

Preface

The Earth, the Blue planet, is so called because its larger biotope is a vast and deep intertwined blue expanse of salted oceans and seas. The water is filled with billions of organisms which are mainly invisible to the naked eye. These life forms have allowed us to breathe and to conquer the lands. They are our ancestors, our stones, our oils, our food or the food of our food... and they may hold the key to our future in these troubled times of climate change.

The idea for this book germinated during an oceanographic survey in the Mediterranean Sea where, as a cell biologist coming out of a high ranked institute of fundamental research, I realized that many imaging techniques including 3D microscopy techniques were not easily available to marine biologists. I came back eager to share my knowledge with this large and amazing scientific community. Many of my friends responded positively and shared the burden of tracking any application of advanced imaging methods in marine biology and I would like to thank them all, in particular Renaud Boistel, who managed a huge crowd of co-authors to give us a wonderful chapter on X-ray related imaging techniques, Stephan Jericho and his colleagues for their patience, Gustaaf Hallegraeff who shared his long-standing experience of Electron Microscopy techniques applied to planktonic species, and finally my students who took some of the burden of collecting information and writing.

This book is not an encyclopaedia of all imaging techniques applied in marine biology. We made a choice and two main factors influenced our choices: three-dimension and promises.

First, water is always a three-dimensional medium that governs marine organisms: their shapes and forms but also, surely, their physiology. And so there is a crucial need to obtain three-dimensional views as this opens ways to deeper approaches: taxonomy, cell biology and *in vivo* biochemistry, fields well established in the medical world. Secondly, because there are so many imaging techniques out there, we had to make choices for this first edition, so we decided to drop the well-established techniques: light microscopy, cytometry... and promote less appreciated techniques or emerging ones that often give us a better three-dimensional view of the creatures of the oceans (Optical Projection Tomography, Light Sheet Microscopy etc.) and we made a big effort to make them available.

We believe that these techniques can be highly beneficial to the marine biology community.

However, we provide some basic skills to enable the reader to photograph larger organisms (Chapter IX) and a historical perspective of ocean imagery (Chapter I) as a reminder of where we are coming from to enlighten the path of where we go...

This book is an introduction to marine biology imaging methods suitable not only for students wishing to pursue marine biology but also for established researchers eager to extend their knowledge of imaging methods that may improve their current or future research.

This first book, specifically-designed for the marine biology field, is work in progress. We hope you will find it informative and your feedback is welcome to improve our common knowledge.

Swim long and image well!
Emmanuel G. Reynaud