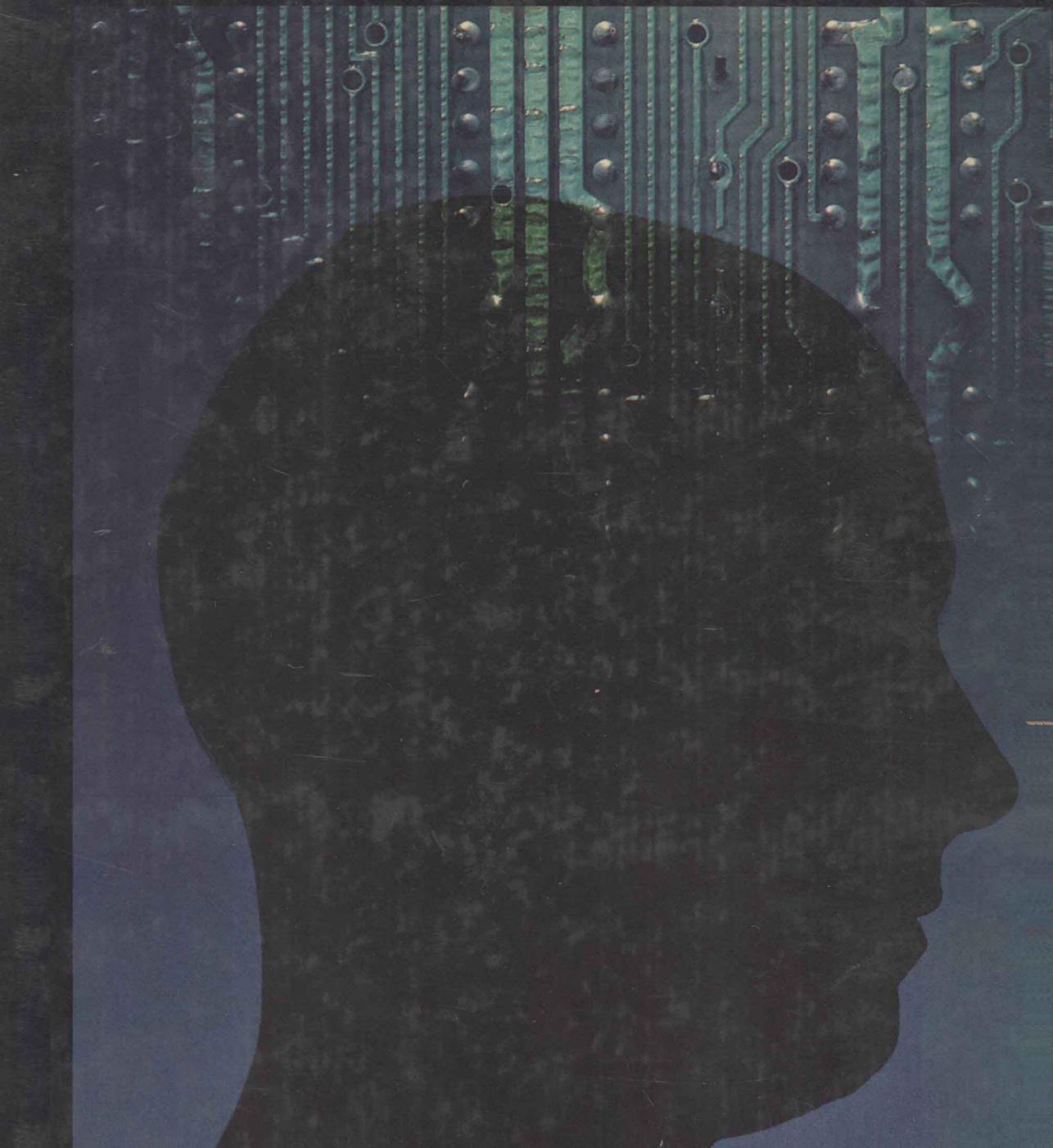
JEAN-DOMINIQUE WARNIER

COMPUTERS AND HUMAN INTELLIGENCE



Jean-Dominique Warnier

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PREFACE

I would like to thank all those who helped me in the writing and the preparation of this book.

The final version follows several earlier drafts. For their contributions to the ideas presented here I am especially grateful to Pierre Colin, who directed my work during the sixties and maintained a strong interest in it afterward, and to Michel Gautier, Pierre Henri Petit, and Michel Dambrine of the *Compagnie Bull.* I would like to thank the *Bureau Intergouvernemental pour l'Informatique* and its director Professor F. Bernasconi who in 1979, with B. Castaing of the *Institut Français de Gestion,* asked me to prepare a report that served as a first draft of the work presented here. I would also like to thank readers of earlier versions for their enlightening comments: Yvon L'Hospitallier, Director of the *Institut de Mathématiques appliquées de l'Université catholique d'Angers,* Yves Dulauroy of *S.I.M.O.G.,* Philippe Medan, and Philippe Toussaint, Director of the *Institut National d'Informatique de Gestion de Paris.*

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Finally, I would like to thank those who did the typing and proofreading of the manuscript, Norma Karlin and those involved in the production of the book, and especially those who undertook the difficult task of translating the book from French to English.

TRANSLATOR'S PREFACE

The first problem to be solved in translating Warnier's *L'homme face a l'intelligence artificielle* was the translation of the French word *"informatique."* A *"Département d'informatique* would be called a Computer Science Department in most North American universities, but as Warnier observes, translation of *"informatique"* by "Computer Science" puts too much emphasis on the machine itself. The words "data processing" carry a very strong connotation of business applications in North America, and Warnier is referring to something larger than that. "Information Science" has about the right connotation, although it sometimes suggests Library Science, and as the author observes in the book, this translation involves other risk of ambiguity. I have translated *"informatique"* by "computing" or "the science of computing." Thus, "computing" is to be understood to refer to the whole field of Computer Science; in particular, it implies much more than mere calculation.

Generally, sentences have been made shorter and paragraphs longer, as is often necessary when translating from French to English. References to *"l'homme"* have been translated by "humans," "human beings," "people," "one," and "we." The word "we" also refers sometimes to Warnier himself, as do the words "the author" and (in the Conclusion, where he adopts a more personal style) the word "I."

N.S.

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1

INTRODUCTION

We consider here one of the most exciting, and at the same time most troubling, questions of our time: is the computer capable of replacing the human being, and indeed is it already doing so?

To answer this question, we must begin with a comparative study of human behavior and the working of a computer, in order to determine whether a computer is capable of reproducing human behavior. However, even if our answer is in the affirmative, we must still decide whether in fact it is desirable to build computers which do so.

When one speaks of research conducted with the goal of reproducing in a machine the faculties and behavior of humans, it is important to distinguish between two different objectives. One is the development of the computer's ability to carry out sequences of operations, possibly very complex, at a speed and level of reliability far superior to those of a human being. The validity of this objective is not in question, although we must take care about *how* it is achieved. The second, which is quite different, is the development of the ability of computers to reproduce human behavior in every aspect. "First of all, the conscious and the subconscious must be reproduced .... As soon as an artificial intellect has its own 'I', it will be able to escape all control, since it will have the ability to set its own objectives, and to engage in activities that were not envisaged when it was originally created. This danger, while quite real, is not however for the immediate future." [1]

Is research oriented in this second direction desirable? Amossov believes that it is necessary, but he asks what might be the long-term dangers of successful research of this type. This brings into sharp relief the question of the choice of the *objectives* of research. The disinterested researcher does not exist: everyone has personal motivations and ambitions, as well as obligations to society and family. Also, the researcher is supposed to make discoveries and is responsible for failing to do so: a researcher who does not discover anything is like an unproductive worker, a parasite. But the researcher who makes dangerous discoveries must take a major part of the responsibility for the harmful results that these discoveries might cause.

In an overpopulated world, it is certainly desirable to produce machines which improve our capacity to satisfy the needs of mankind. But is it necessary to try to produce "... machines that think, that learn and that create...," machines whose "...ability to do these things is going to increase rapidly until—in a visible future—

the range of problems they can handle will be coextensive with the range to which the human mind has been applied" [13]?

If we are successful in producing such machines, will we have achieved a worthwhile goal? Whatever the answer, it seems that the effort in this direction has already led to results which are quite different from those expected. How to develop and use computers is perhaps more than ever before an open question, and in the pages that follow we shall try to show why this is true. We shall also bring out the advantages of computerization, showing how to use computers judiciously while avoiding possible harmful effects. Finally, we shall show why we believe that, after so many years of study and achievement in computing science, the development of computers is proceeding in a direction exactly opposite to that of the imitation of human beings. There is less and less danger that the computer will replace humans. The computer is a magnificent tool, a tool which we must learn how to use, but nonetheless, only a tool.

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