

Preface

The Stem Cell Revolution

We occasionally witness fundamental changes altering the way in which we perceive the world. These sudden changes, sometimes called *revolutions*, may influence very diverse aspects of our every-day-life from politics to health care, from telecommunications to finance. Following a seemingly irreversible historical trend, changes are becoming more and more frequent, to the point that we start to get used to them and barely pay any attention anymore. Not because of that, these *revolutions* are any less important.

Stem cells are perhaps the last of a series of *revolutions* in biomedical sciences that slowly build up over time to explode in the last decade. Stem cells are, and will continue to be for years to come, a source of spectacular scientific achievements and shameful frauds, gold mine for pharmaceutical corporations and ruin for others, a charming hope to unfortunate patients and abhorrence to entire political administrations. Stem cells are the reason why an abstruse terminology limited to a few experts moved from the labs to the streets to be debated, nearly on daily basis, on worldwide media. Examples include *animal cloning*, *gene therapy*, *tissue-replacement*, *regenerative therapies* and so forth.

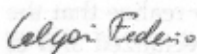
On a historical perspective, it is hard to find a subject in biology that has arisen more controversial feelings and debates at all levels of society. Perhaps the dispute over the risks of gene recombination in the '70 leading to the Asilomar Conference comes to mind as a worthy competitor but to find a clear winner we need to go back by over a century to consider the theory of evolution by Darwin and Wallace. In essence, we are witnessing here a quite remarkable *revolution*, and we should pay attention to it. To do so we first need to understand what stem cells are, which led us to consider the possibility of editing *Stem Cells*.

As it should be expected, a remarkably high number of books about stem cells are already available, in all forms and formats. As we checked the count was over 13,000; and the number is rising as a true *revolution* deserves. However, we did not need to read them all to realize that the overwhelming majority of these books are extremely specialized and of a rather narrow spectrum. Hypothetical examples in this context may range from "*Stem cells in the gastrointestinal tract*" to "*Stem cell policies in*

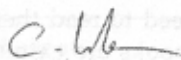
central Africa". Nothing bad about specialised book, we need them too, but our ambition with *Stem Cells* was to provide the reader with a solid overview about stem cells in all the relevant contexts; all in *one* book. We soon realized that the relevant contexts were very many and that a fair coverage would need to include stem cells in the most relevant tissues, in species as diverse as plants to human, during development, adulthood and disease, and in specific applications ranging from therapy to commercial exploitation, each with its specific legislations and ethical considerations; all in *one* book. The challenge was daunting and as we write this preface, we are still surprised that we did not give up our project at that point... yet the challenge motivated us and perhaps the fact that we ourselves are scientists working on basic stem cell research gave us the motivation to run this risky experiment. So here you are reading this book.

To make one point very clear, by no means we expected a single book to cover really *all* aspects of stem cells; no single book can comprehensively describe a *revolution*. Yet, we wanted to cover those aspects of stem cells that we felt were more representative of this very broad field. We felt that this can be conceptually divided in two major categories: basic research and applications although, clearly, the two are deeply interconnected. This is the reason why *Stem Cells* is divided in two volumes. Volume 1 focuses on basic research, starting with an historical overview to then move to a series of chapters focussed on basic stem cell biology, tissue development during development and finishing with the main model organisms that are being used in our labs for stem cell research. Volume 2 continues with a more applicative twist, including stem cells in different tissues during adulthood, disease, therapy and their commercial use, with regulations and ethics connected to them. All chapters were contributed by internationally recognized experts in the respective fields. We are extremely grateful to all of them for sharing our enthusiasm and for contributing their time, knowledge and passion to bring together the many aspects discussed in this book. The merit of *Stem Cells* is all theirs; they are among the ones who fuel the *revolution*.

As our last note, our attention while editing *Stem Cells* was primarily addressed to students approaching this field and to more advanced investigators working on any topic related to stem cells. We truly hope that our work may contribute to the formation of those readers representing the future generation of stem cell scientists. *Stem Cells* is dedicated to them; they are the ones who will carry on, and hopefully successfully conclude, this *revolution* for the benefit of society.



Federico Calegari



Claudia Waskow

Center for Regenerative Therapies, TU-Dresden