

TIME OF EVOLUTION AND THE SPIRIT OF THE TIMES

The sociology of knowledge is faced with a problem of historical temporality that it has carefully avoided up until now. The subject has been avoided or ignored because a discussion of it in depth would run the risk of questioning all modern scientific thought. The problem is that of the concept of absolute time as it is used in evolutionist theory. In this category of theory I include not only social evolutionism, abused for a long time and recently reanimated by the “socio-biologists,” but also biological, paleontological, geological and other types of evolutionism, that is, those qualified as “scientific.”¹

Translated by Jeanne Ferguson.

¹ I must make it clear, however, that in this paragraph I allude to a limited concept of abstract oriented time. Obviously, time is the essential question of metaphysics, a question without an answer and thus constantly being reviewed. In the case of the limited concept just mentioned, scientists, and more recently biologists, have brought the question up again, accepting the view of classic thermodynamics as that of the world. This attitude is very easily seen in the way in which the General Theory of Systems has felicitously renewed the question. Here I would refer to two works that give a general presentation, including the problem of oriented time: in English, W. Buckley, *Modern System Research for the Behavioral Scientist*, Chicago, Aldine, 1968; in French, J. de Rosnay, *Le Macroscopie*, Paris, Seuil, 1975.

I should also like to add that the bibliography of evolutionism is enormous,

Therefore, I shall attempt to show, first, that reflection on this problem is either absent or is a prisoner of that subterranean ideology we could call “the spirit of the times”; second, that the consequences of this state of affairs give evolutionism a ideology we could call “the spirit of the times”; second, that paradoxically, evolutionism bases its statements on space rather than on duration of time.

Let us specify at the beginning that the term “evolution” has two different meanings. First, it indicates only a development or a change. The development of a phenomenon may be oriented by restrictions inherent in the system, but the character of “plus” or “minus” that is given to it concerns only qualities evaluated according to precise criteria. This is the case with languages. We may speak of the evolution of linguistic systems², but no linguist today would maintain that this implies a superiority of a later system over an earlier one. The hypothesis of Lévi-Strauss, according to which man discovered the world all at once and named it, makes linguistic systems and, in general, all symbolic systems of a certain type insensitive to progress; this hypothesis seems to be widely accepted today. We may therefore legitimately assume that in reality many phenomena change but do not progress, that is, they are not located within a linear and irreversible temporality.

“Evolution”, taken in its second meaning, is completely different. Then the phenomenon unfolds (according to the Latin etymology of the term, *ex-volvere*) in an oriented space, and its meaning is rooted in time. It acquires qualities that, in a way, are added to each other and consequently make the later system appear as necessarily superior to the earlier.

This second understanding of evolution has been predominant since the 19th century and is so today, especially in the “natural” sciences. In the social sciences no author, after the structuralist

and I shall thus mention only works that refer to a precise point. A basic bibliography is readily available, and may be found in France in the pamphlet of J.-P. Lehman, *Les preuves paléontologiques de l'évolution*, Paris, P.U.F., 1973. The reader may judge at the same time the validity of the proof and the way in which the temporality proper to the phenomenon is overlooked.

² A. Martinet, *Evolution des langues et reconstruction*, Paris, P.U.F., 1975.

era, would dare assert peremptorily, as did Henri Berr at the beginning of this century: "Primitives are not all degenerates... various circumstances have put them outside civilization." One would be tempted to add, off the "tracks" of civilization!

This proposition figures in the introduction to the famous work by G. Davy and A. Moret, *Des clans aux empires*,³ published in a collection that is still in existence, "L'Evolution de l'humanité." The quotation and quite explicit title, as far as its philosophico-historical presuppositions are concerned, illustrate very well the way the social sciences conceived of evolution before the Anglo-Saxon critique of Radcliffe-Brown or the more epistemological one of the post-war French anthropological school. However, their everyday language still spontaneously uses the former categories copied from those of the natural sciences. In popularized publications, as common parlance, only one meaning is accepted for "evolution": the second one—progressive and progressist evolution.

Here I feel that I must quote a scholar whom I highly respect, one that is a perfect illustration for my purposes and confirms the central position held by evolutionism in the modern scientific paradigm: "Evolution is a fact and not a hypothesis, the great majority declares, to say nothing of the unanimity of biologists of all philosophic tendencies. In that affirmation is weighed ninety years of accomplishment by naturalists of the entire world, after the publication of the *Origin of the Species*," writes P. P. Grassé.⁴ The strong affirmative language seems to me to be the sign of an anguished uncertainty rather than the expression of scientific strictness. The paragraph that usually *precedes* this quotation throws full light on it: "To reject the idea of evolution

³ *La Renaissance du livre*, Paris, 1923, p. ix.

⁴ P.-P. Grassé, *L'Evolution du vivant*, Albin-Michel, 1973, p. 53. Is it necessary to recall, after many authors such as E. Morin or S. Moscovici in France, that far from making man descend from his pedestal, evolutionism has placed him at the summit of creation? This is noted by J. de Rosnay (*op. cit.* p. 221). "From now on the actions of men contribute to opposing (to entropic degradation) a flow of creation of information that is more and more intense." In other words, Man is finally making his own history. Is it because of this that Jacques Monod, at the end of the preface to the French translation of the classic by E. Mayr, *Population, Species and Evolution* (Cambridge, Mass., Belknap Press, 1970) strongly emphasizes that "the theory of evolution is exemplary"?

is to refuse implicitly to understand the past as the present, it is to abandon all hope of scientifically interpreting natural order, of understanding the origin and place of man in the living world." For my part, I cannot accept this entreaty: I cannot believe that the scholar must replace the man of religion, and if there is no God, I do not intend to replace him by man.

The commentary that follows does not claim to pose questions that are always original but hopes to restore scientific discourse to its proper place, in the *spirit of the times*, by renewing the criticism beginning with the essential role that the definition of *its* time plays in it.

I. THE TRITENESS OF THE NATURE OF REFLECTION ON TIME

All modern scientific thought has been constructed around the idea that laws of nature exist and that these laws are invariable over a long period of time. However, this idea of invariability is implicit elsewhere than in the philosophical discourse that has a direct bearing on this question (in sociology, only Sorokin has clearly formulated the problem⁵). It is simply presented as needing no explanation. The repetitious nature of experiments, a first requirement for Bacon as for Claude Bernard, establishes an induction and a repeated motion that develops toward the future as toward the past:

If the combination of certain conditions (the co-presence of certain events) produces n times the same effect, then that can happen, all things events) produces n times the same effect, then the effect can be reproduced, all things being equal, $n + m$ times.

Now, m is included not only between 0 and positive infinity but also between 0 and *negative infinity*. As long as m is weak, we may admit that a certain temporal inertia exists, a historical weight, and so on, but when m assumes great values that suppose

⁵ P. Sorokin, *Sociocultural Causality, Space, Time*, New York, Russell Sage, 1964 (first edition 1943). A collective work due to Unesco also opens up other ways of situating man in duration, *Les Cultures et le temps*, introduction by P. Ricoeur, Paris, Payot/Unesco, 1975; followed by *Les Philosophes et le temps, idem.*, 1978.

a broad temporal extension, we must call to the rescue extra-scientific principles drawn from an arbitrary representation of the world.

At the base of the geological representation of the planet Earth is the “revealed truth” making up the postulate of Charles Lyell, stated in 1834:

Changes on the surface of the earth that occurred in the past are due to causes analogous to those of the present period, in their nature as well as in their intensity.

Physicists, and especially astronomers, were always conscious of the arbitrariness of the process. Edward Milne and J. B. S. Haldane, for example, suggested that when our universe was young the scales of duration were different from those of today. Contrary to most evolutionists, physicists are ill at ease with this *absolute time* invented by Newton (a concept that must have been rather uncomfortable for him, since in his complete works the rigorous demonstration of its validity immediately precedes a commentary on the Apocalypse that contradicts the rationality of the scientific approach). Now, Haldane thus describes the cosmology of Milne:

We can describe events either in terms of a time t with a definite past and Euclidean space or in terms of a time

$$\tau = t_0 + t_0 \log t/t_0$$

in which t_0 is the present era on the scale t and a hyperbolic space. On the scale t the radius of the material universe is ct , spiral nebulae are receding, and the length of rigid objects is proportional to t , but spectral frequencies are constant. On the scale τ nebulae are not receding, matter is not expanding, but spectral frequencies are proportional to t , at the moment of emission, light emitted by distant nebulae being red because it was emitted in the far-off past.⁶

Very roughly stated, Milne’s cosmology makes the measurement of time and, consequently, the historical duration of phe-

⁶ Quoted by F. Meyer, *La Problématique de l'évolution*, Paris, P.U.F., 1955, p. 249.

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nomena, relative. To our knowledge, this is the only attempt to introduce a minimum of explanation into the extraordinary differences of durations measured on the solar scale, that is, the astronomical clock, of historical phenomena that were produced in the distant past of our planet. This theory saves the idea of absolute continuous time while explaining the acceleration of the recent history of life on our planet. Unfortunately if the theory brings about a correct description for the difference between a distant epoch, let us say, that of the dinosaurs in the secondary, and another that is recent, for example, the tertiary at the time of the large mammals, it fails to describe the more recent acceleration after the appearance of the first men. Its temporal extent is too vast for anthropology.

Temporal Acceleration and the Quaternary Division

Actually, there is a way to describe the history of our planet that is common to all scientific disciplines, namely, the acceleration of history. This acceleration that E. Halévy, at the end of World War II, discovered in the duration of industrial societies⁷ is a *general* characteristic of evolutionist thought. It is manifested over extremely varying lengths of time but always following the same principle: the partitioning into several eras causes the appearance of a *very long* duration for the existence of phenomena *at the beginning* and a relatively *very short* duration at the end, with intermediary stages in rapport with the two extremes. Let us judge by looking at some examples:

— If the Big Bang goes back ten billion years, our planet was formed only four or five billion years ago, and the consolidation of the continents (pre-Cambrian) would have taken three and a half billion years. Half a billion (perhaps seven hundred million) years remain for the development of life (one-celled organisms).

--- Respectively and approximately, the four great geological periods are spread over 345 million, 160 million, 65 million and two million years.

⁷ G. Halévy, *L'Accélération de l'histoire*, Paris, Ed. Self, 1948.

— The evolution of vertebrates is deployed in four large classes: fish, reptiles, birds and mammals (amphibians or batrachians are a separate class that is relatively small today). However, while fish “evolved” over about 400 million years mammals took only 60 or 70 million years.

— Within the mammal class itself, while the appearance of cetaceans goes back 60 million years, the hominine line goes back only 15 million years (Ramapithecus or the separation of pongids and hominids).

— Within the hominine line, our direct ancestors go back two or three million years, but *Homo sapiens* dates from around 50,000 years. Thus *Homo erectus* or *pethecantropus*, appeared, in various forms, about two million years ago at least, and modern man about 50,000 to 100,000 years ago.

— However, modern man himself went through various stages: middle paleolithic goes from –80,000 to –35,000 late paleolithic from –35,000 to –8 or –10,000, neolithic follows until about –4,000. Modern man thus extends respectively over, at the maximum, 45,000, 25,000 and 10,000 years, while the figures for recent humanity are only 4 to 6,000 years. Likewise, we can recall the four industries connected with these time periods: pebble culture, Chellean, Acheulian and Mousterian, while the recent period takes us from the Stone Age (stage one) to the three metal industries (stages two through four).

In all the orders, the same story is repeated, and it would be easy to multiply the examples. I do not intend, therefore, to put in question the theories that support these divisions,⁸ but I will call attention to the extraordinary agreement among them, that is; their deep structural homology. This agreement is reminiscent of less immediately scientific theoretical constructions: those of Marxism, for example, with the four means of production that extend over extremely various time spans, or the Hindu Kalpa. In the latter case, the acceleration is even included in the theory: during the course of a Maha Yuga of 12,000 years, the Age of

⁸ An article by A. Cailleux, “Le temps et les échelons de l'évolution” (in a collection) *Time in Science and Philosophy*, New York-Prague, Elsevier, 1971, pp. 135-145, summarizes these theories in the form of “temporal laws.” The title of the article does not contradict our introductory proposition, since there is no interrogation on the socio-historical nature of utilized *time*.

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Gold, the Sathia-Yuga (or Krita-Yuga) lasts for 4,000 sacred years (these years have nothing to do with those of the astronomical clock, differently from those estimated above), the Treta-Yuga occupies only 3,000 years, the Dwapara-Yuga 2,000 years and the Kali-Yuga, our age, only 1,000 years — the Iron Age so well described by René Guénon. This relationship between the decreasing duration of 4,3,2,1, — does it not surprisingly resemble most of the periods given above? To the ternary functional division of the Indo-Europeans corresponds a quaternary division of time.

This cultural background of scientific objectivity must therefore become problematic for the sociology of knowledge, and the problem may be summed up in two questions:

- 1) Is acceleration an empirical fact, or is it predetermined by a structuration of the collective memory that projects a very ancient representation on the empirical data?
- 2) Is not the extreme poverty of events in the archaic period relative to the most recent period a reason (in the strict sense) for the stretching out of time, and does it not induce an artificial unity in the division of time into periods? In other words, is there not here an effect of socio-historical perspective?

Collective Memory and Scientific Reality

It is true that evolutive acceleration is manifested in many ways and that it does not always take the form of the four stages. Some authors see a natural law in it, and the graphs I include will illustrate what the biologist F. Mayer calls the *surexponential* nature of evolution. However, by using more recent indicators rather than those of paleontology or archaeology, this acceleration is confirmed in many other areas.⁹ Today it is often called exponential growth, although its exponential nature is only symbolic of an upsurge. This is seen in such different examples as the curve of maximum speed attained by humans or that, less evident, of the progression in the number of discoveries per unit of time.

At this point, then, it is not without use to keep in mind this

⁹ R. E. Lapp, *The Logarithmic Century*, Prentice Hall, 1973.

methodological rule that does not make the measuring instrument an objective observer (or objective means of observation) but a product of the theory constructed to verify it. I say *verify* and not *validate*, because I agree with Popper that the hypotheses of scholars are “scientific” enough that they may be invalidated. Unfortunately, in social sciences the measuring instrument and the unit of measurement make up a whole that is impossible to divide, and verification is only a *test of internal coherence*. To be more precise, let us take *Figure A* and the illustration of progress it proposes: the choice of the indicator “number of discoveries” comes from an objectivity that is quite relative. Actually, these discoveries do not refer to an ideal and abstract universe of science or knowledge but to concrete and technological applications. The discoveries considered are those that are technologically protracted. In all logic, it would be better to speak of industrial innovations rather than of inventions or discoveries that implicitly allude to a progress of *knowledge*. A look at the past gives us a collection of nested Russian dolls, which is itself the reflection of the present situation of the researcher in the industrial and mechanized epoch. Du Bois Reymond’s graph involuntarily reveals this: it only begins to have meaning at the end of the Middle Ages, when instrumental science took flight. I will thus pose a question that is naive and that will appear to some as absurd: what would become of the curve of evolution of structures of relationship or that of linguistic complexity or even writing (in its capacity to transmit information)? In the last case, we certainly possess as many data as we do on fossils, but to my knowledge no one has taken on this operation: would it be considered futile?¹⁰

¹⁰ I will however mention a curious work by a group of three Belgian researchers whose aim was to demonstrate that all progression is accompanied by an equivalent regression. Their examples are taken from sociology (i.e., regression of collective property in Switzerland) as well as from biology (i.e., atrophy of branchial arches in mammals or the tail in man!); J. Demoor, J. Massart, E. Vandervalde, *L'évolution régressive en biologie et en sociologie*, Paris, Alcan, 1897. Let us remember that this old idea of equilibrium in Nature, organic as well as social, was one of the last great “conservative” ideas before the birth of transformism. Linnaeus, for example, explained at length, with the aid of numerous anecdotes destined for the education of his son, how all morally reprehensible action is, one day, compensated by an unexpected misadventure, in

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Thus, the uselessness of an indicator of a serious phenomenon on one hand and the peremptory probative utility (since we attach conceptualizations in terms of law) on the other! This idea of evolutive acceleration thus seems to me cumbersome with regard to critical epistemology, and it is easy to confirm that the two forms under which it appears in the texts are identical, namely, that several stages exist—of an equivalent qualitative weight—in the evolution of the phenomenon, each of these stages covering a shorter and shorter period of time, or the curve is continuous but events are more numerous as the present moment approaches. In both cases history *apparently* accelerates!

Empirical Fact and Evolutive Representation

An observation is thus necessary: the data entering into the category of events, from the point of view of the history of the phenomenon, are quantitatively linked to time in a simple way. Data becomes more plentiful in an inverse sense of time or rather, decreases with duration measured toward the past, beginning with the present. This regularity could be given the name *historical entropy* on the model of the exact sciences, but an *entropy counted backwards in time*. Normally, the idea of entropy indicates an increase in disorder with time reckoned toward the future, while here we have phenomena for which the arrow of time is reversed! The sociological fact is worth pointing out, even if this use of the notion of entropy should be taken as no more than a metaphor.

This observation comes in part from empirical evidence, but only in part. Time taken backwards is, in effect, discontinuous in its manifestations: it only appears through discrete material references. The fossiliferous periods are rich in empirical facts; others are never given in the book of the Earth, or at least we cannot

an inverse sense and of the same type. Modern political ecology has not yet found this moral, but it is getting close (C. Von Linné, “*De l'Equilibre de la Nature*,” Paris, Vries, 1972, and especially *De Nemesis Divina*, edited by E. Malmström and T. Tredbäy, Stockholm, Bouvier, 1968).

The problem of involution has also been posed, with religious militancy, by G. Salet and R. Lafont, *L'évolution régressive*, Paris, Ed. Franciscaïnes, 1943.

decipher their language on our planet. The paleontologist then acts as a futurologist, he extrapolates or interpolates (it is the same thing in principle) and creates, for example, cryptogenic series. For the failing memory of nature, he substitutes his own. Perhaps this does not take anything away from the scientific quality of the work since that is the way it is in any research. Theory always guides the steps of the scholar when he ventures onto obscure paths. But the evolutionist theory may be a guide in a little too much of a hurry to arrive, and one that explains too quickly the phenomena it meets on the way.

II. EVOLUTIONARY TAUTOLOGY

This characteristic is particularly marked when the critical researcher is concerned with the basic postulates forming the mechanism of evolution and describing its motivating force.

There are three fundamental axioms that are customarily summed up in this way:

- a) what has survived has adapted;
- b) the most complex is successive to the most simple;
- c) in a particular line, what survives is more complex and is more independent with regard to its environment.

Properly speaking, these are not laws, because exceptions are too numerous to be excluded from the field of observation. However, they are axioms in the sense that they make up the three oriented dimensions of space in evolution. For more than a century, there has been criticism of the tautological nature of certain affirmations that derive from this: however, this criticism, even the most recent and most virulent coming from geneticists and systemists, essentially attacks the naive representation of the causality that underlies the general model. Now, my opinion is that it is not so much the relationship between variables as the naivety of their deployment in time that poses the most serious problem regarding evolution. To demonstrate this, let us begin by considering each of the axioms.

a) *Survival of the Fittest*

There is a well-known pseudo-model of the frightening pretention of modern man, that of Brouwer. It is very simply constructed on a tradition that is proper to us: "Let us admit," the author says in substance, "that God put our world in order in six days and that he began on Monday. Life appeared Wednesday at noon..., at four o'clock on Saturday the large reptiles were born, five hours later they died... Man arrived at eleven-thirty Saturday night. A quarter of a second before midnight, Christ was born. At one-fortieth of a second before midnight the industrial revolutions began." Brouwer adds with grating humor: "It is now midnight Saturday, and we are surrounded by people who believe that what they have done in one-fortieth of a second can last indefinitely!"

Thus the problem is presented in the following manner: hominids may be considered as better adapted than pongids, since men came after monkeys and people the entire planet, whereas monkeys are in a few ecological pockets. However, we must note that this characteristic was acquired only recently, and there is nothing to confirm that it cannot disappear tomorrow. That is, when we speak of man in our time, it is obvious that any qualitative affirmation on his adaptability makes sense only if it is put into rapport with an environment whose situation in time is specified. Very few would contest the fact that in daily life equilibrium (a synonym for adaptation in its usual meaning) is essentially unstable. By changing the scale, by using that of Brouwer, for example, the transposition that permits us to make explicit the relative nature of our affirmations, in relation to our species *Homo sapiens*, is simple.

Why then is it not the same for the phenomena of evolution? To take the classic and noble line of *equus caballus*, why should we think that *hipparion* was better adapted than *eohippus*? It seems just as coherent to affirm that *hipparion* was just as successfully adapted to his environment as *eohippus* was to his. *Hipparion*, or its contemporary, *merychippus*, does not represent progress but only a change in a totality that is itself fluctuating. Some authors willingly admit this, but they stop half way in their reasoning. Gregory Bateson, for example, puts the essential questions very well in systemist language: "I cannot understand

how evolution of the horse from *eobippus* could not be only a unilateral adjustment to the conditions of existence of grassy plains. I am certain that the grassy plains themselves evolved at the same time as the teeth and hooves of horses and other hoofed animals. Turf was the evolutive response of vegetation to the evolution of the horse. It is the context that evolved.”¹¹

There was certainly change but change in totality, and the transformations of the component elements do not assume a particular meaning. On the other hand, if the *entire system evolves in a particular direction*, on the axis of time, *then the elements that compose it will be found* with regard to this evolution in a favorable or unfavorable orientation. Thus, to go back to entropy, the second principle of thermodynamics specifies that a closed system is transformed *toward* a growing entropy, that is, toward a chance repartition of the component elements. Consequently, if a phenomenon of order happens unexpectedly it would be qualified as negentropic and given an opposite significance to the global one of the entire system.

From then on, it is because we have the *postulate* of growing entropy that we are able to find our way; otherwise, (i.e., in the absence of a hypothesis of general evolution) there is no meaning to be found in isolated phenomena, only in their specific state. Their qualities are only particular and belong to a certain epoch.

To say that one genus is better adapted than another thus obliges us to give an evolutive orientation to the system of which man is a part, that in all logic he should not be able to observe.¹² To give him this orientation in spite of everything would take us off the paths of ordinary science. It is more like an act of faith based on a metaphysics of time, logically undemonstrable. In other words, the axiom of the “survival of the fittest” calls for two conditions: the first requires a duration of time in which the “survival” occurs, the second supposes an oriented space of reference in which a measurement may be made and an order be found. The way in which the two conditions are met seems at times artificial. In the extreme case of the *coelacanth*, a fish of the primary era caught on a number of occasions, the condition

¹¹ G. Bateson, *Steps to an Ecology of Mind*, New York, Ballantine Books, 1976, p. 154.

¹² Here we find an interesting application of Gödel's theorem.

of duration makes it an extremely well-adapted creature, adapted to its ecological environment, of course, but of what other concrete environment could we speak? The fact is that it was extremely flexible, or skillful, in its adaptation, since it survived gigantic climatic upheavals. However, for this fish to be appropriately classified, this quality must be evaluated within the context of a second time/space dimension; the *coelacanth* will thus be compared to the fish of the primary era and will appear “in advance,” but then it will be included in the inventory of fish of the primary era that disappeared to make room for the more evolved creatures of the secondary. The space of reference is not the same in both cases: the first is static and is based on a synchronic division of time, the second is diachronic and opposes large categories throughout time. In both cases, there is an arbitrary construction of a symbolic space of reference and also of an arbitrary time of reference. Roughly stated, *hipparion* disappeared, but the *coelacanth* did not. Fortunately, the success of *equus caballus* finally proved that *hipparion* was superior to it, just the same! The paradox thus becomes: if man disappeared, and not the *coelacanth*, which would be the best adapted?

We see that this first axiom cannot hold up by itself; it must be accompanied by the two others, especially the second. But this is also debatable.

b) Complexity and Simplicity

We must begin by distinguishing between order and complexity. Order is a structural property of both inanimate matter and living beings. If it accompanies a certain level of complexity in a system, it may nevertheless increase without further growth in the latter. The idea of complexity refers to an ordered ensemble of relationships between the elements making up the system; knowledge is borne on *parameters*, it is probabilist. Variations in order and complexity are thus not parallel, and the equilibrium is dynamic.¹³

¹³ Cf. “Education et évolution” in A. Gras, *Sociologie de l'éducation. Textes fondamentaux*, Paris, Larousse, 1974, p. 364.

This relatively simple distinction does however require some comment. The idea of order is not objective. Order is introduced by the actor who observes one dimension and neglects another. We have a well-known example in the library or work table of a scholar: an inextricable mess for an outsider, the disposition of the objects is perfectly clear to the proprietor. In the same way, the apparently more rational classification of a national library is only an arbitrary order, based on the logic of the institutional subject "Administration" or "Bureaucracy," which is only one historical subject among others.

Consequently, order, as a scientific idea, is also a sociological category, since it requires a communication between the observers and a consensus that leads them to agree on the criteria for classification. Probabilist complexity is thus not radically opposed to determinist order. It simply multiplies the local conditions of balance and imbalance, generators of change. It would thus be better to oppose static order to dynamic complexity, which *takes nothing away* from the *subjectivity* of the two ideas.

The problem introduced by the radical relativism that this subjective nature implies thus seems to have been solved in the following manner: if we accept the existence of the two poles of complexity located on a level of the real, in this case living beings, we should be able to construct a continuous scale connecting the minimum degree and the maximum degree of complexity. It is all the more easy to find these two poles since both are made of the same elementary material. Thus man, whose brain is composed of a multitude of cells, may be taken as the maximum pole, while the one-celled organism would be the minimum. It is however evident that it is not just the number of cells but also their organization that determines their location on the scale of complexity. Now, the degree of this organization cannot be evaluated in itself, the criteria permitting the evaluation in terms of degree are, in reality, based on the type of organization proposed at the maximum pole. Let us keep in mind in this regard the ambiguous sentence of Marx in *Introduction to the Critique of Political Economy*: "The anatomy of man provides the key to the anatomy of the monkey." Right away we again see the presence of a tautological reasoning, anthropocentric in this case, that establishes the scale of complexity.

The idea of a graduated organization of the living is thus not so obvious that it is beyond discussion; it is however acceptable if we admit as proof the empirical existence of two types of organization at the two ends of the life chain. But this problem, once resolved, reveals another. The evaluation of the *elementary unit* as *simple* becomes once more an arbitrary act. If we take an analogy from the building trade, the question we ask is to what degree a brick is simpler than the house of which it is a part. From the point of view of the chemical composition and fabrication of the brick, it is not at all obvious that the brick is easier to make than the house. It is its manufacture that gives it the appearance of simplicity, but in reality it requires conditions that are more difficult to meet than those of a building. We may however argue that a house made of brick and cement adds to its own complexity that of the two building elements. Thus there would be both qualitative and quantitative progression. That way, we mix two orders of phenomena: the house is a particular species, it may be built of brick but also of stone or mud, while brick has other uses: it can be used for kilns or even, crushed, for a tennis court. If it is easy to understand that “the whole is not the sum of its parts,” it is not always so clear that the parts are not parts but specific entities. This aphorism on global totality is dangerous, and magic has always rejected it by claiming that if the microcosm refers back to the macrocosm, there is no reason why one should be less complex than the other. Physicists perhaps finally discover it, tired of their senseless quest for the elementary “brick” and weary of theoretical structures of a frightening subtlety.

Implacable affirmations on the complexification of evolving structures are however numerous. Especially among the scientific systemists who have retrieved the idea of structure by connecting it with that of totality. For example, what is the meaning of this sentence by a chemist, as quoted in *La Recherche*¹⁴ (he had certainly not read the essay by R. Boudon, *A quoi sert la notion de structure?*, Gallimard, 1967): “An evolving system becomes necessarily more and more complex and brings about the appearance of structures”? This type of statement is doubly debata-

¹⁴ In *La Recherche*, No. 100, May 1979.

ble because no condition of place (limit of a system) nor of time (duration) is given. It would be much more correct to say that the system changes and qualitatively modifies its complex nature and that, at the same time, new structures appear. It suffices here to take the term "structure" in its narrow sense of assembly.

The second axiom of evolutionism thus cannot be induced by empirical evidence, and that makes the third one quite fragile.

c) The Survival of the Most Complex in a Line of Descent

Having demonstrated the ambiguities of the ideas of survival and complexity, I shall not dwell long on this third axiom. It is especially the relationship between the terms that remains to be clarified, independently of the terms that constitute it. In effect, this is the basis of all evolutionist classification: elements that are in the same position or have the same function, or simply resemble each other in various organisms, are considered homologous. But these homologies are spread out in time, and we thus obtain a progressive scale. Now, it is exactly the principle of the survival of the most complex that permits the order in which these homologies appear, and this principle requires the simultaneous presence of two orders of independent facts: on the one hand, the appearance of species at different moments, on the other, morphological resemblances between these species and within them.

What survives is the more complex; we may thus speak of evolutive progress.

If we consider that a species comes from a descendance common to all its living components, there is nothing more obvious than the existence of homologies, but the reasoning becomes once again tautological when the discovery of homologies serves as an indicator of a common descent. In other words, to find resemblances it must be stated *a priori* that living beings are designed from a single model or that they have in any case a family resemblance in the strict sense.

On the other hand, this survival of the most complex does not necessarily occur within an evolutive line. In the cases in which there is regression (reptiles from the end of the secondary,

amphibians from the secondary) it suffices to note that the newcomers of another genus or line are "superior".¹⁵ This idea refers then to the axioms we discussed above and again poses the problem of the definition of the system in evolution.

III. EVOLUTIONISM AS SPATIAL REPRESENTATION

This problem of classification is absolutely fundamental. Although it has already been brought up, we must return to it in this third section in order to distinguish clearly between the space and time of evolution.

The problem of classification has been only partly solved, since Gaudry, at least as far as living beings are concerned. For minerals the situation seems stable. On the other hand, it is very fluctuating and often indistinct, as far as the hominine line of descent is concerned. The procedure used by the researcher is, in principle, simple: it is a matter of classifying the elements of the table with respect to each other using carefully defined criteria. These criteria are generally derived from a sector of scientific knowledge in which the temporal hypothesis does not intervene. For example, morphology draws its efficacy from human and animal anatomy, and it projects this knowledge onto fossils, that is, on the very distant past. Here we find the equivalent of Lyell's law, quoted above, in geology, that is, that the causative factors are always the same throughout the centuries.

Is this way of proceeding the only one possible? I see no other in this theoretical construction, even though it gives absurd results if followed blindly. Consequently, if I admit that a paradox does not exist except within a sound theory,¹⁶ I also consider that to

¹⁵ In spite of everything, some enigmas remain, but they are rarely taken into consideration in serious criticisms. For example, 60,000,000 years ago the dolphin had a cerebral capacity greatly superior to *all* mammals that succeeded it. In addition, the cranial volume of the Neanderthal man, who appeared perhaps 100,000 years ago, in any case, before *Homo sapiens*, is on the average larger by 200 cm³ than that of modern man (while the series of increase in cranial volume of hominids had earlier shown a constant progression).

¹⁶ For example, the existence of an irrational number disturbed mathematicians up until the 19th century, but in a topological theory of numbers this problem simply does not exist.

deny the utility of paradoxes to criticize the theory is the same as forbidding any questioning of well-established certainties. The following metaphor thus seems to me to illustrate the weaknesses in the system of classification: starting from functional and morphological criteria, it would be easy to show that the two-wheeled vehicle is the ancestor of the one with four wheels, and that in the wheeled “phylum” or “taxis” the bicycle must be anterior to automobiles—the “phylogenetic” ascendance finally reaching the wheelbarrow!¹⁷ The absurdity of conceptual mechanism is patent here, but that does not disqualify it in the eyes of most researchers. Now, this comparative method brings time in only after the event. As early as 1937, Souriau observed that nowhere could be found a superimposition of geological formations that corresponded to theory, and he pointed out that the primary was not the first.¹⁸ For example, the Armorican socle, among others, was still more archaic and yet this “Archaeon” formation came to the surface. In this case, the oldest was also the closest to hand.

This paradox is thus an exception. The rule rests, in effect, on the idea that levels are deposited one on top of the other. The absence of regularity in this process is considered to be dependent on mechanical factors such as folding, erosion or slides.¹⁹ The equivalent of this superimposition is represented essentially in evolution of living beings by increased complexity, a concept that we have just put into question, and in the hominine line the tendency is especially marked by the more or less pronounced morphological resemblance to modern man. The problems themselves thus have a “tendency” to be solved by strokes of the scientific sword; thus, series whose origins have never materialized in a fossil form are qualified as cryptogenous (from “hidden” and not from “unknown”), and the remains of hominines, too similar to us today with regard to the geological level in

¹⁷ F. Meyer himself had already observed that “paleontological material is presented in such a way that the problem of filiation finds no basis for investigation in it that conforms to the exigencies of a truly positive research” but “from a strictly methodological point of view,” *op. cit.*, p. 10.

¹⁸ M. Souriau, *Le Temps*, Paris, Alcan, 1937.

¹⁹ As J. Dorst wrote: “Geologists and paleontologists are at a loss here, given the intense metamorphosis that transformed them.” (Personal communication and to *Diogenes*).

which they were found, bring a geological problem (sliding or mixture of levels for the men of the Denise Cave, in Puy-en-Velay²⁰). When a classification is found to be faulty, the problem is handed over to the classification of another field of evolutionist knowledge. On the other hand, when the evolutive series is still flexible enough, we see innumerable distributions and redistributions within a theory that remains unchanged. This is, let us repeat, the present case with our own human line of descent, which excites the imagination of paleontologists and brings on a taxonomic deluge: *Homo habilis*, *Australopithecus africanus*, the best known, but also *Australopithecus robustus*, *Australopithecus boisei*, *Australopithecus afarensis*, *Meganthropus africanus*, and so on. All these beings are known for only a few of the parts, generally badly damaged, of their skeletons (with the exception of the famous Lucy, 52 pieces).

The problems confronting the researchers are thus essentially of a spatial nature. Time intervenes only as a variable accessory whose quantification is realized through compared measures of the elements, that is, through their arrangement.

To conclude this critical presentation, I would thus be ready to suggest that the teleological aspect of the transformations in living beings²¹ is induced by the way the scholar proceeds in classifying the phenomena. At the same time, what appears to us as an oriented change would be only a systematics demonstrated in time, not on a concrete empirical duration but in an absolute

²⁰ These skeletons, discovered in 1844, are in the museum of Puy-en-Velay. The geological formation seemed to date from the tertiary, but these hominids appear to be Neanderthalian. This happened in 1906. In 1921 the durations were inversely modified: the sedimentary layer was attributed to the most recent Pleistocene, and the skeletons put back to *Homo habilis*. Nothing more was said about it. We may compare this situation with that of the Piltdown man, immediately authenticated because it went along perfectly with the theory. When much later the "discovery" proved to be a fraud, it was difficult for the scientific community to admit it.

²¹ The relationship between teleology and tautology has not often been made by scientists, even though in the last thirty years biologists had renewed the discussion. On the level of temporality, I have not however found very much that is new. The combat is taking place in a restricted field between vitalists, mechanists, spiritualists, radical materialists and so on. I am thinking of course of J. Monod, *Chance and Necessity*, New York, Knopf, 1971, but also of the commentaries of P. Gavaudan on the classic by A. I. Oparin, *The Origin of Life on the Earth*, New York, Academic Press, 1957, especially Commentary IX.

and abstract temporality.²² To be more precise, let us once again consider that famous law of Lyell that stipulates that the same causes are found again and again and are effective *in aeternum* in geology. Applied to paleontology and to the “cause” that is natural selection, this law would lead to a paradox: either this cause continues to act at the level of the human species, which the scientific community does not accept, or this cause is not a cause! We could even add that if man introduced a qualitative break in paleontological time, why could he not, in the radiant future promised by science, move mountains... and at the same time invalidate his own theory? We must not see in this only a whimsical observation, because K.G. Denbigh has developed in this very regard an aspect of the paradox and has with great perspicacity deduced the consequences of it, consequences that are incompatible with the prevailing point of view.²³ This reminds me of yet another paradox, namely, the fact that this idea of linear and irreversible time has its origin in part in the Judaeo-Christian religious concept, already found in St. Augustine.²⁴ We are thus confronted with the problem of ethnocentrism in Western science, and I hope that the reader has understood that the criticism of one variety of that ethnocentrism is one of the keys to the understanding of my text.

To conclude by returning to the subject, I will invoke the science of Jean Rostand, who did not hesitate to emphasize “the extraordinary, indeed, fantastic nature of the changes that we are called upon to imagine in the past ages of life and of which it seems there is not sufficient astonishment either in the layman, who does not suspect the difficulties it presents, nor perhaps in some specialists, too familiar with the transformist

²² Dating by natural radioactivity changes absolutely nothing. The method appearing after the general theory, and intended to verify it, could only be inscribed in the pre-established restricted concept. Once again, to verify is not to validate. In this regard, and even though I do not share the point of view of the authors on the solution of the problem, I must mention an excellent work of general criticism that also takes up the question of natural radioactivity, J. Flori and H. Rasolofomasoandro, *Création ou évolution?*, Dammarie-les-Lys, S.D.T., 1974. It nicely completes the classic, perhaps too classic, works of the anti-evolutionist L. Bounoure.

²³ K.G. Denbigh, “Time and Chance,” *Diogenes*, No. 89, 1975, pp. 1-20.

²⁴ More precisely, in *The City of God*, XXII xxiv.

Time of Evolution and the Spirit of the Times

idea”.²⁵ He gave no solution nor do I have one, but it is not my place to propose one. Because my problem, as a sociologist of knowledge, was to show we are here in an almost perfect “Kuhnian” situation, in which theory becomes a total paradigm, similar to a vision of the world incapable of being reformed without being destroyed.²⁶ And the danger is great, even for the supporters of the theory, when science takes the form of a faith since it thus becomes licit to change opinions abruptly. At a certain moment in “evolution,” taken in its first meaning, that may even appear to be a necessity...

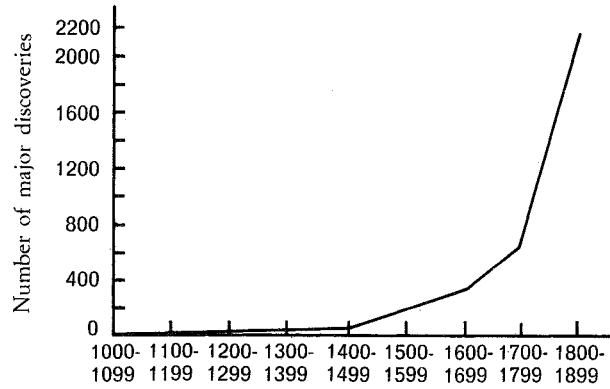
²⁵ J. Rostand, *Ce que je crois*, Paris, Grasset, 1953, p. 24.

²⁶ I am thinking of course of Th. Kuhn, *The Structure of Scientific Revolutions*, 2. ed., Chicago University Press, 1970, but also of the “Popperian” radical P.K. Feyeraben, *Toward an Anarchistic Theory of Knowledge*, London, N.L.B. Books, 1975.

On the other hand, between the submission of this manuscript and the first proof, two works have appeared that support the theses defended here: I Prigogine and I. Stengers, *La Nouvelle alliance*, Paris, Gallimard, 1979; and B. d’Espagnat, *A la recherche du réel*, Paris, Gauthier-Villars, 1979. The first two authors deem that “classical science has reached its limits” (p. 63), that in the long run “for the solar system, for example, dynamics cannot answer with certitude” (p. 248) and even that, paradoxically, “Einstein strongly incarnates the ambition to eliminate time” (p. 274). They do not treat general evolution directly but take it up with a slant of a severe criticism of prevailing scientific concepts. Bernard d’Espagnat, however, is more insistent when he writes: “What must I think of the scientific descriptions of the origin of the solar system? Probably this, that it is only a matter of metaphors, or if you prefer, myths...” (p. 24); or when he considers that biologists are the true scientists of today or sacrilegiously affirms “that the description of lakes and forests of the secondary era is exclusively a commodious process of the synthesis of the indications that can be given to someone looking for oil or diplodocus bones” (p. 59)! Furthermore, between the publication of the French version of this text and its English translation, an article by Mark Granovetter appeared which, by a happy coincidence, develops arguments similar to my own with regard to social evolution: “The Idea of “Advancement” in Theories of Evolution and Development,” *American Journal of Sociology*, Vol. 85, 3, 1979, p. 489-515. It really seems as if we have entered a phase of radical criticism of the old paradigm.

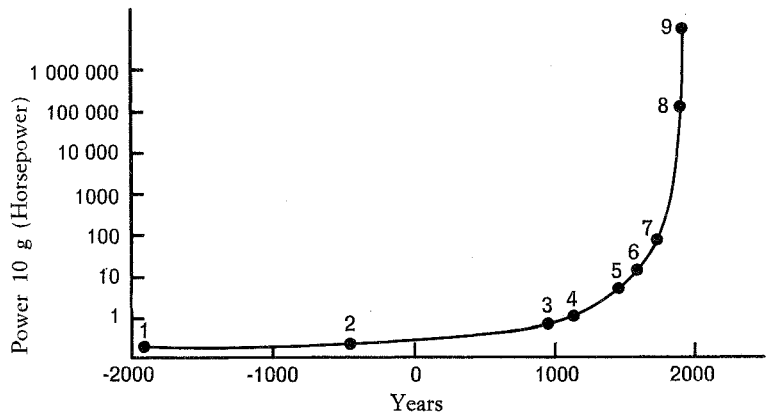
EMPIRICAL "EVIDENCE" OF HUMAN EVOLUTION
AND THE APPEARANCE OF TECHNOLOGICAL PHENOMENA

A) PROGRESS MEASURED BY DISCOVERIES



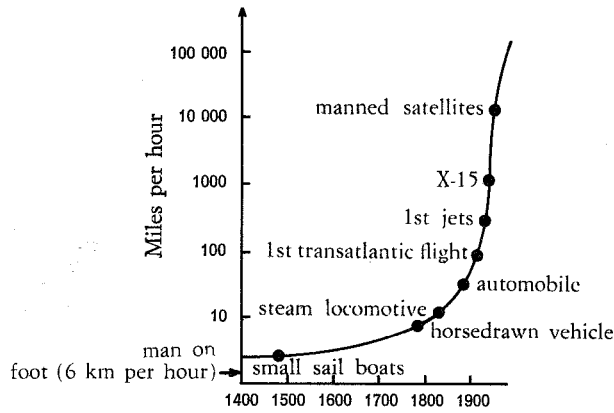
“In the early centuries of this millenium there were fewer than ten important discoveries, while in the last century there were more than two thousand. Even hypothesizing that many discoveries were omitted, there is still a remarkable acceleration of history. These discoveries represent only one aspect of civilization, but they suggest a process of growth that is valid for civilization as a whole.”
 Quoted by Ogburn and Nimkoff, 1958; Lenski, 1970; Wilson, 1976. Drawn from L. Darnstäter and R. Du Bois Reymond, J. A. Sturgart, Berlin, 1904.

B) PROGRESS MEASURED BY THE MAXIMUM ENERGY AVAILABLE

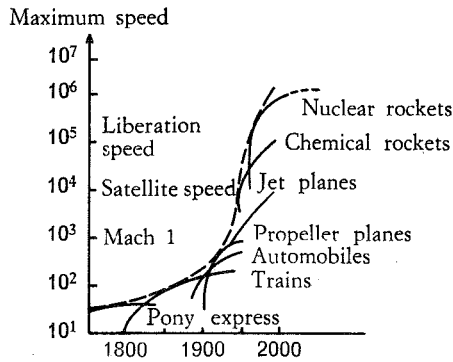


1. ass - 2. ox - 3. horse - 4. water mill - 5. windmill - 6. rotary windmill - 7. Watt's engine - 8. electric power plant - 9. rocket thrust.
 (In F. Meyer, *Surchauffe de la croissance*, op. cit., p. 35).

C) PROGRESS MEASURED BY SPEED ATTAINED BY MAN

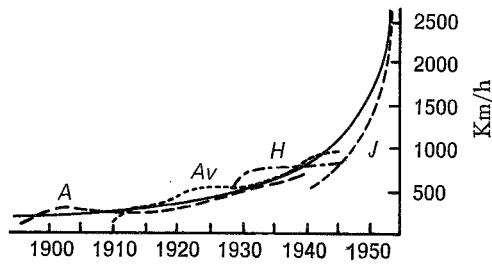


(In J. M. Hale, "World Facts and Trends," *Futures*, Sept. 1971, Vol. III, No. 3).



(In E. Jantsch, *Technological Forecasting*, O.E.C.D., 1967).

A, Automobiles
 Av, Airplanes
 H, Hydroplanes
 J, Jet planes

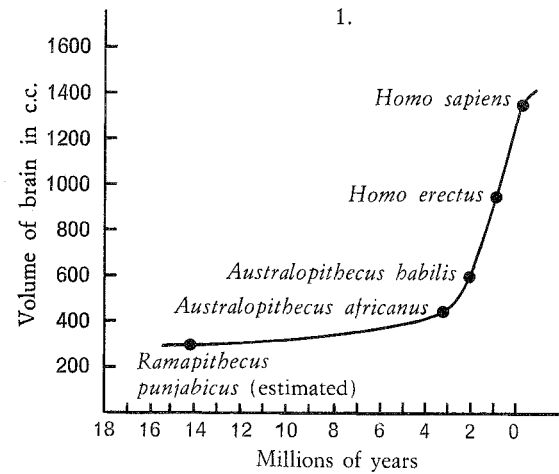


(Meyer, *op. cit.*).

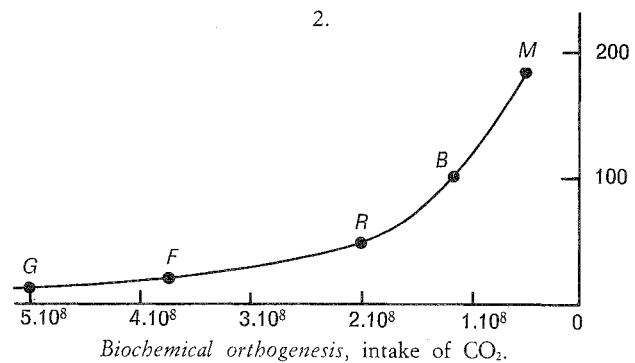
N.B. It would be very easy to multiply the examples, and I give several others in: A. Gras, *La Futurologie*, Seghers, 1976, and also in *Sociologie des ruptures. Les pièges du temps en sciences sociales*, Paris, P.U.F., 1979.

D) BIOLOGICAL EVOLUTION

Here too there are innumerable examples that all follow an identical "temporal" model. We will observe the enormous differences in duration and note the resemblances between the development of phenomena in time, phenomena that are of completely different natures.



(After Pilbeam, in Wilson, *Sociobiology*, *op. cit.*).



After Florkin: quantity of CO₂ absorbed during the respiratory cycle, with a modification of pH of one unit:

G, Gastropod (<i>Busicon canaliculatum</i>)	8.8
F, fish (<i>Raya ocellata</i>)	21
R, reptile (<i>Cbelydra serpentina</i>)	50
B, bird (goose)	100
M, mammal (horse)	180

E) EVOLUTION OF ARMAMENT

This is another case in which the idea of oriented evolution seems very problematical. The *peak* shown by the upsurge in the destructive capacity of weapons of war, beginning with the 19th century, is not at all the product of an ordered development. It has only one unambiguous meaning contemporary and horizontal, which is summed up in the image of the powder keg on which we are sitting.

We reproduce only one part, historical, of the frightening picture of progress in the technology of death.

Weapon	Lethality Index ¹
Sword	20
Javelin	18
Bow and arrow	20
Crossbow	32
Arquebus, 16th century	10
Musket, 17th century	19
Flintlock (18th century)	47
Rifle, mini bullet (middle of the 19th century)	150
Rifle, magazine (first World War)	780
Machine gun (second World War)	18,000
Modern light machine gun	21,000
Automatic grenade launcher, high-explosive fragmentation grenades (HE/frag.)	1,500,000
Some examples of modern weapons:	
Main battle tank	3,200,000
Heavy bomber with HE/frag. grenade clusters	210,000,000
Strategic guided missile with nuclear head of 25 megatons	210,000,000,000 (maximum for the moment!)

Weapon	Index
Cannon, 16th century	43
Cannon, 17th century	230
Cannon, 18th century (Gribeauval)	4,000
75 mm cannon, shell	34,000
Howitzer, second World War	660,000
Tactical missile, nuclear head of 0.05 kg/t	60,000,000

¹ This index measures a combination of several variables, not only power but mobility, fidelity, number of targets per shot, etc.

According to the author of the article, the comparison between the capacities of the new conventional weapons and the capacities of small caliber nuclear weapons shows that the gulf between them has been partially filled in. This makes the rules of the game and the balance of terror obsolete.

This table is taken from J. P. Perry Robinson, "Neutron Bomb and Conventional Weapons of Mass Destruction," in *Bulletin of the Atomic Scientist*, March 1978, pp. 43-45.

tremendous resistance of the nature religions surrounding them. It is certainly true that, with the overthrow and conquest of idol worship, of the painted idol, an element of the abstract, distance and transcendence was asserted in the precepts of the Mosaic law and in the prophetic concept of God which denied the delight in colours of the world of nature. The prohibition of pictorial image was without doubt one of the most revolutionary steps in the history of mankind, and the revelation it showed envisaged a realm somewhat in opposition to the enchanted and imaginative world of nature, which is not altogether happily described in the expression "lack of imagination or poverty of colour." It seems to me, however, abundantly clear, that for the revolution of monotheism, as for any other, a price was paid that seemed too high at the time to many, and even today appears too high. The concept of the worship of God without an image does not by any means signify that man's imagination was thereby cut off or impoverished as the axiom of "the ratio without imagination" would suggest; but certainly limits were set to the imagination in a religiously orientated realm. This indeed involved a withdrawal from the uninterrupted connection with nature, and thereby also to the world of colours, and it would be wrong not to bear this in mind when we now consider the position of colours in the Jewish world.

The world without pictorial image does not however exclude the world of images, it is only its centre and its refuge; the world without colour does not negate the colours that surround it. Even the culture of the God without an image does not deny colours in essential situations that appear in significant contents. Biblical narrative and the Law of the Torah have in many important passages attributed to certain colours or colour phenomena far-reaching significance as sensuous symbols.

Here it should be mentioned that one of the questions debated by scholars is whether in the Bible as a whole there is a specific word for colour. There are creations of nature or human artifacts that have a certain colour; later these are then designated with the word that applies to the specific thing, objects such as animals, flowers, fruit, metals and precious stones. It is, however, by no means certain that there is a general concept "colour" in the Hebrew Bible. The word *sebba* that is later used in tra-

ditional rabbinical literature, appears in the Bible only in the Song of Deborah (Judges 5:30), and can also be otherwise interpreted.² It can have the meaning of “multi-coloured garment.” At any rate, it remains questionable why the Hebrew Bible, when a word for colour is expected, uses a description that employs the word “eye,” *ayin*, in the sense of appearance. Something “looks like” a specific colour for which a word exists.

Another difficulty is also involved, that is, the uncertainty of the precise meaning of individual colours or dyes. The use in speech is apparently fluid. The contexts in which sometimes a particular colour designation appears in different passages indicates, or even demands, interpretations of quite different colours or colour nuances. The same word can mean azure blue or dark blue, blood red or the brown colour of a man’s skin, the brown of a horse or the golden brown of lentils. “There is certainly no specific expression available for mixed or in-between colours and the descriptions that occur are often incomplete.”³ Since Hugo Magnus’ publication *The Historical Development of the Colour Sense* (1877) there has been scholarly controversy over the question whether, over the last thousand years, the human colour sense has changed according to cultural development, so that it must also be considered whether in the Bible, as in the classical world, the same colour description applied to many simplified varieties of colour tone. There is also the biological hypothesis as to whether the development of the retina, which leads to colour sensitivity, was advanced enough in the classical world for man to distinguish blue clearly from other colours, and this would explain the above-mentioned uncertainty. This assertion, however, is violently disputed by others. In our particular context we need take no sides. It must therefore remain doubtful whether, for this discussion, the prohibition of images is so extremely relevant as Morris Farbridge maintained: “Although several indications of color occur in the Old Testament, the Hebrew desire to fulfil the Decalogue

² N. Tur-Sinai, Note on the Hebrew Dictionary of El. Ben-Jehuda, Vol. XI (1945), p. 5367, in the article “Sebha’.”

³ Franz Delitzsch and Lotz, *Realenzyklopädie für protestantische Theologie* V (1898), p. 756.

prohibition against images (Exodus 20:4) at a time when painting was used so widely in the cult of images, restricted the development of their color sense and color vocabulary.”⁴

II

For the origin of colour symbolism outside the Jewish realm, a scholar’s statement from the beginning of the last century is of value: “The meaning of all colour is light; the negation of all light, darkness, is also the negation, the death of all colour; indeed, colour, in its essence, is the appearance, the manifestation of light... The different colours are therefore only different modifications of the light and are related to the same as different sounds are related to a tone. All colour symbolism therefore is based on the concept “Light.” If then... all religions agree to transfer the concept of light to the divine Being, colour as manifestation of light can originally have no other meaning than that of describing the divine in its appearance or manifestation. The different colours are consequently essential symbols of the different ways in which the divine Being appears; they represent the divine Being from various sides, and in its varying relations to being apart from itself. Colour symbolism is attuned to the concepts of the divine Being and its relationship to the world.”⁵ This is, of course—contrary to the opinion of this particular scholar⁶—not directly transferable to the Biblical religion and Judaism, where the unsensual nature of the God without image rather stands in the way of “pagan” colour symbolism. For the Torah, then, God is in no way light, but light is his first creation. This relationship has not lost its meaning even in the later Judaic colour symbolism. Speculations about colours as expression of diving Being in the Bible are therefore highly questionable and superfluous, for the world of creation, delighting in colour,

⁴ Morris Farbridge, *Studies in Biblical Symbolism*, 2nd edition, New York, 1970, p. 277.

⁵ Karl Christian Bähr, *Symbolic des Mosaischen Cultus*, I, Heidelberg, 1837, p. 317. The lists in this detailed work are only rarely acceptable or relevant for the understanding of the Bible or the later Jewish tradition.

⁶ *Ibid.*, p. 323.

is here so distinctly differentiated from the realm of the creator. Only where this distinction, as in the Kabbalah, is subject to certain restrictions through theosophic interpretations of divinity represented by a world of symbols, can colour symbolism in relation to a creative deity be considered. As far as I can see, this is not to be found in the Hebrew Bible, and this lack to some extent explains polemic criticism such as the aforementioned. That does not in any way mean that colours in other contexts may not be significant. I will here cite three examples in which colour symbolism appears, in two of which cases the meaning of the physical symbol is clearly indicated, while in the third case its meaning remains more enigmatic. I refer, on the one hand to the explanations of the rainbow and the blue in the ritual fringes (tassels) as well as on the other hand to the four basic colours in the setting up of the tabernacle, and of the priestly cult.

Genesis 9:11-17 deals with the rainbow when God, after Noah's flood, promises that never again will a flood come to destroy the earth. The rainbow is established as a physical symbol of the Covenant "between Him and all living creatures for all future generations." "I set my bow in the cloud, and it shall be a sign of the Covenant between me and the earth. When I bring clouds over the earth and the bow is seen in the clouds, I will remember my Covenant which is between me and you and every living creature of all flesh, and the waters shall never again become a flood to destroy all flesh." This version of the Hebrew text leaves room for two opposing interpretations: that the rainbow was already there and was only now appointed as symbol of the Covenant between God and his creatures, or that it only appeared for the first time after the tremendous deluge of the flood, a pledge of the true God to his creation. In the last case it would be, as a later commentator has somewhat too poetically said: "the last delicate coloured brushstroke for the completion of "creation."⁷ Still less would I agree with another statement from this author, who sees in the reflection of the sun in the clouds the "coloured reflection from the background of the diving Being." Even the Torah itself knows nothing of

⁷ Benno Jacob, *Das erste Buch der Tora, Genesis*, Berlin, 1934, p. 257.

such a coloured reflection of the divine Being, and the author has, very much against his will, borrowed from the Kabbalists. The rainbow is a sign of the Covenant of reconciliation after the law of punishment, and the form of the bow is also, according to the old commentators (such as Abraham ibn Esra and Nachmanides), compared to the lowering of the sword after a fight. Differing from the commentators, however, the Torah itself does not speak of the colour character of the rainbow and leaves it to the imagination of the reader to recognize in the colour play of the rainbow the special character of the Covenant. The rainbow, in the harmony of colours in a phenomenon of creation, does not point to the divine Being, but rather to the nature of the Covenant.⁸

The rainbow as a constantly reoccurring guarantee of the Covenant that safeguarded the existence of the world and annulled the somewhat disturbing law of punishment led, in the later Rabbinical tradition, to the unexpected development that in the days of the great Judges the rainbow never appeared, because the life of these people was a living sign of the Covenant and guaranteed the existence of the world, so that no other sign was necessary.⁹

The transition to a rainbow symbolism for the appearance of divine glory in the prophetic theophany is completed in the vision of the prophet Ezekiel, at a much later stage of the Bible. He describes the vision of the divine chariot throne, the *Merkabah* and the surrounding glory of God (1:28) "Like the appearance of the bow that is in the cloud on the day of rain, so was the appearance of the brightness round about. Such was the appearance of the likeness of the glory of the Lord." Here, therefore, for the first time, the rainbow is conceived as a simile

⁸ S.R. Hirsch in his commentary on Genesis, *Der Pentateuch I*, Frankfurt 1893, pp. 148-49, finds in this sign in which all the colours are refracted "from red to the darkest violet" thus building a complete ray, a refraction of the divine spirit, capable of reaching even the man furthest and most distant from God.

⁹ In tractate *Kethubboth*, 77b, of Rabbi Josua ben Levi, also later in the Zohar of Rabbi Simon ben Yökkai (*Midrash ne'elam* in *Zohar Khadasch* as well as in the Zohar itself III, 36a). It is there stated as a general rule (III, 15a) that it is a sign of a truly pious man if the rainbow does not appear in his lifetime.

for the supernatural manifestation of the divine, in which indeed his presence is not presented but his appearance in the eyes of the prophet.

Similarly, blue appears in two different contexts, one purely sensual and one visionary. The Hebrew word, *tekheleth*, is used with various nuances, for dark blue, purple blue, and azure. The Torah commands the wearing of the ritual fringes (*tsitsith*) or tassels on the garments of the Israelites, (Numbers 15:38): “They should make tassels on the corners of their garments throughout their generations, and put upon the tassel of each corner a cord of blue.” As specifically stated, their purpose is to induce men to gaze upon them, which will bring to mind all the commandments of God, and so will lead to the fulfilment of those commandments. This gazing, as the Talmud notes,¹⁰ leads to meditation and meditation leads to action. Purple blue amongst the other white tassels which, according to tradition, usually consist of seven white and one blue thread, must have therefore had a particular meaning which pointed to the divine origin of these commandments. A Talmudic tradition from the second century explained this. “To him who keeps the commandment of the tassels (and recognizes the blue therein) it is as if the countenance of the *Shekhinah* (the divine presence) were revealed to him. For the *tekheleth* is like the sea and the sea the grass, and the grass the firmament, and the firmament the throne of glory and the throne of glory is like the sapphire.”¹¹ The connection of blue with the sea and the heavens is of course also found outside the Jewish writings, as in Cicero or Ovid.¹² The connection of this color with the heavenly throne had, however, its basis in two passages from the Bible, which compare the blue of the sapphire in visions with the heavenly

¹⁰ Tractate *Menachoth* 43b. The Kabbalic interpretation of blue in the *tsitsith* in the book of Bahir § 65 is based on this passage.

¹¹ In the Jerusalem Talmud *Berakborth* I, 2; Shorter than the above Talmud of Babylon, where the striking comparison with the (green) grass is missing. In a later version of this tradition in *Midrash Tehillim* on Psalm 24, ed. Buber, 105a, it states at the end: “and the Throne of Glory resembles his own glory.” The comparison with green grass (perhaps also the Pesikta passage cited in note 19) influenced Raschi’s interpretation of *tekheleth* as green: this interpretation is found in numerous passages in his *Commentary on the Torah and Talmud*.

¹² Cf. references Bähr I, p. 305.

throne and the realm that becomes visible “under the feet of God.” Ezekiel describes the four animals that carry the *Merkabah*, above which the firmament arches. “And above the firmament over the heads was the likeness of a throne, in appearance like sapphire, and seated above the likeness of a throne was a likeness as it were of a human form.” (Ezekiel 1:26). This vision of the realm as sapphire-coloured, over which the divinity completely without colour first arises is, however, very much older, and belongs to one of the ancient versions of the Torah. It is evident from the oft-quoted passage, (Exodus 24 : 10), that for the editor of the various traditional sources assembled in the Torah, the God without image did not exclude a supernatural display of God. Here Moses, Aaron and the seventy elders of Israel ascended Mount Sinai: “and they saw the God of Israel, and there was under his feet as it were a pavement of sapphire stone, like the very heaven for clearness.” Here, also, in one of the most striking passages of the Torah, the God without colour is seen above a blue which is nearer to sapphire than to the deep blue of the heavens. It is understandable enough that in the continuation of the story (Exodus 24:17) the appearance of God, to which the glory of God is reduced, is visible “as a devouring fire on the top of the mountain.” The glory could somehow be physically apprehended, but not God himself.

According to a doubtless very old tradition, the blue of the tassels was obtained from the blood of a mussel, found near the east coast of the Mediterranean, mainly between Haifa and Tyre. In the sources it is called *khilzon* or *khillazon* but there are differing opinions as to its identity. They vary between various species of purple snail and the ink fish (*sepia*). In post Talmudic time it was no longer known which animal was actually meant and in religious practise, therefore, only the white was used for the tassels and no longer the blue.¹³ At the end of the last century a very learned and extremely Hassidic Rabbi, Gershon Henoch Leiner von Radzin, maintained that he could unequivocally prove that this animal was identical with the *sepia officinalis* and this involved the obligation once more to

¹³ “Today we have only the white ritual fringes because the *tekheleth* has disappeared”, as stated in the late *Midrash Bamdbar rabbah*, Section XVIII, § 5.

fulfil exactly the Law of the Torah, as his followers and many others still do today. The matter caused a great sensation among the pious and while the Rabbis let it be known unofficially that it was not of great importance, they did not allow themselves to get involved in written polemic with this extremely quarrelsome author.¹⁴ It is, however, of greater interest that from this union of white and blue of the tassels, in the conscious return to Biblical symbolism, the blue-white colour of the Israeli flag emerged.

The introduction of four continuously reoccurring colours in an important passage of the so-called Priestly Code in the Torah, leads in another direction. The passage relates the construction of the building of the sanctuary, God's dwelling during the Israelite wandering in the wilderness, which in Exodus and the following chapter is described in so much detail. The same four colours appear also in the directions regarding the garments of the priests generally, and in particular those of the High Priest. The same series, obviously considered important, constitute a characteristic which determines all the cultural instructions. These colours are the clear blue of the *tekheleth*, the colour purple called *'argaman* which varies between red, blue and violet, then the scarlet or crimson red, *tola'ath shani*,¹⁵ and the gleaming white of *byssus* called *shesh* but also *buts* in later passages of the Bible. These colours are cited more than thirty times in the same order. The materials necessary for the construction of the dwelling, which must be voluntarily donated, are enumerated at the beginning of the instructions: the four colours or dyes are cited immediately after the three metals, gold, silver and copper. The carpets that were used for cover in the inner sanctuary, as well as the different curtains, the girdle, the cloak shoulder plates and the pectoral of the High Priest were four-coloured, that is, woven from the threads of the four colours concerned. Certain other priestly garments were three-coloured and one-coloured (blue), in particular the tunic of the High Priest and the fifty loops that

¹⁴ Compare the description of this *cause célèbre* in some passages of the article. "Tekheleth unserer Zeit" by M. Kasher in *Leo Jung Jubilee Volume*, New York 1962, pp. 241-258 of the Hebrew part.

¹⁵ This expression actually means the cochineal, but also the red colour that is obtained from it.

fastened the ten lower carpets of the sanctuary. Black, but also yellow and green, were consequently excluded from this colour cult, which was certainly not by chance. White was designated for the under-garment and the turban of the High Priest. It is not mentioned what meaning the Torah assigned to the particular colours. The exclusion of black and dark colours, which in numerous Biblical metaphors symbolize the contrast to the realm of light,¹⁶ indicates, in spite of the absence of details, that specially intensive luminous colours in the Torah represent aspects of the living. The use of metaphor in Isaiah (1:18) shows the opposing nature of these colour tones: "Though your sins are like scarlet, they shall be as white as snow; though they are red like crimson, they shall become like (white) wool." Purple as a sign of nobility and power was widely known in the Near East but also in the Bible as early as the Book of Judges (8:26) and in the Esther narrative (8:15). As a reaction to the delight in colours in the chapter cited, Ezekiel (living in the Babylonian exile between the destruction of the first and the rebuilding of the second temple) abolished all bright colours in the priestly vestments and let them be only of white linen. In another context, namely, in the instructions in the Torah about the red cow whose ashes mixed with water serve for the purification of those who have become impure by touching the dead (Numbers 19), red is certainly thought of as the colour of blood, which in several passages in the Torah is thought of as the support of the soul, that is, life. "The animal which is the remedy for the impurity of death should be 'without defect, without blemish,' and even its colour should be a sign of unpolluted life."¹⁷

It is also worth mentioning here that the four colours of which we spoke were transferred to materials that the Torah considered impure, apart from the religious domain, namely, wool and linen, that were mixed in the High Priest's cloak. The mixture of such materials (called in the Torah *kil'ayim*) was forbidden in any form in secular life, whereas they were permitted within the religious domain and were prescribed

¹⁶ Cf. Lamentations 4:8 and Job 10:21 ff.

¹⁷ Franz Delitzsch in R.E.Z.P.T. V, p. 762.

especially on account of their superior quality. Apparently it was the mixture of these fabrics that gave them their special character.¹⁸

The following passage, quoted in varying forms, proves that the Haggadah of the Midrash, which interpreted the sanctuary of the Bible as an image of the cosmos, saw in the above mentioned colours an indication of coloured light symbolism: "Joshua of Sichnin said in the name of Rabbi Levi: As God spoke to Moses: You shall set up four poles and spread the dwelling (tent) above them. This tells us that on the top of Mount Sinai God showed Moses red, green, black and white fire and said to him "Make me a dwelling." "Lord of the universe," said Moses to God, "where shall I find red, green, black and white fire?" God said to him (Exodus 25:40) "And see that you make it after the pattern which is being shown to you on the mountain." Rabbi Berachja said in the name of Rabbi Levi: "This is like a king who appeared to one of his followers in a robe decked with pearls and said to him: "Make me a robe like this." "My lord and king," he replied, "where shall I find a robe that is completely decked with pearls?" The king answered: "I with my glory and you with my dyes."¹⁹ This means then that the four colours that Moses used in building his dwelling correspond to the heavenly colours, in which God's glory is manifested. They can be broken down into the basic colours which were shown to Moses. Instead of the Biblical *tekheleth* (blue) and purple, green and black fire appear. Passages like these herald the transition to a later theosophical colour symbolism which is developed in the Kabbalah. In opposition to this Philo and Josephus²⁰ explain the four colours as allegories of the four elements, that is, as purely cosmological. White stands for the earth on which flax grows, purple is the sea or water because it is obtained from the blood of the sea snail, *tekheleth* is the air that appears in the blue of heaven,

¹⁸ Cf. M. Haran in *Hebrew Union College Annual* 36 (1965), p. 202.

¹⁹ *Pesikta de-Rab Kahana*, ed. Mandelbaum, I, p. 7. Cf. *Shemoth rabbah*, end of Section 35 and *Shir ha-Shirim rabbah* 3:11 where the king more impressively demands from his court painter the copy of a very beautiful picture.

²⁰ Philo, *De vita Mosis* III § 88, and Josephus, *Antiquities* III, 6, 4 (§ 183).

scarlet red is fire.

A few more traditions in the Talmud and Midrash that take into consideration colours and their meaning should be considered here. There are not too many examples to be found. We read in the Talmud passage on dreams, a paradise for psychoanalytical interpretations, more or less successful: "In dreams all types of colour are good omens, apart from purple blue."²¹ In Artemidor's famous Dream Book we learn from the discussion on the various meanings of wreaths in dreams, that dark blue signifies death, as this colour embodies a certain sympathetic link with death. Alexander Kristianpoller, who has dedicated to dreams in the Talmud a very valuable study, believes that Artemidor's interpretation stems from Jewish circles and that the latter attempts to explain the meaning "blue as the omen of death" from this angle, as had been told to him.²² In another tradition about horses in dreams we learn that the white horse is a good omen while the chestnut is the opposite.²³

White is always connected with purity even in the most diverse contexts. Even God, when he prepares for creation, is covered in a mantle of white light.²⁴ White light is the origin from which all the other colours emerge. That the garments of the resurrected are white or black according to their merit, stems from the following passage, where Rabbi Jannai, a third century teacher, told his children: "Do not bury me either in black or white garments; not in black, for perhaps I will be found worthy (to be counted among the righteous) and would therefore be as a mourner among bridegrooms, nor in white for perhaps I will not be found worthy, and would then be as a bridegroom among mourners; rather bury me in red garments (that is, in garments that were neither white nor black, but of mixed colours) that come from lands overseas." In the Pa-

²¹ *Tract. Berakboth* 57b, cf. Al. Kristianpoller, *Traum und Traumdeutung im Talmud*, Berlin-Vienna, 1923, p. 53. There a remarkable variant from the Yemenite Midrash Anthology of the thirteenth century is introduced, from *Midrash ha-gadol*: "All kinds of colour have a bad connotation in dreams, but the worst is purple blue."

²² Kristianpoller, p. 54.

²³ *Tract. Berakboth* 56b and *Sanhedrin* 93a.

²⁴ *Pesikta de-Rab Kahana*, ed. Mandelbaum, I, p. 323; *Midrash Tehillim* 104:4; and the parallels in Theodor's Edition of *Bereschith rabbah*, p. 20.

lestinian Talmud the same event is told of Rabbi Jochanan, with the significant addition that his pupil, Rabbi Joschija, had ordered that he be buried in white clothes made to measure. "Then they said to him: 'Your teacher said one thing and you say another'. He answered: 'Why should I be ashamed of my actions?'"²⁵ This concept of white as the colour of purity corresponds also to the Mishna description of the ritual for Redemption Day, and the duties of the priest at the time of the second temple. He often changes his clothes which are decorated with many different coloured kinds of ornaments. But when he enters, once a year, into the Holy of Holies, and in the sense of the Torah stands alone before God, then his garments must be of pure white (*Bysus*) and without any ornament.²⁶ This corresponds to the idea, already seen in the Talmudic and Midrash literature, that God's two most important modes of action—his mercy and his love on one side, and his power and strength on the other—are symbolized by white and red.²⁷ In later versions this corresponds to the white garments of the righteous and pious at the resurrection or in paradise.²⁸ In contrast to that is the recommendation of a second century teacher that whoever could not control his instincts and succumbed to sexual temptation should at least put on black garments before doing that from which he could not abstain.²⁹ Black for mourning is known from many passages in the old sources, but not prescribed.³⁰ From ancient descriptions of hell

²⁵ Tract. *Shabbath* 114a. and *Niddab* 20a, *Talm. Jer. Kil'ajim* IX, § 5. Cf. S. Lieberman in *Tarbiz* 40 (1970-71), pp. 14-16.

²⁶ *Sifrah* on Lev. 16:4 (Husiatyn 1908), p. 340; tract. *Rosh ha-Shanah* 26a; Jerusalem Talmud *Yobab* VII, 8. In *De somniis* I, SS 214-218, Philo interprets the colours of the priestly garments as progressive steps into the knowledge of God, whereas the white in which the High Priest is clothed when he enters into the holy of holies symbolizes in a similar way the highest step of such knowledge.

²⁷ Michael and Gabriel, who represent these two aspects of the divinity, are, for example in *Sbir ha-Shirim rabbab* 3 : 11, the archontes of Snow (white) and Fire (red).

²⁸ Cf. for example Rashi on *Niddab* 20a.

²⁹ tract. *Kiddushin* 40a.

³⁰ It is interesting to note that black clothes for mourning are only mentioned occasionally, but are *not* cited in detailed description of mourning. A black apparition announced the death of Alexander the Great to the high priest Simon the Just (tract. *Yomab* 39b); at the death of the son of a non-

dating from the Talmud or post-Talmudic period, we learn that the colour of the “souls of the evil was black as a sooty pot” because of the abominable deeds.³¹ On the other hand, the souls of the average men have a pale green colour on account of their misdeeds, before they are purified in the fire of purgatory.³²

The last time colour symbolism appears in the Midrash is in the flags of the twelve Tribes of Israel, which are not mentioned specifically in the Torah itself (Numbers: 2:3 ff.). The Rabbinic tradition describes them in detail, in combination with the twelve precious stones found on the pectoral of the High Priest, where (according to Exodus 28:17 ff.) the names of the tribes themselves were engraved. The basic colours—red, green, black, white, sapphire blue—are enumerated (with their mixtures and combinations) together with the pictures that appear on each flag.³³ It was these colours, each of which (with individual variations) symbolizes one of the twelve tribes of Israel, that provided the colours for Marc Chagal’s famous stained glass windows for the synagogue in Jerusalem.

The complete passage reads: “The cornelian was the precious jewel which corresponded to Reuben; his flag was of red and carried the image of the mandrake (according to Genesis 30:14). Simeon was symbolized by topaz; his flag was yellow with the town of Sichem on it. Levi’s precious stone was the emerald and his flag was of three colours: white, black and red; the *Urim* and *Tummim* (the coloured image of the priestly oracle on the pectoral) was shown thereon. The carbuncle, *nofekh*, corresponds to Judah; his flag was azure blue with a lion on it (Genesis:

Jewish king the inhabitants of his town wore black clothes (*Pirkei Masbiakh*, in Jellinek’s *Beth ha-Midrash* III, p. 74).

³¹ *Massekhet Gebinnom* in *Beth ha-Midrash* I, p. 149; as well as in the Hebrew book of Henoah, which belongs to the literature of the *Hekhaloth* books (cf. H. Odeberg, *3 Henoah*, ch. 44 § 6) as well as in the English translation p. 137. This text, which is of a visionary character and includes a description of the luminous world of the angels, is remarkable for the absence of any indication of specific colours. Instead it revels in vague descriptions of gleaming lights and streams in which the angels or the other creatures of the *Merkaba* are clothed. It avoids the word “colours” and speaks of “different kinds of light” and similar objects. (ch. 26, § 7).

³² *3 Henoah*, Odeberg 44 § 5.

³³ *Midrash Bamidbar rabbah*, section 2, § 7.

49:9). Issachar was symbolized by a sapphire and the colour of his flag was deep black as charcoal; the sun and moon appeared on it (according to I Chronicles 12:32). Zebulun was represented by the diamond and his flag was white with a ship on it (because the tribe lived by the sea and practised navigation) (Genesis 49:13). Dan was symbolized by the opal, *leshem*, and his flag was like sapphire with a snake on it (Genesis 49:17). Gad had the agate for his symol, *sh'bho*, and his flag was a mixture of black and white with an army camp on it (Genesis 49:19). Naphtali corresponds to the amethyst; the colour of his flag was rose red with a hind on it (Genesis 49:21). Asher had the crysolite for his emblem, *tarshish*; he had an olive tree on his flag, and its colour was like the pearl with which women adorn thmselves (Genesis: 49:20). Joseph was represented by the onyx, *shoham*, and his flag was of a deep black colour his two sons, Ephraim and Menasseh, were represented on it in the guise of two Egyptians... Benjamin's precious stone was jasper and his flag was of all the afore-mentioned colours, with a wolf on it (Genesis 49:27)."

After this examination of texts emphasizing important colours in the Bible and Rabbinical literature, it is appropriate to refer to a passage from *The Guide of the Perplexed*, the principal work of Maimonides, where colour symbolism is only mentioned in a marginal way, as for example, when Solomon ibn Gabirol says that even the soul has spiritual, abstract colours which are seen in the blinking of eyelids.³⁴ Maimonides, in a somewhat lengthy explanation of the above quoted vision of the Elders of Israel (Exodus 24:10) is not only concerned in keeping away from the representation of a physical form, and therefore the appearance of God, but he tries to explain this vision as a parable referring to the original matter, *hyle*. He interprets the sentence: "They saw the God of Israel and there was under his feet, as it were, a pavement of sapphire" as if it meant "as the white of a sapphire." In order to try to eliminate biblical anthropomorphism as much as possible, he cites in support of the old Aramaic translation, the *Targum Onkelos*, that interprets

³⁴ Solomon ibn Gabirol, *Tikkun middoth ha-nefesh*, Riva di Trento 1562, fol. 4a; this certainly comes from Arabian philosophers.

“under his feet” not as if it applied to God’s feet, but to the feet of his throne from which the light of the *Shekhina* appears. This is itself a created light in which the transcendent creator manifests his glory as a gleam of light.

In our particular context we do not need to speak of the interpretation of this “throne of glory” which Maimonides analyses in detail in his explanation of Ezekiel’s *Merkabah* (divine chariot) vision (Part III; chapter 2). What concerns us here is what Maimonides has to say about the white of the sapphire at the foot of this throne.³⁵ “What they perceived, (that is apprehended), was the true essence of original matter of which God was the cause. Let us consider the Scriptural phrase: ‘something that resembles (in Hebrew, *kema’asseb*) the light of sapphire.’ If they had wished to emphasize only the colour they would have been content to say ‘like the light of sapphire.’ The expression ‘something that resembles’ was added because, as it was said, material is passive by nature and receives and can only accidentally become active. Form, however, is in its nature always active, and, as is made clear in *Physics* (Aristotle), is only accidentally made passive. It is for this reason that the Scriptures use the expression ‘something that resembles’ for the original material (inasmuch as this is a creation of God). Concerning the ‘white of sapphire,’ this expression means the transparency and not the white colour. (In this passage Maimonides took the word “sapphire” in the sense of crystal! he uses the Arabic meaning of the word). The white of the crystal does not come from its white colour but from its transparency. Transparency is, however, of no colour as is shown in *Physics*.³⁶ If it were a colour it would not be able to receive all the colours without making them visible. It is precisely because transparency is without its own colour that it can receive all others successively. A transparent body resembles original matter because

³⁵ Certain medieval Bible commentaries actually preceded Maimonides in explaining the sapphire as white (i.e. Sa’adya, who explained the sapphire as white, and from whence the medieval Hebrew term for *sappiryi* as “transparent” arose); on the other hand, Abraham idn Ezra interpreted the colour of the sapphire as red-green (cf. David Kaufmann, *Die Sinne, Beiträge zur Geschichte der Physiologie und Psychologie im Mittelalter*, Leipzig, 1884, pp. 114-116).

³⁶ Aristotle, *De anima* II, 7.

it is deprived of form through its nature, and therefore is capable of receiving all forms one after another. It is to be concluded then that to the Elders of Israel the object of their imagination (or their concept) was original matter and its relation to God, insofar as the first is among the created things necessarily subject to growth and decay, and God is its creator.³⁷

III

Even though the colour symbolism of the Kabbalah grows out of biblical and Rabbinical motives, certain cases are worth citing. The symbolism of the Kabbalah saw in creation the pulse beat of the hidden life of the divine; in this way they established theosophical meditation on the events and processes which determined the life of this divinity, and also on the natural realms of his creation. It was actually out of the latter realms that they could create symbols through which the abstract could be described with the aid of parables. One thing played a decisive role in this context. Contrary to the rationally grounded medieval Jewish philosophy which emphasized the transcendence of God, mysticism discovered in him a domain where his hidden Being revealed itself through symbols and presented itself to meditation in the form of the ten degrees of his manifestation or emanation. This meditation examined even in its most physical forms the power of this life continuously at work in creation. That was the realm of Sefiroth that in itself belongs to the divine, indeed, even creates its own secret life, but at the same time contains those laws and harmonies which are repeated in the universe, constituting its rhythm. It is therefore natural that the colours also play an important part in describing processes in the world of Sefiroth: they were inserted into Kabbalist symbolism which developed with such power and influence in the thirteenth century.

³⁷ *Moreh Nebukhim* I, 28. I use the 1957 translation of S. Pines, *The Guide of the Perplexed*, Chicago 1957, p. 61, which gives far more precisely the original Arabic text. The Hebrew translations of Jehudah Alkharizi and Samuel ibn Tibbon, which have certainly had far more influence, are not so reliable in many passages such as this.

Before I discuss the analysis of such colour symbolism in Kabbalistic writings, I wish to recapitulate briefly the structure of the world of Sefiroth or primeval powers as it appears in the classical writings of the Spanish Kabbalists. It should be understood that this primeval energy is not so much an intellectual concept, but arises out of meditation and intuition connected with older ideas which have developed exgetically, so there is something fluid and ambiguous in it which can be better understood in theosophical concepts, which are more easily comprehended as images rather than concepts. This primeval energy can be understood under different aspects, and it is for this reason that different, contradictory motives appear in descriptions. There is, however, a fundamental structure. God in his transcendence, in the mystery of his Being, who cannot be manifested or understood with the aid of images or pictures, is called by the Kabbalists *En-Sof*, that is to say, "that," or the infinite. This technical term was introduced by the Kabbalists in order to designate that which is unnamable in Dog. From him emanate the ten Sefiroth which are not the fundamental qualities of God in his relation to creation, but his active powers, or more than that, the realms of divine light. They contain the creative powers of God which proceed from him and are active in creation, in other words, the determining forces: the living God who steps out of his mystery and reveals himself. The Sefiroth are not creations of God, they are the diversity which is contained in the dynamic unity of his life.

They are composed of three triads and of one comprehensive power. They form primal man in whose image man is created, the tree of the world with its earth, roots, trunk and branches, as well as the primal words of creation or the ten words of creation. The first triad are the Sefiroth *Keter 'el'yon*, the highest Crown; *Khokhma*, Wisdom and *Binah*, the faculty of Discernment or intelligence. These three highest powers are also the first steps made by *En-sof* outside of himself in the direction of creation. They are, however, still entranced, because none of the primordial days were attributed to them, whereas the seven others build the creative week of Genesis, the "Sefiroth of

world creation.” To the second triad belong voluntary Grace, *Kbessed*, the strict and rigorous Judgment, *Gevhurah* or *Din*, and finally the balance of these poles in the Sefira of Mercy, *Tifereth*. These incorporate the divine attributes most often occurring in Talmudic literature and also in Philo. In the third triad we have another unified development of the former: the middle components *Netsakh*, Duration and *Hod*, Majesty, unite in the ninth Sefira, *Yessod*, which is the creative foundation of the world; this Sefira means also, in connection with ethical and cosmic symbolism, the Just, *Tsaddik*, the wielder of the universal and at the same time generative power in this world. The tenth Sefira, *Malkhuth*, the Realm of God, includes all the afore-mentioned powers; it has no active force of its own but represents the unfolding unity of all the others. It is thus a transition to the world of creation and is presented especially in symbols of the feminine. It is “The Presence,” that is, the Presence of God, his immanence in all realms of his creation; it is designated by the ancient expression, *Sekhina*, derived from Talmudic literature. For the Kabbalists each of these *Sefiroth* represents a world in itself in a continually progressive specification.

Besides this very brief exposition of the structure of the Sefiroth which, as aforesaid, could be seen in the form of spiritual lights, it becomes apparent, especially at the beginning of the Kabbalistic development in Spain, that there are descriptions which entirely ignore such a structure, but which deal in great detail with the outbreak of many “intellectual lights”; these lights can only with difficulty be made to correspond with the Sefiroth. The influence of neo-platonic mysticism appears clearly in some writings of this kind, as, for example, in the *Sefer ha-I' yun* at the beginning of the thirteenth century; in this work God is described as “The One” that in himself unites all his powers, as a flame of fire is united in all its colours, and its forces emanate from its unity as the light of the eye emerges from the blackness of the eye.³⁸ This recalls an idea of Galen's, widely known in the Middle Ages, that the light penetrated outwards from the brain through the eye.³⁹ The supreme powers are

³⁸ Cf. Scholem, *Ursprung und Anfänge der Kabbala*, Berlin, 1962, pp. 276-77.

³⁹ Cf. Kaufmann, *Die Sinne*, pp. 105-10.

contained in the first Sefira and break out of it “as a source for the flame and a flame for the source, a source which ascends to the unfathomable and infinite light that is concealed in an excess⁴⁰ of the hidden darkness.” In a book of the same period, *Ma’ayan ha-Khokhma, The Source of Wisdom*, it is stated that the source of wisdom arises out of original ether, which corresponds in other description to the first Sefira, and breaks out of two sources, one of darkness and one of light, and then flows downward in a play of many colours, whose details are not clear. The colours for these sources (perhaps as symbols of God’s strength and mercy) were originally red and white, but later differentiate themselves into five colours, and from then on into an infinite play of colours. The source of darkness is not conceived, as one might expect, as uniform obscurity, but of a mixture of green, blue and white. In another passage it is designated as “the light that is too dark to shine.” The ten lights which, in the same way as the ten Sefiroth, break out of the original source, are not, however, colours but have other attributes of light such as “wonderful,” “hidden,” “sparkling,” “clear,” “bright,” “radiant,” etc. The dark which is also here called “darkness” is the fullness of light that blinds the eye. If this light is called darkness, it is not because it is really dark, but because no creature, neither angel nor prophet, can stand it or comprehend it.⁴¹ This explanation of dark light parallels, on another plane, the mystical “Nothing” of the Kabbalists which is only called that because it is beyond the knowledge of all creatures. Actually, this “Nothing” of divinity is—to repeat the Kabbalistic explanation at the end of the thirteenth century—“infinitely more real than all other reality.”⁴²

⁴⁰ This expression reflects perhaps the Jewish version of the neoplatonic terminology of Scotus Erigena, who rendered the *hyperousia* of Proklus as *superesse*. “The light that is hidden in the *superesse* (hebrew *tossefeth*) of the inaccessible (literally, hidden) darkness (of the pure divinity)” would then be a more correct translation of this difficult sentence. In the almost contemporary writings of Azriel von Gerona *superesse* is used for the Biblical word *yithron*. The two words contain the element of “excess” which approach the meaning of *superesse* which in Hebrew is difficult to translate. For the Hebrew text, see A. Jellinek, *Auswahl kabbalistischer Mystik*, Leipzig, 1853, p. 10.

⁴¹ Cf. Scholem, *Ursprung und Anfänge*, pp. 296-7.

⁴² Cf. Scholem, *Die jüdische Mystik*, p. 25 and 353, where reference is made to Scotus Erigena’s same terminology in *de divisione naturae*.

Actually the symbolism of light evoked in this explanation originates from the first sentences of the Zohar, which gives a mystical interpretation of the first word in the Bible *Beresbith*, the birth of the point of origin conceived by Zohar as the symbol of Divine Wisdom, written in solemn Aramaic and described in bold images. "In the beginning as the king's will began to act, he dug signs out of the heavenly aura (that is, the primordial ether that surrounded him). A dark flame sprang from the most hidden realm of the mystery of *En-Sof*, like a mist that grew out of the formless, surrounded by the ring of this aura, not white nor black, not red nor green but deprived of all colour. It was only when this flame took shape and extension that it broke out in gleaming colours. At the inner centre of this flame arose a source in which colours poured downwards, hidden in the secret mysteries of *En-Sof*. The source broke through and yet did not break through the surrounding ether and became absolutely unrecognizable until the force of the break-through lit up the highest hidden point. Beyond this point nothing can be known, and therefore it is called *Resbith*, Beginning, the first word of creation."⁴³ It is by a symbolism of colours or light that the author of *Sohar* represents the events within the highest Sefira, that in *En-Sof* are designated as heavenly aura or primordial ether. In many Kabbalistic texts of the thirteenth century this dark flame is called in Hebrew *mith'alleim* i.e., "withdrawing" or "completely hiding." In a very early description of the ten Sefiroth it is designated as the first Sefira, the bearer of all the differentiations, and compared to the mirror in which there is no colour or form, but which reflects all kinds of colours.⁴⁴ The comparison with the mirror makes one think of other comparisons used for the *Hyle*, the original matter which without form itself carries and shows all the forms. Thus in the world of Sefiroth the colourless, hidden light is a kind of *Hyle* for all the Sefiroth which are derived from it.

⁴³ Zohar I, 15a, cf. the full text of these pages in Scholem, *Die Geheimnisse der Schöpfung*, Frankfurt 1971 (Inselbücherei no. 949), p. 49 ff.

⁴⁴ *Sod ba-sefiroth*, Mss. Vatican hebr. 171, fol. 133a, cf. also *Ursprung und Anfänge*, p. 297, and my Hebrew study on the *Spuren Gabirols in der Kabbala* (1940), p. 173.

⁴⁵ Zohar II, 239a.

Where the Kabbalists establish a clear distinction between *En-sof*, the *deus absconditus*, and the highest Sefira, it becomes clear that *En-Sof* is beyond all metaphors and symbols. There can therefore be no question of colour or light in it, as the Zohar expressly states.⁴⁵ *En-sof* is simply that which is without form. "It is without any form; neither question nor concept that arises from the intellect can reach it. But from that which is most hidden, from whence the descent of *En-Sof* begins (in the realm of Sefiroth) shines a subtle not yet recognizable light, hidden as the point of a needle. From thence a light streams from primordial thought which provides the archetypes for all the letters."⁴⁶ The colour symbolism, which in Sefiroth creates the living divinity, begins by this act the first triad; these Sefiroth could also be described as the garments in which *En-Sof* is clothed. It is only rarely, notably in a very late stage of Zohar, that the first Sefira, *Keter*, is called black in relation to *En-sof*, designated here as "the origin of origins." This implies that the metaphor of the colour black is in comparison to the fullness of infinite light of the primordial cause.⁴⁷ There were many possible ways of developing the origin of colour symbolism; one finds evident references in Azriel of Gerona, in Zohar and in Moses Cordovero, who devoted a whole chapter of his kabbalistic compendium to this colour symbolism.⁴⁸

In Azriel's "Commentary on the Ten Sefiroth" (around 1220-30) the first Sefira is designated as the "hidden light" as stated above, a completely colourless light. The second Sefira *Khokhma*, Wisdom, includes all the colours, without possessing itself a specific colour. On the other hand, the author recalls a Hebraic play on words whereby the dark blue, *tekheleth*, is etymologically connected with *Takblith*, taken in the sense of limit (specifically to black), but can also be used in the sense of the "quintessence of all the colours."⁴⁹ According to Cordovero, this definition ap-

⁴⁶ Zohar I, 21a.

⁴⁷ *Tikkune Zohar*, Kopy's 1825, no. 70, fol. 135b: "Even the most radiant lights were dark before him."

⁴⁸ *Pardes Rimmonim*, composed in 1548, Cracow 1591, leaf 71a-73d; in the pages which follow, the paragraphs of the chapters are cited as follows: Cordovero § ...

⁴⁹ Azriel, *Perush esser sefiroth*, Berlin 1850, § 9; also in *Sod ha-sefiroth*, Mss. Vatican 171, where it states that this blue is not a colour, but the po-

plies to the transparency of the sapphire which, as we have seen, Maimonides considers to be the substratum of all the colours.⁵⁰ For Cordovero the true pure blue belongs rather to the lowest Sefira which includes all the others. According to Azriel (and to many other Kabbalists) the third Sefira, *Binah*, corresponds to green; this goes back to a Talmudic passage that has never received satisfactory explanation. Thus *Tobu*, the void in Genesis 1:2, is designated as “a green strip encircling the earth.”⁵¹ For this mystical exegesis of Genesis, the *Tobu wa-bobu* is nothing other than the two Sefiroth *Khokhma* and *Binah*, out of which, as out of chaos in the creation story, all other powers and realities first arise from the spiritual world.⁵²

Cordovero differentiates three aspects from which the highest Sefira can be seen. In relation to its source in divinity, it can be called black, in relation to itself it is colourless, but in view of its manifestation in the lower Sefiroth it represents “the highest degree of white.” This latter symbolism goes back to the bold anthropomorphic descriptions of the Zohar which describe the highest forms of the divinity revealing itself as “the white head” according to the vision of Daniel.⁵³ The correspondence of the colour white to the highest Sefira can also be explained by the Aristotelian concept, well known to the Zohar that all colours in the world are contained in white.⁵⁴ Gikatilla also says: “The origin of all colours is white, their end black.” Cordovero draws

tentiality of all colours. The etymology of *tekheleth* mentioned in the text probably comes from Abraham ibn Ezra's Commentary on Exodus 25:4, explained in more detail in the shorter version which was published by I. S. Reggio, Prague, 1840, p. 78. S.R. Hirsch explains this passage as the colour which lies at the “limit of our horizon” and which points to the invisible, to the divine, which goes beyond our physical horizon. (This is not far from the Kabbalistic concept).

⁵⁰ Cordovero § 2.

⁵¹ *tract. Hagiga* IIb, cf. M. Joel, *Blicke in die Religionsgeschichte des zweiten Jahrhunderts* I, Breslau 1880, p. 142.

⁵² Azriel, *Perush 'Aggadoth*, ed. Tishby, Jerusalem, 1943, pp. 89, 102-105.

⁵³ Very frequently in Zohar in the *Idras* and in the passages entitled *Mathnithin* (mystical Mishna). Also found in Joseph Gikatilla, *Sha'are Orab*, Offenbach 1715, fol. 110b. The expression *Mabsof ha-lovhen* (Genesis 30:37) is mentioned in the same sense as the name of the first Sefira in the meaning of the “uncovering of the white” in the Sefiroth nomenclature of the thirteenth century. Cf. no. 65 and 93 of the list in *Kiryath Sefer* X (1934), pp. 505, 508.

⁵⁴ Zohar III, 128b (*Idra rabbah*), 293b (*Idra zutta*); Gikatilla, *loc. cit.*

from an unidentified source the symbolism of *Khokhma*, which contains the seven colours of the eye described by medieval physiology,⁵⁵ he considered this in certain constellations as a correct symbol for this Sefira. *Binah* is not only symbolized by leek green, but also by the yellow of egg and red white.⁵⁶ One is tempted to see therein a development of the idea of green and red as complimentary colours. One does not find, however, a consistent symbolism of the first three Sefiroth in the main part of Zohar, apart from the already mentioned great anthropomorphic colour play in the description of the “white head” and its different anatomical parts. Zohar puts more emphasis on the symbolism of the second Triad, of the three intermediary Sefiroth. Added to this is colour symbolism for the last Sefira which is just as richly developed, whereas for the third Triad colour symbolism hardly plays any part.

Nearly all the Kabbalists agree in saying that the Grace and Severity of God are symbolized by white and red; their synthesis, realized in the balance of Mercy, is represented by the mixture of these two colours, sometimes by purple, but above all by green. This agrees with the directions concerning the graphic representation of the so-called Tree of Sefiroth, where no difference is recognized.⁵⁷ It only remains for me to speak of one notable exception to this symbolism.

These colours appear in the oldest Kabbalistic text known to us, the *Sefer Bahir*. Referring to a verse in Isaiah 55:1 where there is a question of wine and milk, it is said: “What have they to do with each other?” That means, in effect, that the wine is a symbol of Fear or Severity and milk of Love or Grace. And why does he mention the wine first? Because it is nearer to us (meaning their order in the world of Sefiroth). “Wine and milk, you say? Understand thereby for more the colours of wine

⁵⁵ Kaufmann, *Die Sinne*, pp. 86-94, on the seven skins of the eyeball in medieval literature. These are also partially interpreted in colour mysticism and cited in the *Tikkune Zohar*, for example, in the introduction, fol. 14a and No. 70, fol. 128.

⁵⁶ Cordovero § 2.

⁵⁷ Such instructions, *Seder Siddur ha-’ilan*, are found about the middle of the fifteenth century in a manuscript of the Jewish Theological Seminary, New York (Inventory Number 76362) col. 106-112.

and milk (red and white).⁵⁸ This agrees also with the symbolism (§ 35) of silver (white) and gold (red) which Bahir attributes to these two Sefiroth. For Cordovero the Sefira of Grace is sometimes simply white, sometimes, however, a blue white inasmuch as Grace unfolds out of *Sophia*, Wisdom, conceived of as blue. He adds here that natural silver is an impure white before the silversmiths—the term used here could also be used, in its precise sense, for alchemists—transform it into white by fusion.⁵⁹ Even the sphere of rigorous severity, in antithesis to the former, can be seen in various shades of red. Deep red that is almost blue or black alludes to the intensity of Judgment or Vengeance,⁶⁰ whereas when its actions are milder, it is replaced by yellow red or light red. Finally, it is necessary to speak of the different amalgamations of gold which, according to a Talmudic tradition, are of seven kinds.⁶¹

The question arises why gold, the most valuable metal in our world, is considered to be in a lower sphere than silver, which represents Grace. Zohar answers this questions with a remarkable meditation, behind which seems to be a mystical concept of the alchemists' transformation of metals into gold. The pure mystical gold is here considered as superior to silver and as belonging to the Sefira of *Binah*, which is the absolute fear of God. "And that is gold that shines and flashes in the eyes, so that when it appears in the world, from whoever acquires it and hides (*sic!*) it within, appears a stream of all the other kinds of gold. It is only when it changes from that (highest point, but not specifically named) into blue, black and red colours that it belongs to the sphere of rigorous Severity. True gold, however, belongs to joy and has its place therein, where from the absolute fear of God joy arises and climbs. Silver is below, according to the mystery of the right arm (the quality of grace), for the

⁵⁸ Scholem, *Das Buch Bahir*, Neudruck Darmstadt 1970, p. 100 (§ 93).

⁵⁹ Cordovero § 3.

⁶⁰ For this the Kabbalists always refer to Isaiah (63:1-4, where God in a red garment treads on the winepress of nations).

⁶¹ *tract. Yomah* 44b. I have dealt with this passage in Zohar II, 148a in more detail in "Alchemie und Kabbala," *Monatsschrift für Geschichte und Wissenschaft des Judentums* 69 (1925), pp. 22-25. On p. 22 I proved that Moses of Leon, the author of the principal part of the Zohar, referred in a Hebrew writing to the alchemists who understood well the "Great Work."

highest mystical head is of gold, as stated in Daniel 2:38: "You are the head of gold." ...But when the silver becomes perfect, it is then contained in gold. It is in this way that (in its completion) silver becomes gold and its place is perfect. Copper also arises out of gold which is degraded, and that is the left arm in the vision of Daniel: "The left thigh is blue and the right is purple red that is included in the left." The superior mystical gold, however, is a hidden secret and is therefore called in the Bible (I Kings 6:20) "hidden gold which the earthly eye cannot perceive whereas it can perceive inferior gold."⁶²

"All red and black allude to the quality of rigorous Severity, and all white to Mercy" said the Castilian Kabbalist Isaak ben Jakob Kohen⁶³ shortly before Zohar. In the mystical description of the events on Redemption day, Zohar indicated that when the High Priest came before the Holy of Holies to obtain pardon for the sins of Israel, he was attached to the outer world with a gold coloured cord. If this cord became white it was a sign that his prayers had been heard, if not, it showed that the priest himself was a sinner and his prayers had not been accepted.⁶⁴ It is appropriate here to cite a description of a vision of light that is the only one of its kind in Zohar; it is by Rabbi Chriskija, one of Zohar's spokesmen who, during an explanation of modes and forms, speaks of divine Mercy. He refers to a verse in the Song of Solomon 7:11. "I am my beloved's, and his desire is for me" which he understands as follows: the relation to God in the depth of contemplation arises out of desire for him. "I was sunk in contemplation and lo, a sublime ray of supreme light expanded its splendour into three hundred and twenty five circles. And there was something dark in this light, as when one bathes in a deep stream whose waters come from higher regions and flow in all directions. Shining with a liquid light, it climbs to the bank of this sublime and profound sea from which all good results proceed. I asked for the meaning of this vision and I was told: 'You have seen the forgiveness of sins.'⁶⁵ The

⁶³ Compare the text in *Madda'ei ha-Jabaduth* II (1927) p. 280.

⁶⁴ Zohar III, 67a; 102a; *Zohar Khadash (Midrash ne'elam)*, Warsaw, 1888, fol. 19a, 21a.

⁶⁵ Zohar III, 132b (*Idra rabbab*). This vision is a recollection of the Talmud passage in *tract. Sanhedrin* 111a-b, where Moses "saw" the patience of God

darkness, which bathes in splendour, in order to ascend to the primordial sea of light, represents the severity of God's judgment, which is dissolved in the Grace of Love of God in the forgiveness of sins."⁶⁶

The synthesis of these two Sefiroth achieved in the sith, *Tifereth*, appears mostly either as a mixture of red and white or as green. In Hebrew this colour can also mean yellow, as Cordovero explained. However, the symbolism of blue and of purple, in which the three colours—white, red and green—are united, is also present here.⁶⁷

It is the symbolism of white which, according to the custom arising in the sixteenth century under the influence of a Saffidic religious movement, causes the Kabbalists to wear white garments on the Sabbath. This custom is referred to many times in the writings of Saffidic mystics.⁶⁸

It is strange that it is not related to the Sefira, *Khessed*, where white is conceived as God's Mercy; it is rather connected with a custom of the *Tanna Jebuda ben Illai*, who presented himself to his disciples, clothed in garments like an angel of God.⁶⁹ Similarly, the (white) garments of light of the angels are referred to here, as was mentioned in the literature on angels.⁷⁰ Through the authority of Isaak Lurias, who gave a mystical basis for this

This "forgiveness of sins" is one of the characteristics of God in Exodus 34:6 ff. which was known in the Jewish tradition as the "thirteen *Middoth* (or attributes)." In the course of the above-mentioned passage Simon ben Yokhai, the legendary chief spokesman of Sohar, says: "I have also seen the thirteen Middoth before me as radiant lights."

⁶⁶ Cf. Ignatz Stern in his analysis of Zohar, in the journal *Ben-Khananya* I (1858) 1 p. 509.

⁶⁷ In Zohar III, 215a two opinions are mentioned: the customary opinion where the patriarch Jacob (the Sefira *Tifereth*) corresponds to green, and also the unusual interpretation where he is represented by unmixed white because no degenerate sons descended from him as Ishmael did from Abraham (whose white approaches green) and Esau (Edom) from Isaac (whose white approaches red). The green for Ishmael evidently alludes to the green flag of Islam. The red colour for Edom, originally the Roman Empire, and in the middle ages, Christendom, is the colour of martial Rome and Christianity, and represented for the Jews their bloody persecutions.

⁶⁸ Solomon Schechter, *Studies in Judaism, second series*, Philadelphia 1908, pp. 297 and 299, mentioned this text.

⁶⁹ *tract. Shabbath* 25b.

⁷⁰ *3 Henoch*, ed. Odeberg, ch. 18, p. 62; According to *Yomab* VII § 3 the angel as high priest in heaven (Gabriel) wears white garments.

custom, it became very popular in Europe and in Islamic lands⁷¹ in the middle of the seventeenth century. The recommendation to wear white clothes on the Sabbath was introduced into the Zohar text through an error.⁷² A contemporary of Sabbatai Tsvi, the Messiah of 1665/6, reports, in somewhat unreliable contexts, that the latter wore white satin during solemn ceremonies.⁷³ Afterwards the custom is often verified⁷⁴ and passed from Kabbalistic circles to the Hassidim whose leaders, the Zaddikim, generally wore white garments.

⁷¹ This is reported in the name of Luria in Chaim Vital, *Sba'ar Ha-Kawwanoth*, Jerusalem 1873, fol. 63a; see also Jacob Zemach, *Naggid u-Mesawweb*, Amsterdam 1712, fol. 51a; also *Shulhan Arub Ha'ari*, Jerusalem 1961, p. 100.

⁷² *Zohar Khadash*, Venice 1663, fol. 59b. There is nothing on this subject in the first two editions of Saloniki 1595 and Cracow 1604.

⁷³ De la Croix, *Mémoire... contenant diverses relations de l'Empire Ottoman*, vol. II, Paris 1684, p. 306. When he received a delegation in 1666 from Poland, which had at that time suffered severe Jewish persecution under Chmelnicki, he wore a red robe in order to allude to the vengeance for bloodshed (Isaiah 63:1). Cf. Scholem, *Shabbetai Tsevi, the Mystical Messiah*, Princeton 1973, vol. II, p 623 f.

⁷⁴ This custom is described in detail in *Khemdath Yamin*, Venice 1763, I, fol. 20d-21c and in a Responsum of Rabbi Meir Eisenstadt from the beginning of the eighteenth century, *Panim Me'iroth*, II (1733), no. 152.