Preface

At the beginning of the 1970s, I started down the road of mathematical modeling, following in the footsteps of Jean-Marie Legay. He is cited many times in this book: not by way of a posthumous tribute, because the citations were inserted long before his sad demise, but simply because he was one of the founders – *the* founder, even – of the method, and because the way in which he oversaw my work on my doctoral thesis lent itself perfectly to what I was and what I wanted to do. There were only a few of us in the biometrics laboratory, which he had recently set up, and I recall close collaborations – both scientific and amicable – with the whole team; the first article, penned with Jean-Dominique Lebreton; the first book, written with Jean-Luc Chassé; and the hours spent alongside Jacques Estève preparing mathematical teaching materials for the biology students who were inspired by this bold venture – the attempt to connect two domains which were, at the time, very far removed from one another. At the time, we had to convince both mathematicians and biologists, not only with skilled speechmaking and decorative discourse, but with real results. Today, I believe the battle has been won.

This victory is also due in part to the project run by Greco (Groupement de recherche coordonné – Coordinated Research Group – at CNRS), "Analyse des systèmes" (Analysis of Systems), where I worked with Arlette Chéruy and our mutual colleagues, pooling her experience in the field of automation and mine in the field of biometrics. Together we solidified the methodological foundations for the modeling of biological systems. Also at that time, the Société Française de Biométrie (French Biometric Society) was beginning to supplement its traditionally statistical approach with forays into mathematical modeling, particularly under the guidance of Richard Tomassone and – of course – Jean-Marie Legay. In 1983, the *Groupe*, later to become the *Club Edora* (*Equations Différentielles Ordinaires et Récurrentes Appliquées* – Applied Ordinary and Recurrent Differential Equations), was created within Inria, and lived a stimulating life for a decade. There were several of us at the root of this pleasant and effective association: Pierre Bernhard,

Jacques Demongeot, Claude Lobry, François Rechenmann and myself, along with a group of (somewhat younger!) researchers, including Jean-Luc Gouzé. For a good modeling approach in life sciences, it is necessary to be firmly within the biological and ecological reality; thus, biologists, ecologists, agronomists and doctors actively participated in our cogitation, such as Paul Nival and Antoine Sciandra, biologists from the marine environment, or Jean-Pierre Flandrois and Gérard Carret, and other doctors, chemists and researchers. This club contributed greatly to the emergence of mathematical modeling in life sciences. In 1989, the thinktank "interactions des mathématiques" (mathematical interactions) from the CNRS published a crucial contribution in its periodic report. I remember the scintillating debates that took place in this group, impelled by Jean-Pierre Kahane. In the wake of these reflections, in 1990 within the CNRS' environmental program run by Alain Ruellan, we set up the topical program "méthodes, modèles et théories" (methods, models and theories). Beyond mathematical modeling, Alain was convinced of the usefulness and even the necessity of it. By his side, I learnt to design and drive large-scale scientific operations. In 1996, the CNRS' Programme Environnement, Vie et Sociétés (Environment, Life and Societies Program), the successor to the environmental program, organized a conference about "new trends in mathematical modeling for the environment", and managed, thanks to the quality of the debates and the written publications, to demonstrate the pertinence of the approach in this vast domain.

This dynamic was also developing in parallel in other communities; in some others it had long been established. It contributed greatly to the progress of modeling and its extension to most scientific disciplines. In order to foster this dynamic and promote better links between these diverse communities, in 1997 the CNRS created the interdisciplinary program "modélisation et simulation numérique" (modeling and digital simulation). It was conceived and driven forward by Claudine Schmidt-Lainé. I contributed a little to it, and my collaboration with Claudine continued for a number of years, when she took up the post of Scientific Director of Cemagref, which became Irstea (*Institut national de recherche en sciences et technologies pour l'environnement et l'agriculture* – National Institute for Research in Science and Technology for the Environment and Agriculture). During that time, we published several articles together, showing – in particular – how mathematical modeling facilitates the practice of interdisciplinarity.

Since then, work has continued, and although I am in charge of a project situated a very long way from Metropolitan France, I have continued to take an interest in mathematical modeling and to promote it. It occupies a significant place in the work done in French Guiana since 2002, of which a narrative can be found in the book cowritten with Gaëlle Fornet, *Amazonie, une aventure scientifique et humaine du CNRS* (Amazonia: a scientific and human venture by the CNRS).

In hindsight, we can give an outline. To begin with, all this bears the hallmarks of a social activity, with many personal relationships. We draw strength and inspiration from our extensive reading, our multitude of discussions, individual or collective dreams, and also from our friendships. I have learnt a great deal from my colleagues, friends, the people with whom I have worked, and from the efficiency of Mrs Piéri, to whom I owe much of the composition in my earliest published works. No less can be said of my little family – not by a long stretch. Marie-José supported me for many years, which were cut short too soon. Marc is fulfilling all the hopes we had for him. As an historian, his knowledge extends to numerous sectors, and in addition, he is always a wise and critical reader of my written work.

Ultimately, the effectiveness of the method has been proven, and a genuine scientific community has sprung up. The laboratory of a dozen people in 1966 has become a research unit that is home to over 200 scientists, and has developed in numerous directions: biometrics, mathematical modeling, biocomputing, molecular evolution, ecology and evolution biology. In 2012, we are celebrating its 50th anniversary. In my book "La course de la gazelle", I go into further detail about this rich history. Regarding the method, this book attempts to communicate the essential bases of it with the complicity and spectacular efficiency of the publisher who agreed to take it on.