

Introduction

Welcome to the World of *Xenopus*! More than 20 years ago, Cold Spring Harbor Press published the first edition of our *Xenopus* Lab Manual with those words at the beginning. I am thrilled that in 2021, together with *Cold Spring Harbor Protocols*, our community has brought together this enormous and seminal collection of *Xenopus* protocols. With 18 Chapters, 18 Topic Introductions, 120 Protocols, and 213 authors, there has never before been a book of this magnitude focusing on the *Xenopus* system.

Congratulations to everyone involved!

I have known *Xenopus* for many decades, starting as an undergraduate at Wits University in Johannesburg, South Africa. On the top floor of our Zoology building was a room full of these frogs. In large concrete tubs, they would hang, weightless, with just nose and eyes in the air. We collected the frogs with nets from local ditches, and in a single sweep scooped up dozens of plump animals. Back in the frog room, if you simply put together a male and female, she would lay hundreds of perfect eggs. Later we put the frogs back in their ditch. For an undergraduate project, I grew thousands of embryos, kept in rows of rectangular dishes. One day as I walked along my rows, I noticed that all embryos of the same age were doing the same thing—when a few hours old, all comprised four cells, next day all were kidney bean-shaped with a patch of black pigment at one end, and the day after all had eyes and long tails. Like magic! Maybe, I thought, one could extract from the embryos chemicals that were making them develop in sync, to understand this magical process. The amazing development of *Xenopus* embryos put me on the career path of developmental biology research.

When I came to the United States to pursue a Ph.D., I felt so grateful for the opportunity, but the transition was difficult and lonely. Happily, it turned out that there was a frog room at the new university. In old bathtubs were the same kind of frogs that had hung in the water at Wits: the South African claw-toed frog, *Xenopus*. I was so pleased to see them! They had such familiar friendly faces, even though they'd been born in the United States. Those frogs made me feel less uneasy in my new home. As a postdoctoral researcher, I began to search for molecules that tell *Xenopus* embryos what to do, developing the cement gland as a positional marker, and focusing on early steps of nervous system and face formation. All the way to the present, with my wonderful research group, *Xenopus* embryos have given significant insights and unusual answers in our research.

Toward the end of my postdoc, I started thinking that we owed the frogs something. In South Africa we had put the frogs back into their ditch after they laid eggs. In the United States, *Xenopus* lived in the laboratory and we had to keep them healthy, and to gently collect eggs from the female. It seemed that new investigators would value instruction into *Xenopus* use and care, and this led me to propose and set up the first Cold Spring Harbor (CSH) *Xenopus* course in 1992. As a new Assistant Professor, I taught the course with Richard Harland and subsequently Robert Grainger, and we three co-edited the first edition of the *Xenopus* Manual. Through leadership from other outstanding *Xenopus* researchers, I am deeply proud that the course runs to this day, almost 30 years on.

Cold Spring Harbor has had a long, excellent relationship with our community. Terri Grodzicker embraced my proposal to set up a *Xenopus* course, and CSH has been pivotal in supporting the course all these years. Our partnership with *CSH Protocols* has made this manual a reality. On behalf of our community, I want to express greatest appreciation to Richard Sever (Assistant Director, Cold Spring Harbor Laboratory Press), Maria Smit (Managing Editor), and Inez Sialiano (Senior Project Manager). Their unending patience, polite prodding, and joy when submissions arrived made working on the manual a positive experience for everyone. Thank you so much!

And now, we have a new celebration of the power of *Xenopus*! In contrast to the first edition of this manual, which focused on the embryo, this second edition includes the broad range of

techniques by which *Xenopus* oocytes, eggs, embryos, tadpoles, froglets, or adults can drive fundamental and translational research. The protocols include use of both *Xenopus laevis* and *Xenopus tropicalis*. They include techniques by which *Xenopus* embryos have made unparalleled contributions—defining the genes, signaling pathways, and cellular processes that direct vertebrate development. This new protocol set adds important methods addressing oocytes and oogenesis, cell biology, nuclear and chromosomal dynamics, imaging, genetics and gene editing, genomics, transcriptomics and proteomics, neurobiology, immunology, metamorphosis, regeneration, and chemical or toxicity screening.

A further innovation is that as well as a hard-copy edition, the manual and each protocol will be available online. Comments can be appended to existing protocols and new ones can be added to keep the *Xenopus* collection current and of greatest usefulness.

Our manual includes contributions from eminent senior *Xenopus* investigators, with a Foreword from Professor Eddy de Robertis and Nobel Laureate Sir John Gurdon. But many more junior investigators have contributed protocols, ensuring continuation and innovation for the *Xenopus* system. As noted further in the Acknowledgments, my warmest and most sincere thanks to every chapter editor for planning contents and identifying experts, and my gratitude to every author of a protocol or topic introduction.

Whether you are new to *Xenopus*, and wondering whether this is the system to address your questions, or whether you are a frog veteran wanting to expand your repertoire, please explore the vast range of considerations and technical options laid out in the manual. Congratulations on your choice of system, and welcome back to the world of *Xenopus*!

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