The Unity of Nature

Carl Friedrich von Weizsäcker

TRANSLATED BY Francis J. Zucker

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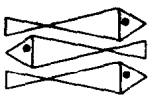

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Preface

With one exception, the essays and lectures collected in this volume were written in the years 1959 to 1970. Most of them have already been published in various places; some that seem important to me have remained unpublished until now. The volume is in a way a continuation of the collection *The World View of Physics,* completed in 1957.[1]

I regard the essays here collected as portions of a unified whole that is explicated in the Introduction. To underscore this unity, I have written prefatory remarks for the four Parts of the book and for the individual essays, and have interpolated a large number of footnotes in the text to provide cross-references. For the sake of convenience, I have chosen a quasi-outline system of organization, which is indicated in the Table of Contents.

The demands made by these essays on the reader's intellectual background differ according to their origin. I have placed the easier ones at the beginning of each Part. No special scientific knowledge is presupposed in Part I, with the possible exception of I.5. Part II is the most difficult one for the non-physicist. II.1 may serve as a kind of introduction; the reader in need of a preparatory text should perhaps consult the small volume *Contemporary Physics,* by J. Juilfs and myself.[2] Part III is more easily understandable; III.1 and III.2 are loosely formulated talks that introduce the problems. IV.1 plays an analogous role in Part IV, which does presuppose some knowledge in the history of philosophy.

[1]C. F. von Weizsacker, *The World View of Physics,* trans. by M. Grene (Chicago: University of Chicago, 1952) This translation, which is based on the 4th German edition, does not contain all the essays included in the 7th German edition, *Zum Weltbild der Physik* (Stuttgart: Hirzel, 1957). —Translator.

[2]C. F. von Weizsäcker and J. Juilfs, *Contemporary Physics,* trans. by A. J. Pomerans (New York: Braziller, 1962). —Translator.

Introduction

The following essays serve to exhibit a *single* philosophical idea, the idea of the unity of nature. One could insist that the presentation of such an idea should itself display a unified form. Philosophical tradition suggests the "system" as a form that unity could take. I have not succeeded, however, in presenting the idea of the unity of nature systematically. At the beginning of this Introduction I would like to relate the form in which the presentation of this idea here appears to the content of the idea.

Written over a period of about twelve years, partly in compliance with public requests, partly in response to my own needs, but in any case on scattered occasions, these essays and lectures are the work of a politically active professor of philosophy who was trained as a physicist. I have excluded from this volume an approximately equal number of political essays and lectures which were written at the same time.[1] More detailed, systematic presentations of individual topics were also begun during this period, but have not yet been completed.

The idea underlying these essays appears to me like a submerged mountain range slowly rising above the surface of the sea. A few isolated peaks emerge as islands. By and by, they form an archipelago whose layout and contours intimate the topography of the whole. The structure thus intimated should make it clear why no one person can systematically present the whole.

Knowledge of nature which the modern mind considers valid is termed "natural science." An awareness of the unity of nature would have to express itself scientifically in a unification of the natural sciences. Science in the modern sense is the collective achievement of a social group. The realization of the unity of nature, if scientifically feasible, can come about only as a result of this collective achievement. Therefore, so long as science remains incomplete, the idea of the unity of nature can be presented only in the form of a program illustrated by examples. In this conception, philosophy does not play the role of a fundamental science which formulates the principles for the specialized disciplines in a historically a priori sense; philosophy is indispensable, not to lay down the laws, but to continue asking the questions. The specialized disciplines validate themselves precisely by ceasing to

[1] See, however, C. F. von Weizsäcker, *Fragen zur Weltpolitik* (Munich: Hanser, 1975) and *Wege in der Gefahr* (Munich: Hanser, 1976) (*The Politics of Peril* [New York Seabury Press, 1978]), which include some of the ideas in the above-mentioned essays and lectures. —Translator.

ask for a justification of their own principles. In so doing, they cement their pluralism. The legitimate question as to the meaning and justifiability of the principles reappears in the form of another mode of inquiry, that of philosophy. The truths in question are one and the same, however, and if philosophical questioning leads to insights of sufficient depth, it will produce a conceptual fusion of the specialized disciplines; i.e., a more highly integrated science.

This idea, at first merely skeletal, will I hope be given flesh and blood in the essays that follow. I have arranged the book in four Parts, whose themes are stated in the Table of Contents. These themes, first of all, arise quite naturally in the ambience of a modern philosopher of nature. Under the title "Science, Language, and Method" I take up some of the contemporary methodological issues and thus deal with current problems in modern philosophy of science. The two large domains of contemporary natural science—the sciences of inorganic and of organic nature—are treated in the next two Parts, within the context of the unity of physics, which is my central concern. Finally, this enterprise has to be tied in with classical philosophy, a task tackled in Part IV.

In this sequence of topics one might also discern an ascending reflection on the concept of unity.

Most contemporary philosophers of science accept the sciences in their plurality and look for unity not in the objects of science but *only* in its methods. I am convinced that in this way we do not even arrive at an authentic unity of method. The essays of Part I try to cut a swath through the underbrush of inconclusive ruminations in this field. In almost every one of these essays we notice, however, that we have not progressed beyond an outer courtyard of philosophy.

Part II is an attempt to consider seriously the unity of the object; in that sense it is the topical center of the book. The object in question is "nature," a translation of the Greek term *physis*. The science which ought to give expression to the unity of nature is even today called physics. Once elucidated, the unity of nature would therefore also be the unity of physics. The historical development of physics can indeed be viewed as a path to unity. But here we must face the question of how our consciousness, which has become so very discerning in matters methodological, is supposed to conceive of the unity of physics; we do not, after all, wish simply to vault over the inconclusive methodology-oriented philosophy of science by begging the issue. The query: "How is the unity of physics possible?" therefore leads us back to the question: "How is physics possible?" Viewed methodologically, phys-

ics is an empirical science; i.e., a science based on experience. The unity of experience appears to be a metaphysical postulate as long as we do not ask: "How is experience possible?" Experience is a process in time (e.g.: we learn in the present, from the past, for the future). The rich structure of time is therefore one of the preconditions of the possibility of experience. The essays in Part II develop my claim that the general, and therefore unifying, laws of physics formulate neither more nor less than the possibility of experience itself. Physics, this implies, is possible only because the unity of physics is possible. Thus the object dealt with in science can now be as little detached from the method as previously the method from the object. The unity of nature, understood as the unity of physics, becomes the unity of experience.

Our conception of the unity of nature as experienced by man presupposes the dualism of subject and object, of man and nature. One could ask for a higher unity, the unity of man and nature. As a preliminary inquiry into the question of that unity I have, on an earlier occasion, studied the mutual dependence of man and nature under the aspect of their historicity. Nature is older than man,[3] and man is older than natural science.[4] We must therefore comprehend natural science, with all its concepts of nature, as the work of man, and man, with all his cognitive capabilities, as a child of nature. These requisites close in a circle whose center, figuratively speaking, is what makes the circle possible; i.e., the sought-for unity of man and nature. Before reaching this point, however, we, as modern scientists, must traverse the two semicircles which constitute the circle. This is what the two middle Parts of the book try to do. Part II studies the unity of science as a function of human performance, i.e., of experience, which, admittedly, is in turn possible only insofar as nature can in fact be experienced; in other words, this part deals with the unity of science only in the still unanalyzed context of the essential interrelation of experiencing man and experienced nature—i.e., of the sought-for unity.

Conversely, the question behind Part III is how man, understood as child of nature, can gain knowledge; i.e., truth. Several steps must be taken. First of all, the unity of nature must be understood as encompassing organic nature; this is the theme in the foreground. Physicalism in biology is fully endorsed in these essays—as a hypothesis, of course. If the unity of physics rests on the possibility of objectifying

[3] C. F. von Weizsäcker, *The History of Nature*, trans. by F. D. Wieck (Chicago: University of Chicago Press, 1949).

[4] C. F. von Weizsäcker, *The Relevance of Science: Creation and Cosmogony* (New York: Harper & Row, 1964).

experience, then physics must be applicable to biology to the extent that biology can be analyzed in terms of objectifying experience. The irritation occasioned by this "reductionism" is, I think, merely a consequence of the unclear conception of physics most people have. The second step consists in the genetic embedment of man in nature through the theory of human evolution; this hypothesis, too, I wholeheartedly accept. The third and most important step is the completion of this embedment through a physicalist theory of human performance. Cybernetics hopes to furnish such a theory, and that is why cybernetics is the real theme of Part III. Again, I do not in any way question the program of cybernetics, at least as a hypothesis; indeed, I investigate what it leads to if it works. Man's ability to achieve true knowledge is the human performance that most concerns us here. A cybernetics of truth is therefore the central theme; my contribution to it, to be sure, is only a preliminary study. Part III ends with an essay which—the first turn around the full circle having been completed—begins to traverse it a second time by injecting the consequences of the cybernetic approach into the basic notions of physics. This essay presents a sketchy philosophy of the concepts of form and information.

A further level of reflection is required and has in fact, in a rudimentary form, already been reached in the earlier Parts. One may call it the question of the unity of the One, or the question: "What do we really mean when we talk of unity?" This happens to be the figure of thought in classical Western philosophy. And we have in fact been operating within that universe of discourse all along. The question as to the preconditions of the possibility of experience, which guided us in Part II, is the point of departure in Kant's philosophy. The recourse to the concept of form, to which cybernetics obliges us, brings us face to face with the points of departure in the philosophies of Plato and Aristotle. The unity of the One is, at least in Plato's interpretation, the primal proposition of Parmenides. These connections are thematized in Part IV, again merely in terms of suggestions and examples. In the questions posed by the classical philosophers we encounter our own questions once again, though on a level of reflection whose very possibility is usually unknown to us as scientists; on the other hand, these questions come to us in historical styles of thought from which we have become estranged, and they come embedded in a state of empirical knowledge that we have long since left behind us. We can learn from these questions only if we try to interpret them in their historical setting and, to the extent that we are able to do so, on the high level

on which they are posed. To have been professionally obliged to do just that for over a decade was the reward I reaped for my shift from physics to philosophy. That I have remained a dilettante, i.e , a devotee of the new discipline, will not escape the attention of my philosopher colleagues, and will perhaps be forgiven by them. The last Part of the book remains the most incomplete. It does interpret the classical thinkers in the—perhaps only barely permissible—form of a colloquy on the questions we share with them, but as interpretations of the philosophers and as results of my own philosophical questioning, these essays constitute only preliminary studies. Let me illustrate this in connection with a central question.

In classical philosophy, the One is a conception of God. The unity of nature, in this philosophy, is the modality in which nature makes God manifest. That is what the term "spirit"[5] refers to whenever it appears in the essays of Part III. Time is now found to be the first precondition for the possibility of experience, and thereby also for the unity of nature. Furthermore, it is in historical time that the circle of the mutual interdependence between man and nature is placed. The unity of man and nature, of subject and object, appears to be grounded in the unity of time. How does the unity of time relate to the unity of the One? That is a question the present work does not take up.

[5]In this book, *Geist* is translated as "spirit" when used as in the above context, and as "mind" whenever its purely intellectual aspect is intended. —Translator.

PART I

Science, Language, and Method

PREFATORY NOTE

As stated in the Introduction, this Part has a preparatory function. It accepts the sciences as they present themselves and in discussing some of the problems of their interpretation and justification hopes to show the need for the further clarification of their foundation.

Essay I.1, a synopsis of the contemporary sciences, points out some of the problems that must be dealt with in the immediate future.

The following three essays, I.2 through I.4, concern the problem of "language and science." Their point of departure is the tension between the demand for an unambiguous language for science and the protean and ambiguous nature of the natural languages. Two attempts to solve the problem on a purely linguistic plane will be discussed; these two are polar opposites of each other. The first attempt is the creation of a formal language for science, described in I.2 for logic and in I.3 for physics. The second, discussed in I.4, is the theory of linguistic relativism, which regards the meaning of knowledge, including scientific knowledge, as fundamentally dependent on the language of the culture that gave it birth. I try to show that neither attempt succeeds in ridding itself of what it cannot assimilate: the formal languages cannot dispense with natural language, which alone can convey meanings; and linguistic relativism cannot escape the language-bridging nature of material issues. To understand the relationship between science and language it is necessary, with the help of language, to take up the material issues of science.

The two concluding essays treat more substantive, though still methodological questions of particular sciences, in continuation of the themes in I.2 and I.3: I.5 once again deals with logic; I.6, with physics. In logic we study the relation between universality and certainty in terms of Lorenzen's operative foundation of logic. I posit that we perceive universality as such, but that this perception does not imply certainty. Under the title "perception of forms," this discussion in effect thematizes Plato's theory of ideas, which is treated more extensively in Parts III and IV (particularly in III.4 and IV.5). The essay on physics (I.6), a transcript of a lecture, outlines some problems in the methodology of physics and includes a challenge to certain claims of the empiristic philosophy of science. Even critics of positivism (for example, in recent years, J. Habermas) grant too much to positivism in their description of science. I attempt to show in I.6 that one cannot