

Language and Learning
The Debate between Jean Piaget
and Noam Chomsky

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PREFACE

IN OCTOBER 1975 the participants in the debate between Jean Piaget and Noam Chomsky met at the Abbaye de Royaumont near Paris. This book, a rare testimony, emerged from that debate, the first, and to this date the only, personal encounter between the founders of genetic epistemology and of generative linguistics, two conceptual systems that from their beginnings have inspired innumerable scientific works throughout the world. In essence the debate is between two still-developing programs, defined by some as two of the major scientific revolutions of our time. The light shed by the meeting at Royaumont is bound to extend far beyond the circle of what I would call the natural readers of this book—linguists, psychologists, and epistemologists. Pioneers in the fields of neurobiology, ethology, animal psychology, cognitive anthropology, artificial intelligence, and philosophy of mental processes took an active part in the debate between Piagetian constructivism and Chomskian innatism, widening its scope and allowing for an unprecedented synthesis. Philosophers of science and every person attuned to the development of scientific theories will discover in this book an eyewitness account of the processes of scientific consensus.

Piaget's and Chomsky's theories have created an intense and growing fascination in a number of fields of research. Often relying on scanty information or even a "principle of authority," people talk about the two systems as scientific paradigms. The theoretical positions and the data on which they are founded are discussed here in the light of objections raised by specialists from other areas. *Language and Learning*, in short, is intended

to be a vast, critical inventory of the research strategies that in the future will give us new insights into the problem of human nature. Reading such a book may constitute a turning point for anyone interested in the foundations of language and the development of cognitive structures. In order to make the book accessible to a wider public, I have endeavored to remove unnecessary technical jargon and to clarify any references that might prove an obstacle to the lay reader.

Before giving an overview of the book's structure, I would like to explain the origins of the meeting and the special circumstances that allowed for its realization. The observation that convinced the Centre Royaumont pour une Science de l'Homme to organize the debate was this: the well-known theory of cognitive development elaborated by Piaget and the equally famous theory of generative grammars elaborated by Chomsky were being compared more and more frequently—sometimes in terms of oppositions, sometimes in terms of complementarity—in courses, lectures, epistemological discussions, and specialized reviews. However, an examination of the works of these two authors reveals that cross-references were few and unsystematic. The analyses of Piaget's theses in Chomskian terms and of Chomsky's theses in Piagetian terms were sketchy at best, and a reader could draw the most disparate conclusions. Taking into account the paradigmatic status assigned to the two theories in examinations of the relationships between what is innate and acquired and between biological and cognitive structures, we at the Centre thought it would be a service to the scientific community to arrange a direct confrontation between Piaget and Chomsky. Beyond the intrinsic interest of such an encounter, we hoped to produce as complete and detailed a document as possible, to arrive at a transdisciplinary synthesis so that in the future all discussion on the oppositions or "compromises" between Chomsky and Piaget would have a firmer base.

Scott Atran, at that time a permanent associate at the Centre, became the main proponent of this idea, and his enthusiasm was contagious. Piaget declared himself willing to meet Chomsky and discuss the foundations of their systems of thought in the presence of scientists working in related fields. Jacques Monod, president of the Centre Royaumont, did not let the opportunity go by, for he had been pondering such a project for quite a long time. This meeting, moreover, was an ideal step toward the Centre's goal of widening communication between

the life sciences and the social sciences. Monod enthusiastically supported the project, helped us to finance it, participated in the discussions, and presided over one of the sessions with the mixture of open-mindedness and ruthless criticism that was such a salient feature of his personality. Because of his premature death, his own comments and questions during the meeting unfortunately could not be corrected or amplified, but they have been transcribed here, testimony to his positions on constructivism and innatism.

The book is based on a transcription of the debate as well as on two papers written for the participants and distributed before the colloquium. Nevertheless, in its present format the book is more than a mere proceedings. Chapter 1 consists of Piaget's brief, programmatic "invitational" text and Chomsky's reply, which together identified the crucial points of the debate. The rest of Part I presents the stages of the debate in their original sequence. However, to emphasize the most important passages and the problems to which the debate brought new solutions, I found it necessary to make selections, develop certain arguments and counterarguments, and omit digressions. The exchanges are respected nearly word for word for entire pages; I did, however, seek a compromise between literal fidelity and free recreation, making a special effort to preserve the "convivial" character of the colloquium.

After carefully rereading the transcriptions, the authors were given the opportunity to amplify their comments, in some cases quite extensively. Any new or newly formulated arguments were then communicated to their challengers, sometimes provoking fresh or more detailed responses. As a result of these additions, the transcriptions gained in clarity and rigor. I felt that it was unnecessary to indicate in the text the transitions between the original debate and later additions, because the spirit of the discussion has been respected everywhere. The result, deemed acceptable by the authors, is therefore an enlarged, enriched, and at the same time more concise debate.

Because of the numerous and important changes and this "epigenetic" growth of the transcriptions, Piaget reread the entire manuscript and offered his responses in "Afterthoughts," which concludes Part I.

Part II is a debate on the debate. Hilary Putnam, a logician and philosopher, was not able to participate in the colloquium, but he studied the transcriptions carefully and drew up a rigorous, thought-provoking text. Indeed, his "What Is Innate and Why?"

calls into question some fundamental points made by Piaget, Chomsky, and Jerry Fodor. Piaget responds briefly to Putnam in "Afterthoughts." Chomsky and Fodor each develop detailed and polemical counterarguments, and a short reply by Putnam follows. The four texts of the Putnam-Chomsky-Fodor "quarrel" have been unofficially circulated in some academic circles as a kind of philosophical *samizdat*; we cannot help being delighted that the second part of this book has become a "classic" even before its publication.

In his comments at the end of Part II, Jacques Mehler, a psycholinguist and former colleague of both Chomsky and Piaget (and as such a bridge between the Geneva and MIT groups), draws up a synthetic picture of the actual and potential points of convergence between their scientific programs. Mehler also sketches lines of future research in cognitive psychology and psycholinguistics.

The three appendixes clarify particular aspects of the debate. The idea of phenocopy, introduced in Piaget's opening remarks, rekindled by François Jacob's and Jean-Pierre Changeux's critical comments, and taken up again by Piaget in his "Afterthoughts," still needed a precise definition. In Appendix A, Antoine Danchin analyzes this apparently technical issue, upon which Piaget's biology and the biologists' split. His "critical note," written from a neo-Darwinian standpoint, highlights the sharp divergence between the "instructivist" and "selectivist" theories of the appearance of new forms of life or of new cognitive structures.

Appendix B presents mathematician René Thom's criticism of the Geneva school's theories of the genesis of space, together with Piaget's response to Thom, once again a debate on the debate. It was not possible to make this un hoped-for insight into the problems of mathematical foundations a genuine Part III, solely because of the physical limitations of the book. I hope that this appendix, along with Jean Petitot's very interesting text on the "catastrophic" approach to linguistics, will one day become the point of departure for another debate and another book.

At the beginning and end of chapters, I have inserted some introductory remarks, comments, and reminders of crucial points in the debate. These editorial comments are given in italics to distinguish them from the text proper and to help the reader who wishes to follow a particular problematic axis.

I would like to stress that all credit for this achievement must

be given to the competence, generosity, and dedication of the participants. The colloquium and the book would not have been possible without the financial assistance of the Volkswagen Foundation and Editions du Seuil. During the editing phase, the Centre Royaumont benefited from the aid of the Ford Foundation and the Délégation Générale à la Recherche Scientifique et Technique.

I wish to pay my respects to the memory of the late Henri Gouin and to thank Isabelle Gouin for generously offering part of their living quarters at the Abbaye de Royaumont at the time of the colloquium. Constantin Jelenski and Sylvia Duchacek lent us their valuable and efficient assistance during the colloquium itself. The high quality of the bilingual translation is attributable to the remarkable competence of Christopher Thiery. Marilu Mehler transcribed the debates and assisted me in preparing the book. I would also like to thank Joseph Garreau, who did the English translations of Piaget's papers and of many of the other presentations that were originally written in French.

Although most of the debate and the original manuscript were in English, the American edition is being published a few months later than the French edition. This interval has been full of rewards, because the French-speaking public and the press have manifested a keen interest in the book. Some European psychologists and linguists have gone as far as to call it "the book of the year." However, it has become evident that the great interest in the book is accompanied by some frustration among nonprofessionals. Some questions have recurred, such as: "In the end, where does all this lead?" "What is really at stake here?" and "How does that relate to problems in my field?" Quite often, this "field" is simply the human condition.

In the meantime I discovered that the American psychologist Howard Gardner's brilliant, crystal-clear review of the book, originally published in *Psychology Today*, then made available to the French public in *Psychologie*, was a very good "primer." I was glad, therefore, that the director of Harvard University Press had the idea of asking Gardner to write an additional, less technical foreword. It is a pleasure to acknowledge the quality and appeal of Gardner's synopsis, and many readers will find it useful to have the plot and the backgrounds of the main characters presented before they enter the opera house. They will be as grateful as I am both to Professor Gardner for accomplishing a very difficult task and to Harvard University Press for having commissioned it. If cognition, as Gardner contends, has

come of age because of the debate and this book, he must definitely be credited for having made this somewhat elusive event a public fact.

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Massimo Piattelli-Palmarini

FOREWORD

Cognition Comes of Age

Howard Gardner

A FUTURE HISTORIAN of the cognitive sciences—that recently formed amalgam of disciplines which probes the operations of the human mind—might select any of a number of episodes as the initial milestone in the emergence of this field. If struck by the earliest manifestations of interest in mental phenomena, he might revert to the questions posed by classical philosophers—for example, Socrates seeking the nature of knowledge. Searching for less remote antecedents, he might alight on certain dramatic moments in the history of modern thought—Descartes arguing that his existence could be inferred from his capacity to doubt, or Locke responding to Molyneux's questions about the experiences of a blind man restored to sight. If our mythical historian discerned the origins of the cognition movement in the earliest days of experimental psychology, he might describe Wilhelm Wundt's opening of the first laboratory in Leipzig in 1879, or the microscopic investigation by researchers in Würzburg around 1900 of humans engaged in solving problems. If on the alert for seminal publications that have inspired the current cadre of scholars, he might well cite Jean Piaget's *Origins of Intelligence in Children* (French edition, 1936), or Noam Chomsky's *Syntactic Structures* (1957).

Although the time of origin of the cognitive sciences may be a matter of dispute, the time when they came of age seems reasonably clear. Only in the last decade or so have cognitive studies seized the limelight of psychology and pointed toward a significant integration among such diverse fields as philosophy, neurology, and anthropology. Journals have proliferated, many

INTRODUCTION

How Hard Is the "Hard Core" of a Scientific Program?

Massimo Piattelli-Palmarini

It is legitimate to regard this debate as a representative cross section of a scientific domain in full growth, right at the opening of the last quarter of the twentieth century. Though focused on language and learning, the debate presents, in fact, a number of compelling arguments on a wide range of topics, challenging current patterns of explanation both in the natural and in the social sciences. Piaget's constructivism and Chomsky's innatism are to be framed within a long-standing tradition of rational inquiry into the nature and structure of the human mind, and it is against the background of such tradition that theories, facts, and standards of intelligibility can adequately be evaluated. Reflecting most of the methodological options that now lie open for assent before the scientific community, but whose different degrees of cogency are yet to be fully appreciated, the present volume constitutes an exploration more into alternative research programs as a whole than into locally opposing psychological or linguistic theories.

I have attempted in this introduction to draw an outline of the "archeology" of Piaget's and Chomsky's programs, stressing the continuity between each program and their respective analogues in the natural sciences. Jacques Mehler, in his paper, delves into the present structure of scientific programs in psychology, linguistics, and psycholinguistics, charting their actual or possible lines of convergence in an attempt to give a long-term evaluation of the impact of Piaget's and Chomsky's theories. The reader can, however, according to his personal preference, invert the order and read Mehler's comments first

and then the debate, leaving the introduction for the end. Mehler and I have anticipated such an alternative itinerary and have written each section accordingly. The natural scientist and all those who find the genealogical approach to problems particularly congenial may well appreciate the existing sequence. The more analytically oriented reader and the professional linguist or psychologist, on the other hand, may want to enter the debate straight away and jump to Piaget's and Chomsky's own introductory papers. Since this volume has an open structure, it will, we hope, prove to be a rewarding and enjoyable journey no matter which pathway the reader selects.

THE PIAGETIAN HARD CORE

Ontological commitments that are liable to steer a scientific research program must usually satisfy two requirements: to be a priori plausible enough to safeguard the program against destabilization and readjustment (what responsible scientist is willing to accommodate too many ad hoc hypotheses?); and to be at the same time bold enough to lock a vast domain of empirical evidence into nontrivial sets of relations. Programs of systematic inquiry often fail because of inherent inadequacy of the embedded ontological commitments, going too far in one direction or the other. Locke's program and its manifold reenactments, from Condillac's statue to Skinner's pigeon boxes, have foundered on the shoals of a Spartan ontology, committed to the "empty bucket theory of mind," as Popper rightly calls it. Jerry Fodor provides in this volume (see Chapter 6 of Part I and his reply to Putnam in Part II) a vivid account of this momentous wreckage and argues for a much richer ontology of "what is in the mind." The Kantian program has run aground on the opposite bank. This is in part because of the reformation of programs in mathematics and logic that yielded, for instance, non-Euclidian geometries, Bourbakian set theory, logical types, and many-valued logics; and in part because of a progressive "problemshift" (to quote Lakatos) in cognitive psychology, due to Piaget more than to anyone else. Kant's assumptions bearing on the universal built-in limitations of human cognitive ability proved to be too restrictive or, to adopt a modern terminology, chronocentric (parochial to the science of his own time) and adultocentric (*static*, as Piaget correctly specifies in his reply to Bischof). The Piagetian program is, in his own words, "anti-empiricist" and inspired by a "dynamic Kantism." Correspondingly, his ontological commitments are halfway between the empty bucket of the empiricist tradition and the a priori percep-

tual forms postulated by Kant and the neo-innatists such as Chomsky and Fodor. But where precisely do these commitments stand?

From its inception, every scientific program develops out of "themata" extremely general strategies of ordering reality expressed through "quasi-aesthetic judgments . . . with deep psychological roots."¹ Gerald Holton suggests a discipline, called "thematic analysis of science," which adds a third dimension or a "Z-axis" to the empirical and the heuristic-analytical axes heretofore established by historians and philosophers of science. "This third dimension is the dimension of fundamental presuppositions, notions, terms, methodological judgments and decisions—in short, of themata or themes—which are themselves neither directly evolved from, nor resolvable into, objective observation on the one hand, or logical, mathematical, and other formal analytical ratiocination on the other hand."² Interestingly enough, Holton appeals to a Piagetian genetic epistemological analysis of such themes: "It is likely that the origin of themata will be best approached through studies concerned with the nature of perception, and particularly of the psychological development of concepts in young children."³

Let us try to apply a thematic analysis, almost in a self-referential context, to Piaget and to the foundations of his genetic epistemology. It has not escaped the attention of many commentators that Piaget's program in developmental psychology relies heavily on the theme of *equilibrium*.⁴ Subservient to this dominant theme is Piaget's constant emphasis on adaptation, assimilation, homeostasis, and autoregulation. His complex and tightly argued essay on biology and knowledge is, ideally and admittedly, a kind of self-oriented epistemology.⁵ The guiding ontological commitment (*hypothèse directrice*), perhaps a bit acritically justified on the grounds of its "banality" and its "simplicity," (*très simple et d'une banalité complète*)⁶ is the following: "Life is essentially autoregulation." The essay as a whole purports to be a sequential unfolding of the innumerable implications of this assertion. Anticipating what Piaget also states in the present volume, we are told that self-regulation is a *third* way, avoiding both Darwinism and Lamarckism. Cybernetic feedback loops and information flows are the cornerstone of self-regulation, to which cognition belongs as a subdomain proper. The focal problem is "describing those organs that bring about regulations," entailing a search for the mechanisms through which organic regulations include "as a fundamental element of ever-increasing importance, ex-

changes with the environment. These exchanges are subject to their own progressive adjustments." These presuppositions lead to a core hypothesis, out of which the entire program of genetic epistemology has been developed. We read the following, italicized in the original text: "Cognitive processes seem, then, to be at one and the same time the outcome of organic autoregulation, reflecting its essential mechanisms, and the most highly differentiated organs of this regulation at the core of interactions with the environment." Piaget adds that "in the case of man, these processes are being extended to the universe itself."⁷ This I take to be the "hard core" of the Piagetian program, around which a protective belt of strictly psychogenetic hypotheses has been fastened.

There are two interpretations of what Piaget commits us to believing. The weaker interpretation is "simple" and "banal," exactly as he claims; the stronger one is not trivial, but is susceptible to refutation. The weaker interpretation is that the process we call life rests on a process of a more general kind, detectable also in inorganic and artificial systems, called regulation. No biologist since Claude Bernard would contend with that. The stronger interpretation is that regulation patterns and the structures on which they are based get "swallowed" (*englobées*) by the organism by means of a sequence of operations called *assimilation*, *reorganization*, and *accommodation*. The ideal metaphor for describing this stronger interpretation is "transfer of order" or even "transfer of structure." Although Piaget does not himself use these words in exactly these combinations, he nonetheless speaks of *structures of order*, *nested structures* (*emboîtements*), and *epigenotype*⁸ in a dynamic framework that encourages us to relabel the hypothesis in question in a somewhat more provocative, almost blunt statement. Can there be a "transfer of structure" from the milieu to the organism? Piaget's answer seems to be yes. The present volume amply testifies that this is indeed what his evolutionary "third way" boils down to. What Guy Cellérier calls "Piaget's gentleman's disagreement with Darwin" (see Chapter 2) recurs in Piaget's contributions here. His reliance on the notion of "phenocopy" goes toward a transfer of structure, that is, toward what molecular biologists such as Jacob, Danchin, and Changeux purport to exclude categorically. Jacob states squarely: "*There is regulation only on structures and with structures that exist and that are there to regulate*" (see Chapter 2), which must be understood as having an implicit presupposition and an unspoken consequence: the presupposition is that both structures (the regulating

and the regulated) already preexist when regulation takes place; the consequence is that the total range of regulatory mechanisms available to an organism is constrained from the start by the blueprint of that organism. One cannot pierce what Changeux calls the "genetic envelope" of a given species except through random mutations occurring from the inside, unrelated to any "structure" the outside world may offer. Thus Piaget and contemporary molecular biology appear to uphold very different—even antithetical—ontological presuppositions. It seems to me that this debate shows clearly and for the first time that (1) Piaget's "hard core" is to be interpreted according to the stronger version, accommodating the concept of transfer of structures within its constitutive hypotheses, and (2) this assumption openly clashes with the ontological commitments of molecular biologists.

Piaget's hard core corresponds more closely to that of a distinct scientific research program which, although a few biologists like C. H. Waddington and Ludwig von Bertalanffy have adhered to it, shares very little with what is now "classical" molecular biology. This program can be thought of as the "self-organizing systems" approach. In his "Afterthoughts" (Chapter 13), Piaget says that he had, subsequent to the meeting, an "aha-experience" while reading Heinz von Foerster's statement of the "order from noise" principle. We will now turn our attention to this principle in order to get a clearer picture of the inner logic of Piaget's hard core.

THE "ORDER FROM NOISE" PRINCIPLE VERSUS THE "CRYSTAL" PARADIGM

A universal tendency of all systems toward their state of equilibrium has been the focal ontological commitment of classical mechanics, later refined and generalized by analytical mechanics in terms of the principles of "least action" and of "shortest path," and in such sophisticated disguise, this principle has trespassed into contemporary quantum physics. In classical thermodynamics, a complementary and parallel commitment was endorsed and translated into the macroscopic (that is, purely phenomenological) principle of energy conservation and of constant increase of entropy (that is, increasing disorder) in isolated systems. The progressive "problemshift" promoted by Boltzmann's scientific research program of statistical thermodynamics, started somewhere between 1865 and 1870,⁹ became gradually capable of translating these different but related principles one into the other and of making of classical thermo-