Some Aspects of Hélène Metzger's Philosophy of Science*

Introduction

Hélène Metzger's way of writing history of science is revelatory of her philosophy of science. We can learn her philosophy from occasional remarks illustrating or summarizing her historical investigations. As will be seen, these investigations are characterized by (a) a hermeneutic approach: in fact, she discovered the usefulness of hermeneutics as a method of investigation in the history of science; (b) a historicist conception of the history of science; (c) an emphasis placed on the history of the reception of scientific ideas, consistent with a conception of science as an enterprise that transcends mere personal or individual peculiarities.

Metzger's analyses, however, seek not only a hermeneutic understanding of historical developments, they also judge these developments. The concepts of truth and progress play an essential role in her thought. In fact, the tension is quite conspicuous between her belief in scientific progress and her historicist convictions. She tries to resolve this tension by distinguishing between two levels of scientific research: the establishing of facts and their theoretical explanation. Theories can be evaluated by their capability to explain the available facts but they cannot themselves be derived from the facts. The notion that facts do not unambiguously determine the corresponding theory leaves room for preconceived philosophical ideas and even makes them necessary if we want to account for the fact that scientists succeed in reaching a consensus over general theoretical postulates.

Metzger further contends that these insights apply to the features of historical investigations too. Theories about nature and about history essentially display the same structure. A conventionalist methodology and a quasi-biological approach are
examples of the preconceived ideas she herself applies to the analysis of the history of science. In addition to mere correspondence with the available data, a theory has to furnish the simplest description possible. Complexity is a negative quality of a theory. Metzger describes a typical developmental pattern of theories that is characterized by ever growing complexity of a theory and by its eventual replacement by a simpler one. Furthermore, Metzger's way of looking at history is similar to that of Spengler who also treats historical processes as quasi-biological processes.

I. The Principles of Metzger's Historiography of Science

a – Metzger's Hermeneutic Approach

Hélène Metzger conceived of the development of science as a succession of ideas, not as a mere collection of definitely established facts. The task of the historian of science accordingly is to revive these ideas, to let them arise in all their uniqueness and individuality before the eyes of the contemporary reader. Modern textbooks cannot be used as a point of departure for an historical understanding of science. The study of a scientist of the past cannot be guided by the question which of our contemporary views he already held. That is, historiography must not become hagiography, not a hymn to the perseverance and the penetrating insightfulness of those intellectual titans whose works, outstanding in their own time, made claims similar to those of present-day science. In contrast to the misguided belief that we can bridge over the centuries, Metzger stressed the dissimilarity of past thought, a dissimilarity that requires an effort in understanding. The gap in time between those authors and ourselves is like an opaque film distorting our view. It blurs contours and produces misunderstandings. The modern reader runs the danger of reading these yellowed treatises on a way that does not correspond to the author's intentions. He is unconsciously imposing modern categories on his helpless victims, and happily concludes that in the past the same problems were treated in much the same way, though possibly with somewhat less expertise. If such a modernizing adaption does not succeed, the reader may simply put the book down, amused and puzzled at the collection of absurdities it contains. Metzger, however, realized the necessity of dispensing with such interpretations, which remained prevalent in the history of science much longer than in general historiography. Reviving a theory - in Metzger's eyes the main task of the historian of science - must not be done exclusively with the help of present-day concepts. The fulfillment of this task requires rather to take the contemporary, historical perspective into account as well:

Afin de ressusciter véritablement les doctrines chimiques d'autrefois, nous les avons abordées en nous faisant autant que possible l'âme d'un contemporain de leurs auteurs.
H. Metzger's position on this issue is akin to Dilthey's conception of hermeneutics. Understanding means identifying oneself with the author, or putting oneself in his position. It requires the sensitive reconstruction of an author's original mental processes. To be sure, when Metzger was writing, historiography in general had already accepted Dilthey's claim as a methodological principle. But the history of science was an exception. In this area of historical investigation the general opinion was that due to the specificity of scientific thought Dilthey's methodological requirement does not apply here: no hermeneutics is necessary in order to understand the complexity of past scientific thought. Hélène Metzger has taught us better: history of science cannot do without hermeneutics.

The goal of a hermeneutically inspired approach is to reconstruct the simplicity, unity and wholeness that once characterized these now faded doctrines:

Il s'agissait tout d'abord de suggérer une vision d'ensemble qui laissât deviner l'homogénéité et l élégante simplicité de chaque doctrine jouissant alors d'un certain prestige.

We have to see these past explanations and theories in terms of intellectual standards of their own period to make them understandable for us. In this way, « les théories qui nous paraissent déraisonnables reprennent vie et vraisemblance ».

This is precisely what Metzger does when she outlines — without a trace of arrogance — how Biringuccio in 1540 explained the increase in weight of some metals during calcination, an explanation that strikes us today as quite peculiar: during calcination a metal lost its shininess and this feature was thought to indicate that the metal was dying. According to Biringuccio, just as a dead animal is heavier than a live one because its soul, which is light and strives toward heaven, has escaped, so the death of a metal causes it to gain in weight. But instead of ridiculing such a hypothesis, Metzger considers it an example of hylozoism in the Renaissance. By viewing such explanations in terms of the contemporary philosophical context, she is able to show why Biringuccio must not be considered a misguided fantasist. For Metzger the evolution of science does not consist in a succession of factual discoveries and their technical utilization, but in the development of theoretical conceptions that are an integral part of a particular cultural totality and thus imbedded in the general history of ideas and the dominant philosophy of the period. Science is an historical phenomenon. Traditionally, historical positivism considered philosophy to have had a negative influence on scientific development, an influence that had to be overcome through positive facts. For Metzger, on the contrary, the influence of past philosophical (i.e. non-scientific) ideas appears as an essential factor of scientific progress.
The second essential leitmotif in Madame Metzger's historiography is a historicist approach to the history of science. The term « historicism » is usually taken to mean that every historical period is considered as an independent whole with distinctive, individual traits. The thought of any particular historical period is inherently unique and differs for the most part from that of other periods 7. The commitment to hermeneutics, as the methodology appropriate for revealing historical processes, often goes hand in hand with a historicist metaphysics of history. This is also true of H. Metzger. She sees the development of science not as a process involving the accumulation of a definitive body of knowledge, but as the succession of basically different ideas about nature. Scientific progress does not mean replacing an inability to explain something scientifically with a correct, even if perhaps still incomplete view. Scientific progress is instead characterized by a series of views that are incompatible or even incommensurable.

Accordingly, science does not always deal with the same set of problems. Rather the problems are subject to historical change. For example, Metzger highlighted the distinctiveness of chemical research in the 18th century by putting together a catalogue of questions scientists were asking at that time: Is light a material substance or a process? Are air and fire physical elements or merely instruments of chemical analysis and agents initiating chemical transformations? 8 And instead of concerning themselves with a question that was in retrospect quite important — why does the weight of metals increase during calcination — scientists in the early 18th century considered it much more important to investigate the relative percentages of sulphuric acid and phlogiston in sulphur or to try to synthesize sulphur from its component elements 9. To talk of absurdities here reveals a tendency to consider as nonsense what we don’t understand 10. Gaining access to a theory, therefore, means, first, reconstructing how a specific problem was perceived. It also means, secondly, becoming familiar with generally accepted categories and concepts of the period. Only when we have fulfilled these conditions is it possible, thirdly, to understand, on the one hand, the appropriateness of that conceptual scheme for solving the problems it had itself posed and, on the other, how this scheme is embedded in the intellectual context of the period. The historian’s aim must thus be to evaluate a theory first of all by the standards of its own period. This makes it necessary to understand « en quoi [chaque doctrine] satisfaisait aux aspirations intellectuelles de son époque » 11.

This line of argumentation reveals how Metzger's hermeneutical approach is implied by her historicism. Hermeneutical efforts in understanding are necessary because scientific thinking in different periods is, as a matter of fact, fundamentally dissimilar. The supposed ontology of history suggests the methodology appropriate for
historical studies.

Reading Metzger helps us to understand not only how chemical doctrines interacted with views current at the time in philosophy, medicine or physics, but also to grasp the totality and harmony of the contemporary world-view. Science is here an integral part of a culture, yet both are subject to considerable historical change. That is the historicist aspect of Metzger's historiography of science.

c – Science as a Social Institution

A third aspect of Metzger's approach to the history of science is the emphasis placed on the reception of scientific theories and on viewing theories against the background of prior accepted beliefs. Metzger does not begin with important scientists. She is much more interested in the traditions they inherited or in the effects of their ideas on their contemporaries. Her target is never the individual thinker. She deliberately avoids any biographical detail and every bit of psychological analysis. The individual scientist never appears as an individual, but only as a representative of general ideas, an exponent, as it were, of a scientific tradition. Since her aim is to reconstruct « l'opinion moyenne »13, she is less interested in the genesis of individual conceptions than in the genesis of theories. Science is a social institution, and as such acquires an impersonal character.

These three aspects of Madame Metzger's approach to the historiography of science – the emphasis placed on a hermeneutical understanding of past ideas, the historicism, and the view of science as an impersonal enterprise – represent, when taken together, a marked departure from the highly individualistic view, current in the 19th century, that men make history. Similarly, they also represent a departure from the mania prevalent in the same century (and still later) of wanting to view the history of science in terms of precursors. According to Metzger's view, what should serve as a basis for understanding and judging historical evidence is not the up-to-date scientific textbook but the totality of science and the world-view as a whole of the period under study. With Metzger the standard historian of science employs changes from the current state of science to the scientist's own culture: « Ce n'est pas en fonction de la chimie d'aujourd'hui que nous devons étudier le passé lointain de la science »14. Thus it appears not to be a exaggeration to see in Madame Metzger's works a paradigm shift in the history of science.
II. Hélène Metzger's Logic of Science

a – Historicism and Progress

It would be a mistake to assume that in H. Metzger's view the history of ideas is all what the history of science is about. History of science is not sufficiently characterized by the mere development of ideas, it exhibits experimental and theoretical progress in addition. In Metzger's eyes, Lavoisier's theory, for example, constitutes progress of both kinds 15. Metzger considers science to be an enterprise whose aim is the acquisition of knowledge. Accordingly, the history of science reveals the stages of scientific progress and thus clears up the process by which knowledge is gained. In this vein, Metzger sees her own historical investigations as making a contribution to epistemology. By examining outdated and now rejected theories, she tries to illustrate this process of gain of knowledge, since those approaches which have now been surpassed once contributed to scientific progress. In short, revealing how we acquire knowledge is the aim, the history of science is the means: « Nous espérons rendre, par là, service au philosophe soucieux de savoir par quels procédés l'esprit humain parvient à la connaissance des phénomènes et des lois de la nature » 16.

Besides describing Metzger's views on the means-end relation between history and philosophy of science, the last quotation reveals once more that for her there is scientific progress in whose course man acquires knowledge of the laws of nature. A more detailed discussion of Metzger's ideas on scientific progress requires reference to the methodological criteria she advocates and which I will present only in II. b. But nonetheless I will briefly outline here the conflict between the belief in progress in general and historicist convictions.

The aim of the historian of science is to penetrate and understand theoretical systems, to make himself the contemporary of the persons who created the theories. This aim, however, is difficult to harmonize with the perspective of someone judging the developmental aspects, i. e. qualifying a certain theoretical change as scientific progress. If the goal of the former is to reconstruct a system of theories as a unique entity, the aim of the latter is to show how every stage of development can be seen as part of a history of scientific progress whose norms transcend the particular theoretical approaches involved. Strictly speaking, historicism and a belief in progress constitute a dichotomy.

Metzger attempts to harmonize these two conflicting perspectives by qualifying her historicism. In fact, she has not taken the historicist approach to its extremes. In science, facts constitute a standard for judging theories. Mastering the facts is the first task of every doctrine. In the history of science, the relation of theories to empirical evi-
dence sets limits on the historicist approach. However, while data represent a means for assessing theories, they do not determine unambiguously their own theoretical description. Ever since Lavoisier, for example, the weight of the reacting agents before and after the reaction has been considered a « criterion of truth » (Metzger) in experimental chemistry. But before one weighs, one must first know what should be weighed 17. This brings to light that in Metzger's view scientific investigations have to meet two conflicting demands. Scientific developments are characterized by a conflict between the necessity of dealing with facts and the orientation towards general ideas, whence a conflict between two contrasting perspectives within the history of science: the one historicist, the other tied to the concept of progress.

The last paragraph may have conveyed the impression that Metzger considered scientific data as being simply given, and that she only placed emphasis on the under-determination of theories by this unbiased experimental evidence. In fact, however, she recognized the « theory-ladenness » of facts, even if only in a restricted sense. In her view, theories do not bring about their own factual basis, but they are involved in the establishment of the relevant experimental evidence by guiding the selection of important facts:

Comment, en effet, un esprit qui aurait véritablement fait table rase de toute notion préalablement connue, de toute idée préconçue, saurait-il choisir le fait à observer, intéressant, important, dans l'expérience qu'il contemple au milieu des faits hétérogènes qui, toujours et partout, l'accompagnent? 18

To select important and relevant facts out of the intricate jungle of observable phenomena is a legitimate task for theory. In this way, a theory influences, if not determines, its own experimental basis by staking out its domain of application. Thus it should be at least occasionally possible to relegate recalcitrant data either to another theory's domain of application or simply to the « background-noise » of « heterogeneous facts ». This partial self-determination of a theory's experimental basis, an aspect which Metzger clearly noticed, should have made her qualify her view that facts constitute a criterion of truth for theories.

To sum up, although observations constitute a kind of touchstone for theories, they cannot generate theories. There is a gap separating observation and theory, that must be bridged by the scientist's creative imagination and by preconceived ideas and heuristic guidelines.

Let me now pass to the meta-level of historical studies of empirical theories. Interestingly enough, Metzger bolds that her approach to empirical theories is equally suited, mutatis mutandis, to characterize and clarify the aims and methods in the historiography of science. Accordingly, she distinguishes between two levels of historical investigation. The first concerns the problem of establishing the factual basis, i. e. « de sélectionner et de comprendre les documents » 19, whereas the second involves orde-
ring all the documentary evidence into a clear and plausible story, i. e. « construire le monument historique » 20. The first problem can be tackled by a « méthode expérimentale » 21, i. e. by trying various interpretative hypotheses in order to find out which of them fits a given text best. In Metzger's opinion, the best interpretative hypothesis actually does exist: the task of the historian is to « saisir le sens véritable des textes » 22. Metzger is completely aware of the fact that it may be difficult to determine which is the best interpretation. As in the natural sciences, the experimental method inevitably involves uncertainties. The historian may make mistakes in chronology or rely on unauthentic texts, his interpretation may be uncautious or ill-considered 23, but these are problems he shares with his colleagues in the science department. History is a science like the other sciences, i. e. it differs from them only technically 24. Her belief in the existence of a unique interpretation of a text testifies to the Diltheyian origins of her hermeneutic approach. The difficulties involved in achieving this true interpretation are only a matter of technique, not of principle. The historian of science has to realize that although he may be unable to grasp an author's true intentions 25, this does not mean that his interpretation is determined by his own inevitable presuppositions.

A second level of historical investigation is necessary in order to classify and arrange the facts established on the first level: «... les faits dévoilés par l'historien ne sauraient par leur seul assemblage révéler la marche de l'esprit humain » 26.

As in the case of empirical theories, the historical facts do not themselves indicate a way to put them into a plausible order. And as in the case of empirical theories, it is only through preconceived ideas – now the historian's – that the assemblage of historical facts can be structured into a history of science which can reveal the progress of human thought about nature: «... nous croyons que si l'historien n'avait aucune idée préconçue en abordant son travail, ce travail deviendrait fastidieux » 27.

Without preconceived ideas the historian's work would only lead to a boring collection of facts. This second-level philosophical convictions are therefore necessary prerequisites if the parts are to combine into a coherent mosaic. Theses preconceived ideas cannot be dispensed with. But – and this is a very important idea – they can be tested and improved. Historical investigation may serve epistemological purposes by allowing one to apply epistemological theories to the actual historical course of the development of scientific practice: «... les théories de la connaissance scientifique ... trouvent un champ d'application nouveau dans la pratique de l'histoire de la pensée scientifique » 28.

This foreshadows Lakatos' proposal to use historical processes to test methodological theories. For Metzger, there is thus a relationship of mutual clarification and improvement between epistemological theory and historical study.
Metzger clearly recognizes that a given class of historical facts may be arranged in conformity with various sets of preconceived categories. But these categories are not all equally well suited. It is always possible to force history into a rigid philosophical framework. But it is also possible to detect that force has been used:

et sans doute le « tribunal de l'histoire » est, dans ce cas [the case of a Marxist historiography of science], obligé de se prononcer; mais il ne se prononce pas librement; il doit se contenter de montrer en accumulant les détails que le déterminisme décrété d'avance s'accorde avec la succession des faits; un habile historique de ces faits mettra cette conclusion hors de doute! 20

In order to make the historical test of epistemological theories possible, the historical narrative should not be deliberately distorted by dogmatic constraints:

L'histoire des sciences, comme l'observation de laboratoire, doit être interprétée par notre esprit, interprétée d'une manière scrupuleuse, et sans être forcée d'aucune manière, pour pouvoir, en toute sagesse, être utilisée par le philosophe 30.

For Hélène Metzger, then, the respective approaches of a scientist and of a historian of science both display essentially the same two-level-structure. With this thesis she extends her model of the structure of an empirical theory to embrace the domain of historical investigation too. This means that history has no special status apart from some technical peculiarities. On the first level, physical or historical facts can — with certain qualifications — be derived from nature or history. On the second level, ordering structures have to be imposed on these collections of facts in order to ensure a more or less adequate understanding.

At this point the question naturally arises concerning Metzger's own preconceived ideas: what are the ordering structures she herself applies to elucidate and classify the mass of historical evidence? I will argue that there are essentially two distinct sets of pertinent categories. One contains quasi-biological notions of scientific development (which I will discuss in III), the other consists of a conventionalist methodological theory that regards the simplicity of an empirical theory as an indication of methodological superiority.

b — Metzger's Criteria for Theory Appraisal

Metzger's criteria for theory appraisal and her stage model of theory development, both of which I will now discuss, can be inferred from some scattered remarks found primarily in her Doctrines chimiques and Newton, Stahl, Boerhaave. These remarks are scarce but they appear repeatedly whenever she is concerned with methodological problems. Yet although she refers to these implicit criteria in order to account for the development of pre-Lavoisier chemistry, she never uses them in her discussion of Lavoisier's work 31.
With these qualifications in mind, we can now say that in Metzger's view, science, in addition to having to conform to the facts, is also characterized by a search for the simplest theories possible. She considers striving for simplicity as the dominant factor in the history of science. This makes the evolution of science conform to a typical pattern of development: a simple idea is expanded into a theory which becomes increasingly complex and is finally replaced with another simple idea, so that the whole process continually repeats itself. I would like to illustrate this model of scientific growth by using Madame Metzger's own case studies.

Due to the state of theoretical anarchy in chemistry around the middle of the 16th century, each scientist, beginning at some arbitrary point, developed his own theory of chemical change. These theories were often intended to explain the whole universe. There was no commonly accepted frame of reference in which research could be conducted as a common entreprise \(^{32}\). Paracelsus and the Hermetics, striving to unify the multitude of conflicting approaches to chemistry, developed their own chemical theories out of this chaos. But in order to establish facts in a laboratory and to account for them, more was necessary than general principles. Concrete explanations were needed that could be achieved only through the addition of supplementary hypotheses. The increasing number of additional assumptions, however, soon began to push the fundamental hypothesis itself into the background. The discovery of new facts and, correspondingly, the invention of ever new auxiliary hypotheses so burdened the entire framework that it finally crumbled under its own weight:

Les philosophies chimiques [...] étaient parvenues à un tel degré de complication qu'elles semblaient plutôt dues à des rêveries d'une imagination déréglée et fantasiste qu'au développement rationnel d'un principe fondamental; [...] la chute de ces anciennes philosophies [...] se serait produite d'elle-même sans aucune attaque de l'extérieur \(^{33}\).

No attack from outside, from rival theories, was necessary to bring about the fall of these chemical theories. Although there actually was a conflict between the rival approaches, it had no causal influence on the decline of the old doctrines. Their own complexity had turned them into dinosaurs bogged down by their own weight. The mechanistic philosophy of Lémery appeared once the reputation of the old explanations had faded; but its appearance had no causal connection with the decline of the doctrines preceeding it, so that it is only a mere coincidence that it arose at this point in time. Structural chemistry now began to gain acceptance, seeking to account for the multitude of substances and the endless number of chemical reactions within the simple and harmonic approach of a mechanistic world-picture. And it strove to reduce the colourful multiform of phenomena to spatial configurations of particles and their motion alone.

But the initially simple mechanistic philosophy itself soon underwent increasing differentiation leading to an ever greater complexity. Further development of the ini-
Metzger's philosophy of science, M. Carrier

tial basic ideas led to the formulation of numerous additional hypothetical assumptions
and supplementary principles which finally gave the theory an « apparence roman-
esque » 34. Eventually, the initial principles could no longer support such an elabora-
te superstructure and the whole building with all of its baroque ornamentation caved in:

Et comme ces anciennes doctrines, il [le mécanisme] s'est effondré sous les poids de ses
propres excroissances et de ses perfectionnements 35.

Mechanical philosophy was thus responsible for its own demise. For H. Metzger, the
decline of the theory is brought about not by external but by internal factors. It is mere
coincidence that Newton and Stahl inherited the meagre rest of the older doctrines at
precisely that moment when mechanistic philosophy was on its way out:

Or, en même temps que la théorie mécanique perdait, sans combat [my emphasis], de son
prestige [...] des nouvelles philosophies de la matière prenaient naissance 36.

Lémery's chemistry, bent with age, would have left the field willingly without waiting
for a challenge from Newton's and Stahl's newly published writings. The new systems
triumphed because of their uniformity and simplicity. Stahl provided a unified concept
of combustion 37, and Newton developed a new theory of forces, which rejected the
notion of a multitude of particle shapes in structural chemistry, at least in their func-
tion as a principle of explanation.

As could be expected, these conceptions were not able to escape the same fate
either. The attempt to conceive of the manifold nature of chemical interactions in
terms of forces of attraction — analogous to gravitation — exerted by specific sub-
stances, required that every pair of substances be ascribed a particular form of attrac-
tion. As a result, the formerly rejected complexity on the level of particle shapes now
reappeared on the level of particle attractions:

La loi de gravitation universelle, pour rendre compte de la chimie, s'assouplissait en s'al-
térant; en douant chaque substance de propriétés spécifiques, [...] les savants [...] lui firent
perdre sa pureté, de son homogénéité, de sa grandeur 38.

Not even Buffon's manoeuvres to save the purity of the notion of gravitation were
successful. His attempt to prove that the different attractions were all the result of the
same force of gravitation made it necessary to invoke again the shape of particles in
order to account for the different chemical properties of specific substances. But this
succeeded only by reviving the prior complexity of structural chemistry: « Les figures
différentes ne mettent-elles pas autant de diversité dans le monde que les puissances
d'attractions variables? » 39

Once again a theory inescapably succumbs to the same fate. This recurring scenario
sufficiently illustrates H. Metzger's conception of the development of science, her kinem-
tics, as it were, of research processes. Comprehensive ideas and metaphysical
conceptions succeed each other only after each has gone through a characteristic rise and fall pattern. The decisive parameter in this scheme of beginning and ending is the complexity of the theory woven around the core idea.

But what does Madame Metzger actually mean by the « complexity of a theory »? She offers two criteria. The first can be termed internal complexity and characterize theories that contain « [des] conjectures les plus artificielles, les plus compliquées » 40. It is easy to recognize that Metzger's concept of internal complexity refers to a surplus of ad hoc hypotheses within a theory. The second aspect of Metzger's concept of complexity is what I would like to call external complexity. This refers to the splitting up of a doctrine into a multitude of variants. Mechanical philosophy – as Metzger explains its demise – « au lieu de conserver sa belle et harmonieuse unité, s'éparpillaient en une infinité de petites doctrines particulières souvent incompatibles entre elles » 41. When a doctrine splits up, it is in fact degenerating, scattering its strength in a multiplicity of versions until it finally collapses from exhaustion.

By highlighting the forces that bring about scientific change, Hélène Metzger believes, it is possible to explain the dynamics, as it were, of scientific progress, i.e. not only to describe the theoretical changes kinematically, but also to explain their causes dynamically. Once we have taken notice of this conception of scientific change, it is possible to further clarify Metzger's two-level concept of historical studies. According to Metzger, it will be recalled, the first level of study in the history of science is the descriptive, hermeneutically inspired one, which reconstructs individual conceptions as seen through the eyes of those living at that time. Whereas this first level is exegetic, the second one – as far as methodological criteria are involved (i.e. apart from the quasi-biological approach to theory development I will discuss in III) – is based on the logic of science and attempts to explain the succession of systems which one has tried to understand hermeneutically. What previously was only a plausible story, is now being justified with respect to the general laws of scientific progress. Whereas on the first level one is concerned with the question why scientists at a given period consider one theory to be superior to the others, on the second level, one deals with those factors which justify the superiority of a theory in light of a particular methodology, i.e. in light of a particular metatheory of scientific change. Metzger, however, does not always clearly separate the two levels from one another. Instead, she mixes explanations belonging to the philosophy of science with the hermeneutic point of view, as if the studied scientists of the past had used Metzger's concepts of complexity in order to found their judgements. What she actually does, is trying to fit the scientists' theory-choices to her own methodological criteria. Scientists behaved as if in choosing between theories they had always Metzger's methodological criteria in mind. But certainly they did not actually do so. The methodological conceptions prevalent among scientists in the periods studied by Metzger were empiricist or rationalist, but certainly

146
not conventionalist ones. These scientists wanted to prove their theories by appealing either to the facts or to the light of reason. They were not content with such pragmatic notions of comparative superiority of theories as offered by Metzger's criteria. Concerning the methodological aspects, Metzger writes (generally unwittingly) rationally reconstructed history. Only once (to the best of my knowledge) does she indicate that she has shifted from a hermeneutic point of view to a « point de vue logique » 42. On the whole her treatment conveys the impression that methodologically reconstructed history is being passed off as hermeneutically interpreted history. Reasons (or what appear to be such in the light of a particular methodology) are pretented to be motives.

The criteria H. Metzger offers for appraising theories make it clear that she cannot be regarded as a relativist. Someone adhering to a relativist position in philosophy of science does not acknowledge any difference of principle between the history of science and, say, the history of art. For a relativist there is no basis on which to compare objectively (i.e. without relying on such criteria as taste or allegiance to a metaphysics) the relative merits of two rival theories. In other words, neither the construction nor the assessment of a theory is fixed by a combination of the available facts with the prevailing methodological standards 43. This implies that for a relativist there is no possibility of talking of progress. Contrary to a relativist approach, however, Metzger does in fact assess methodologically the development of scientific theories. She employs such concepts as « theoretical progress » in science 44 and even refers to such notions as the « truth » of a theory. The doctrines of Lémery, Stahl and Boerhaave, for example, « contenaient des parcelles de vérité » 45. Similarly, on the meta-level of theories of history, Metzger explicitly rejects the idea that history is a simple mirror which only reflects the historian's own « spiritual image » 46. In other words, neither the scientific search for better theories nor the historical search for improved understanding and explanation are vain pursuits.

III. Metzger, Spengler, and Comparative Morphology

A still better understanding of H. Metzger's approach can be obtained, I believe, if we compare it to that of O. Spengler, with which it has some striking similarities. This is not to say that there was an actual influence; Spengler's idea of a comparative morphology of cultures was « in the air » and had already been expressed by others in a similar fashion. A brief sketch of Spengler's ideas reveals the extent to which they are analogous to Metzger's conceptions. According to Spengler, history consists of a number of individual cultures, each of which is characterized by a particular unified world-view. This world-view determines how men act and is thus the basis for a general conceptual orientation. Each of these cultures develops autonomously, i.e. it is not influenced by other
cultures but determines its own development. This development passes through a series of typical phases, to which Spengler refers metaphorically as the « four seasons ». Spengler treats cultures in analogy to biological organisms: they grow, mature and age. All that historiography can do is to elucidate their nature at a particular point in their development. The metaphor Spengler uses to characterize his metaphysics of history is the life cycle, a repetitive cycle of rise and decline. History is a chain of such cycles 47.

If we now compare the view offered by Madame Metzger with that of Spengler, we recognize that her treatment of the development of theories is quasi-biological. She, too, regards theories as organically developing units, as coherent structures meaningful in themselves and subject to a process of growth, maturity and decline. She, too, *compares scientific theories morphologically*. Both share, moreover, a commitment to the thesis of autonomous development. Spengler's cultures develop independently of each other. And, as pointed out, an important aspect of H. Metzger's philosophy of science is that theories do not collapse as a result of serious competition or criticism, but because they become overburdened. What we find in both Metzger's and Spengler's meta-histories are (1) a *quasi-biological pattern of development*, linked with a conception of historiography as *comparative morphology* and (2) an assertion of *autonomous development*. These are the most significant parallels between Metzger's and Spengler's views 48.

There are, however, also a number of significant differences. H. Metzger, for instance, gives alien modes of thought a much better chance of being understood than Spengler does. Again, she sees the development of science as a series of progressive advances. And, finally, she seeks to describe the driving forces behind scientific development. For Spengler there is only a fateful development and he does not consider the factors or conditions involved in cultural development; Metzger, by contrast, attempts to account for the development of science by describing a mechanism in which theories get ever more complex and are eventually replaced by simpler ones.

Metzger's « biological model » forms part of her own preconceived ideas, which she uses for structuring the history of science. These preconceived ideas are not derived from historical data, but imposed on them in order to make historical evidence intelligible. They are thus *a priori* in the relative sense that although they are not independent of any experience at all, they are yet independent of any historical evidence. This point can be made even stronger. Preconceived ideas are necessary presuppositions for the possibility of a historiography that transcends mere fact collecting. They are thus similar to notions of *transcendental character* in the Kantian sense. They make coherent historial accounts, if not historical experience, possible.

In the light of these considerations, the coherence in Metzger's thought becomes evident. Science strives at true theories and history strives at the correct reconstruction of these theories. The search for true accounts is in both cases only possible by relying on preconceived ideas, i.e. on *a priori* concepts.

**Martin Carrier**

148
NOTES

* I am grateful to Prof. Dr G. Wolters for his helpful comments and to Mr S. Gillies for his help in improving my English style. My special thanks to the editor, Dr G. Freudenthal, for his valuable remarks. Manuscript completed March 1986.

4. l. c.
5. l. c., pp. 375-377.
6. l. c., pp. 342-345.
7. For a further clarification of historicist views on history compare Riedel 1984.
8. *NSB*, pp. 8-10.
10. l. c., p. 402.
11. l. c., p. 342.
12. l. c., p. 342.
13. l. c., p. 9.
16. *DC*, pp. 12; see also *PML*, pp. 8 and 23. The claim that it is possible to make contributions to epistemology by studying typical phases of development is also found in Piaget. What makes human understanding possible is a question that cannot be answered by meditative introspection or transcendental philosophical speculation, but can only be brought to light by the careful study of those processes that play a role in the development of conceptions about the world. The difference between Metzger and Piaget is that Metzger refers to the development of scientific theories, whereas Piaget considers the generalizable traits of mental development in children to be of special epistemological value.
18. *NSB*, p. 89.
19. *MP*, p. 35.
20. l. c.
21. l. c., p. 34.
22. l. c., p. 35.
23. l. c., p. 33.
24. l. c.
25. l. c., p. 45.
26. l. c., p. 34 f.
27. l. c., p. 34.
28. l. c., p. 33; cf. also p. 104.
29. l. c., p. 27.
30. l. c., p. 106.
31. Cf. PML.
32. DC, pp. 24-27.
33. l.c. pp. 290-291.
34. l.c., p. 448.
35. l.c.
36. l.c., p. 449.
37. NSB, p. 179.
38. l.c., pp. 57.
39. l.c., p. 60.
40. DC, p. 449.
41. l.c.
42. NSB, p. 60.

43. Neither the construction nor the assessment of a theory can be made unambiguous simply by referring to the empirical evidence. One reason is that other theories may exist which, although they are incompatible with that theory, can yet « save the phenomena » just as well. Thus the problem facing a theory of scientific rationality is whether there are methodological criteria (1) that allow for an unambiguous assessment of theoretical achievement when considered in addition to the available data and (2) that meet certain adequacy requirements. For this problem see also Carrier 1986a, Carrier 1986b.

44. Metzger 1932, p. 32; PML, p. 21.
45. l.c., p. 40.
46. MP, p. 32; cf. also pp. 105-106.
47. For Spengler’s views compare Dray 1967.
48. Metzger’s autonomy thesis marks a sharp contrast to the thinking of A. Koyré. For Koyré, regardless of how inadequate a theory is, it is never given up in the absence of an acceptable alternative. « La pensée abhorre le vide », Koyré observes, « une théorie scientifique ne disparaît que si elle est remplacée par une autre. » (Koyré 1939, 181-182). The fact that an old doctrine is always succeeded by a new one waiting in the wings is for Koyré an indication of causal relationship, and not mere coincidence.

Bibliography