “Quelques particularités de la langue et de la pensée chinoise” (“Some particularities of Chinese language and thought”, 1920) in particular. This can be seen in a footnote attached to the following assertion: “The study of vocabulary highlights the prodigiously concrete character of Chinese concepts” (1920: 103-104). In this footnote, Granet points out that “Mr. Lévy-Bruhl’s analysis of the principles of American languages” have been a very useful guide for him, and that “Lévy-Bruhl’s conclusions (*cf. Les fonctions mentales*, p. 187 and following) are most often the same as his.”

At another level however, as noticed by Claude Rosental, Granet (1920) “deploys a much broader conception of logic, but also significantly vaguer, than the one developed by Lévy-Bruhl [...]. The notion of logic has a very general meaning for Granet. It is nothing more than a principle of organization of both language and thought. [...] the expression ‘logical thought’ refers to a capacity for abstraction, analysis, classification, decomposition, regulation” [...]. It is “often taken as synonymous with clear, general, methodical thinking. The term of logic is also used to characterize structural principles of the propositions, in the framework of a grammatical, semantic, but also formal analysis, of the links that connect the elements [of the propositions]” (Rosental, 2012: 82-83)—my translation. Original text: Granet déploie une conception de la logique beaucoup plus large, mais aussi sensiblement plus floue que celle développée par Lévy-Bruhl [...]. La notion de logique revêt pour Granet une signification très générale. Elle ne constitue rien de moins qu’un principe d’organisation tout à la fois de la langue et de la pensée. [...] l’expression ‘pensée logique’ fait référence à une capacité d’abstraction, d’analyse, de classement, de décomposition, de régulation [...]. Elle est souvent prise comme synonyme de pensée claire, générale, méthodique. Le terme de logique est également utilisé pour caractériser des principes de structuration des propositions, dans le cadre d’une analyse d’ordre grammatical, sémantique, mais aussi formel, des liens qui unissent leurs éléments.

For a critical approach to Granet’s work on Chinese thought and science, see (Chemla, 2007).

⁶⁶ Rey further asserts that this “non-theoretical, but practical and mystical” mathematics could be found in a similar form (without distinguishing the exact value with rough estimation), in both Egyptian and Indus civilizations. “Regarding the ratio of the circumference to diameter, the Egyptians (and their remarkable approximation to the area of the circle, as the square of 8/9 of the diameter), the Hindus (and their no less remarkable approximation of $\sqrt{2}$, probably borrowed from the late sixth century Greek mathematics), use those numbers without mentioning that they conceived them as approximate results. And, indeed, no document makes us suspect that they would have discovered irrational numbers before the Pythagoreans (V^e c. BC.)” (Rey, 1937: 12-3)—my translation.

Original text: [...] pour le rapport de la circonférence à son diamètre, les Egyptiens (approximation remarquable de l’aire du cercle, par le carré des 8/9 du diamètre), les Indous (approximation non moins remarquable de $\sqrt{2}$ peut-être empruntée aux Grecs de la fin du VI^e siècle), nous donnent ces nombres sans jamais marquer qu’ils les connaissent comme approximatifs, puisqu’aucun document ne laisse soupçonner qu’ils aient conçu le nombre irrationnel avant les Pythagoriciens (V^e siècle av. J.-C.).

in both contexts. However, logical discourses would have been derived from “techniques” in a different manner from one context to the other : in Greece, by wholly erasing them, and in China, keeping the “souvenir” of it:

“The Chinese have acquired an empiricism that through the trades and all practices necessary in life has kept a wholly practical meaning. However, they have derived from it, in their general conception, a [mental] framework, which follows a different direction. The comparison with Greece is meaningful.”

“The Greek scholar of the golden age (600 to 300 BC) also had an absolute disregard for every technique (arithmetic, measurement/metrics, mechanics, [...]). [Subsequently,] his thought has been greatly improved on the discursive level drawn from the techniques. [The Greek scholar] thus created our logic, our science, our rational intellectualism, and their [specific mental] tools. The Chinese sage has left out—with the same disdain—the techniques as well as their logical and philosophical potentialities. However, he was absorbed in mystical-magical thinking, and developed through it the very memory of techniques.⁶⁷

According to Rey, the Chinese mind would be therefore more “concrete” and “qualitative”, guided by a “concrete rationalism”. As Lévy-Bruhl does in *Les fonctions mentales*, Rey illustrates this point by putting forward the concreteness of Chinese numerical systems due in particular to their mystical characteristics. Therefore, he concludes that the primitive thought is still perceptible within Chinese mentality. The latter would thus have evolved from the former:

Chinese thought has evolved from the primitive mind, and has continued to breathe its atmosphere. We face a surprisingly complex civilization and high culture. However, we have followed the same path. This is the incomparable value of the testimony afforded by China for studying the ‘outillage mental’. [China] represents to us—and still does in spite of all the recent Western influences brought to it as disparate alluviums—a civilization which is roughly directed in the opposite direction of ours. [Chinese civilization] has developed its own apparatus in an atmosphere within which we perceive primitive representations.⁶⁸

⁶⁷ (Rey, 1937: 12-9)—my translation. Original text: “Les Chinois ont bien acquis un empirisme qui dans les métiers et pour les usages courants dont la vie ne peut se dispenser, a gardé une signification toute pratique. Mais ils en ont tiré dans leur conception générale une construction qui va dans un sens tout autre. La comparaison avec la Grèce est significative”.

“Le savant grec a eu lui aussi, à la grande époque (600 à 300), le mépris le plus absolu pour toute la technique (le calcul arithmétique, la métrique, la mécanique, [...]). Seulement sa pensée s’est approfondie singulièrement sur le plan discursif tracé à partir de la technique. Ainsi a-t-il créé notre logique, notre science, notre intellectualisme rationnel et toute leur instrumentation. Le sage Chinois a laissé dans le même dédain la technique et ses virtualités logiques et philosophiques; mais il s’est absorbé dans la pensée mystico-magique et y a enveloppé jusqu’aux souvenirs techniques” (Rey, 1937: 12-9).

⁶⁸ (Rey, 1937: 12-12)—my translation. Original text: La pensée chinoise a évolué à partir de la pensée primitive, mais continue à en respirer l’atmosphère. Nous sommes en face d’une civilisation étonnamment complexe et d’une très haute culture. Mais nous avons avancé sur la même voie. C’est la valeur incomparable du témoignage que nous offre la Chine pour l’étude de l’outillage mental. Elle nous présente - et encore vivante malgré tout ce que les récentes influences occidentales ont pu y apporter d’alluvions disparates - une civilisation qui est orientée au rebours, ou presque, de la nôtre. Elle s’est constituée un appareillage qui lui est propre dans cette ambiance où nous paraissent baigner les représentations primitives.

In contrast, although comparable to Chinese civilization in the beginnings, Western civilization would have followed a different route to knowledge, through a different form of rationality, in an opposition to—or through a rupture with—the so-called primitive mentality (Rey 1937: 12-12).

In conclusion

In this chapter, we have seen that Lévy-Bruhl elaborated his theory of primitive mentality, while distancing his work from the current anthropological theories of the time. The main point of divergence lies in the fact that Lévy-Bruhl does not believe in the unity of the human mind. According to him, the human mental functions, and the logic that they imply, vary significantly from one society to another. In the case of primitive peoples, their mental functions would be governed by the “law of participation”, which states that the primitives’ collective representations are characterized by essential identities made systematically between different objects and/or beings. In his view, the law thus implies/entails that these people do not refrain from contradiction, a phenomenon that Lévy-Bruhl defines as the prelogical aspect of primitive mentality. Furthermore, Lévy-Bruhl adopts an anti-evolutionist position, defending that the prelogical mentality cannot be considered as the mentality of the early humans. Subsequently, his two books *Les fonctions mentales* (1910) and *La mentalité primitive* (1922) have been strongly criticized by anthropologists, defending anthropological theories based on a (drastically) different conception of humanity.

Although, in the last years of his life, Lévy-Bruhl himself critically reviewed his concept of “prelogical mentality” (*cf.* his *Carnets*, edited and published in 1949), these ideas might have had a significant impact in the field of history and philosophy of science throughout the twentieth century. In an attempt to gain a better view of this impact, I have chosen to focus on two influential authors in the field, who relied on Lévy-Bruhl’s theory in their studies. While reflecting on the ontogenesis of numbers, philosopher Léon Brunschvicg borrows Lévy-Bruhl’s concept of prelogical mentality. In Brunschvicg’s view, such a mentality would have entailed, in the context of the elaboration of numerical systems, a lack of “methodical coordination and regularity” in the logical discourse of primitive peoples. Unlike Lévy-Bruhl, Brunschvicg adopts an evolutionist perspective, considering that ethnographic data allow us to hypothesize on the arithmetic knowledge of the earliest human societies, attributing the prelogical aspects of numerical systems to human beginnings. For his part, historian Abel Rey refers to Lévy-Bruhl’s theory on primitive mentality when comparing civilizations, regarding their use of logical reasoning. Like Brunschvicg, Abel Rey reinterprets this theory in the context of the evolutionist theories of the time, considering the possible transitions from one mental state to another, each of them characterized by a particular “outillage mental”. For Rey, the prelogical mentality (characteristic of the primitive mind) would have evolved in different directions, depending on the civilizations. Abel Rey argues that the pervasiveness of a prelogical/primitive mentality in China would explain the lack of exactitude (particularly in mathematical practices) noticed by other scholars (*cf.* Granet). Brunschvicg and Rey’s use of Lévy-Bruhl’s concept of

“prelogical mentality” have thus served to create a division between human civilizations or societies, tracing a line between those whose mentality is governed by rational thought, and the (inferior) others. In other words, and as we have seen throughout this chapter, these anthropological/historical approaches to “otherness” is steeped in a profound racism.

The influence of Lévy-Bruhl’s theories on the primitive mentality, as well as of some of his commentators’ contributions, is, furthermore, perceptible in several works on the history of mathematics, and of numbers in particular, written throughout the 20th century, and up until today. Some authors have continued to contrast the (supposed) extreme concreteness of the (early) number concept in indigenous societies with the (so-called) abstract concept of number elaborated in more advanced societies, through a unilineal development (Dantzig 1930, Struik 1948, Boyer 2011). Furthermore, other authors have explicitly borrowed Lévy-Bruhl’s idea of the “number-set” (*i.e.* “collections of beings or objects” that are “felt and perceived, but not abstractly conceived”, *cf.* Section 1.4) (Ifrah, 2000) as well as his assertion that indigenous people would “not refrain themselves from contradiction” (Keller, 2016). Moreover, as I argue elsewhere (Vandendriessche & Petit, 2017), the prevalence of the evolutionist and “prelogical thought” theories in the field of history and philosophy of science appears to have durably contributed to impede the recognition of genuine mathematical practices developed in oral tradition societies worldwide. At the turn of the second half of the 20th century, a significant epistemological change occurred on this issue (at least in the field of anthropology), through the work of anthropologist Claude Lévi-Strauss in particular (1962). This change represented a genuine epistemological rupture, and seems to have prompted the development of studies that are now generally considered to be seminal works in the establishment of ethnomathematics. Over the last decades, this has been followed by the development of this interdisciplinary research field that aims at studying the cultural variations in the uses of mathematical knowledge and practices, and particularly those developed in societies that scholars from Europe and the United States used to refer to as primitive.

Acknowledgements

I am extremely grateful to Pr. Ivahn Smadja, Pr. Karine Chemla, Pr. Agathe Keller, and Pr. Christine Proust, for their invaluable advice. I would also like to thank Philippe Bordaz for his careful polishing of this chapter.

References

- BERGAIGNE, A. (1878). *La religion védique d’après les hymnes Rig-Véda*. Paris : F. Vieweg.
- BOAS, F. (1890). *Sixth Report on the North Western Tribes of Canada*. London: British Association for the advancement of sciences.
- BOYER, C. B. (2011[1968]). *A History of Mathematics*. Third edition revised by U. C. Merzbach, New York: John Wiley & Sons.
- , (1911). *The Mind of Primitive Man*. New York: The MacMillan Compagny.
- BRUNSCHVICG, L. (1912). *Les Étapes de la philosophie mathématique*. Paris, Alcan.
- , (1932). Nouvelles études sur l’âme primitive. *Revue des deux mondes*, 52 : 172-202.

- CHEMLA, K. (2007). Penser sur la science avec les mathématiques de la Chine ancienne. In Anne Cheng (ed.), in collaboration with Philippe de Tonnac, *La pensée en Chine aujourd'hui* Paris : Gallimard.
- CHIMISSO, C. (2008). *Writing the History of the Mind. Philosophy and Science in France, 1900 to 1960s*. Hampshire: Ashgate Publishing Limited.
- COMTE, A. (1830). *Cours de philosophie positive*, Tome 1. Paris, Rouen Frères.
- , (1844). *Discours sur l'esprit positif*. Paris: Carilian-Goeury et Dalmont Editeurs (1995, nouvelle édition, Paris, Vrin).
- URL: <http://gallica.bnf.fr/ark:/12148/bpt6k76267p/f4.item.r=.langFR.zoom>
- , (1905). *Cours de philosophie positive : extrait à l'usage des candidats aux baccalauréats (leçons I, II, III et X)* [preceded by a summary of the life and work of the founder of positivism by P. Laffitte]. Paris: Delagrave. URL: <http://gallica.bnf.fr/ark:/12148/bpt6k5541378m/f3.item.r=%22math%C3%A9matique%22.zoom>
- CONANT, L. (1896). *The Number Concept*. New York/London: MacMillan & Co.
- DANTZIG, T. (1930). *Number: The Language of Science*. New York: Macmillan Company.
- DEPREZ, S. (2010). *Lévy-Bruhl et la rationalisation du monde*. Rennes : Presses universitaires de Rennes.
- DURKHEIM, E. (1898). Représentations individuelles et représentations collectives, *Revue de Métaphysique et de Morale*, 6 (3) : 273-302.
- , (1909a). Examen critique des systèmes classiques sur les origines de la pensée religieuse. *Revue Philosophique de la France et de l'Étranger*, 67 : 1-28.
- , (1909b). Examen critique des systèmes classiques sur les origines de la pensée religieuse (Suite et fin). *Revue Philosophique de la France et de l'Étranger*, 67 : 142-162
- , (1912). *Les formes élémentaires de la vie religieuse. Le système totémique en Australie*. Paris : F. Alcan.
- FRAZER, J. G. (1911-1915) *The Golden Bough: A Study in Magic and Religion*. 12 volumes. London : MacMillan and Co.
- GRANET, M. (1920). Quelques particularités de la langue et de la pensée chinoises. *Revue Philosophique de la France et de l'Étranger*, 89 : 98-128.
- , (1934). *La pensée chinoise*. Paris : La Renaissance du livre.
- HADDON, A. C. (1890). The Ethnography of the Western Tribe of Torres Straits. *The Journal of the Anthropological Institute of Great Britain and Ireland*, 19: 297-440.
- HIRSCH, T. (2013). Un « Flammarion » pour l'anthropologie ? Lévy-Bruhl, le terrain, l'ethnologie. *Genèses*, 90: 105-132.
- HORTON, R. (1973). Lévy-Bruhl, Durkheim and the Scientific Revolution. In Robin Horton and Ruth Finnegan [eds], *Modes of Thought: Essays on Thinking in Western and Non-Western Societies* (pp. 249–305). London: Faber & Faber.
- IFRAH, G. (2000). *The Universal History of Numbers: From Prehistory to the Invention of the Computer*. Translated from the French by David Bellos, E. F. Harding, Sophie Wood, and Ian Monk. New York: John Wiley & Sons.
- KECK, F. (2005). Causalité mentale et perception de l'invisible. Le concept de participation chez Lévy-Bruhl. *Revue philosophique*, 130: 304–322.
- , (2008). *Lucien Lévy-Bruhl, entre philosophie et anthropologie*. Paris : CNRS Editions.

- , (2010). Présentation de la réédition de l'ouvrage “*La mentalité primitive*” (Lévy-Bruhl, L. 1922, *La mentalité primitive*. Paris: F. Alcan, pp. 7-47). Paris: Flammarion,
- KELLER, O. (2016). *L'Invention du nombre. Des mythes de création aux Éléments d'Euclide*. Paris : Classiques Garnier.
- LEVI-STRAUSS, C. (1952). *Race et Histoire*. Paris : UNESCO.
- , (1962). *La pensée sauvage*. Paris : Plon.
- LEVY-BRUHL, L. (1900). *La Philosophie d'Auguste Comte*. Paris: Librairie Félix Alcan.
- , (1903). *La morale et la science des mœurs*. Paris: Librairie Félix Alcan.
- , (1910). *Les fonctions mentales dans les sociétés inférieures*. Paris: Librairie Félix Alcan.
- , (1922). *La mentalité primitive*. Paris: Librairie Félix Alcan.
- , (1925). L'Institut d'Ethnologie de l'Université de Paris. *Revue d'ethnographie et des traditions populaires*, 23-24: 233-236.
- , (1927). *L'âme primitive*. Paris: Librairie Félix Alcan.
- , (1923). *Primitive Mentality*. Authorized Translation by Lilian A. Clare. London: George Allen & Unwin LTD, New York: The MacMillan Company. Translation into English of Lévy-Bruhl, *La mentalité primitive*. Paris: Librairie Félix Alcan.
- , (1949). *Carnets*, coll. Bibliothèque de philosophie contemporaine. Paris : Presse Universitaire de France.
- , (1966). [1926]. *How Natives think*. Introduction by Ruth L. Bunzel, Authorized Translation by Lilian A. Clare. New York: Washington Square Press. Re-edition of Lévy-Bruhl, L., 1926. *How Natives think*. Authorized Translation by Lilian A. Clare, A.A. Knopf, New York. Translation into English of Lévy-Bruhl, L. 1910. *Les fonctions mentales dans les sociétés inférieures*. Librairie Félix Alcan, Paris.
- , (2010) [1922]. *La mentalité primitive*. Paris: Editions Flammarion. Re-edition of Lévy-Bruhl, 1922, *La mentalité primitive*, Librairie Félix Alcan, Paris, presented and annotated by Frédéric Keck.
- LEVY-BRUHL, L. et al. (1923). La mentalité primitive. Séance du 15 février 1923. *Bulletin de la Société française de Philosophie*, 23 : 17–48.
- , (1929). L'âme primitive. Séance du 1^{er} juin 1929. *Bulletin de la Société française de Philosophie*, 29 : 663–698.
- LLOYD, Geoffrey E. R. (1990). *Demystifying mentalities*. Cambridge: Cambridge University Press.
- MALINOWSKI, B. (1922). *Argonauts of the western Pacific: an account of native enterprise and adventure in the archipelagoes of Melanesian New Guinea*. London: G. Routledge and Sons, ltd. / New York : E.P. Dutton and Co.
- , (1925). Magic, Science and Religion. In Joseph Needham (ed.), *Science, Religion and Reality* (pp. 19-84). New York : The MacMillan Company.
- , (1929). *The sexual life of savages in Northwestern Melanesia: An ethnographic account of courtship, marriage and family life among the natives of the Trobriand Islands, British New Guinea*. London: G. Routledge and sons.
- MERLLIÉ, D. (1998). Did Lucien Lévy-Bruhl Answer the Objections Made in *Les Formes élémentaires ?*, in N. J. Allen, W. S . F . Pickering, W. Watts Miller (eds.), *On Durkheim's Elementary Forms of Religious Life* (pp. 29-38). London/New York: Routledge.
- , (2012). Durkheim, Lévy-Bruhl et la « pensée primitive » : quel différend ? *L'Année sociologique*, 62(2) : 429-446.

- MEYERSON, E (1931). *Le Cheminement de la Pensée*. 3 vol. Paris : Alcan.
- PARODI, D. (1932). Le cheminement de la pensée selon M. Emile Meyerson. *Revue de Métaphysique et de Morale*, 39 (3) : 38-415.
- PEACOCK, G. (1845). Arithmetic. In: Smedley, E., Rose, Hugh J., Rose, Henry J. (Eds), *Encyclopaedia Metropolitana*, vol. I: Pure Sciences, London, pp. 369–523.
- POWEL, J. W. (1885). From Savagery to Barbarism. *Transactions of the Anthropological Society*, Annual address of the President J. W. Powel, 173–196.
- REVEL, J. (1986). Mentalités. In André Burguière (dir.), *Dictionnaire des sciences historiques* (pp. 450-456). Paris: PUF.
- REY, A. (1937). ‘L’évolution de la pensée: de la pensée primitive à la pensée actuelle’, in Febvre (ed.), *Encyclopédie française*.
- , (1942). *La science dans l’antiquité. La science orientale avant les Grecs*. Paris : Albin Michel.
- RIGHI, N. (2003). L’héritage du fondateur ? L’histoire des mentalités dans l’École des *Annales*. *Le Philosophoire*, 19(1) : 155-174.
- ROSENTAL, C. (2002). Quelle logique pour quelle rationalité ? Représentations et usages de la logique en sciences sociales. *Enquête*, 2 : 69-92.
- STRUICK, D. (1948). *A concise history of mathematics. Volume 1, The beginnings—The beginnings in Western Europe*. New York : Dover Publications.
- TANNERY, J. (1906). Manuscrits et papiers inédits de Galois, 1^{ère} partie. *Bulletin des Sciences Mathématiques*.
- von den STEINEN, K. (1894). *Unter den Naturvölkern Zentral-brasiliens. Reiseschilderung und Ergebnisse der Zweiten Schingu-Expedition 1887-1888*. Berlin : Geographische Verlagsbuchhandlung von Dietrich Reimer. Inhaber: Hoefer & Vohsen.
- TYLOR, E. (1871). *Primitive Culture: Researches Into the Development of Mythology, Philosophy, Religion, Languages, Art and Customs*. London: John Murray, Albemarle Street.
- , (1973). *La civilisation primitive*. Tome premier. Translation of the second edition of Primitive Culture (1873) by Pauline Brunet. Paris: Ancienne Librairie Schleicher, Alfred Costes, Éditeur.
- VANDENDRIESSCHE, E. (2022). The concrete numbers of the primitive societies. *Historia Mathematica*, 59, p. 12-34.
- VANDENDRIESSCHE, E. & PETIT, C. (2017). Des prémices d’une anthropologie des pratiques mathématiques à la constitution d’un nouveau champ disciplinaire : l’ethnomathématique. *Revue d’histoire des sciences humaines*, 31 : 189-219. URL: <https://journals.openedition.org/rhsh/458>