

EXPERIMENTAL DESIGN FOR BIOLOGISTS

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The effective design of scientific experiments is critical to success, yet graduate students receive very little formal training in how to do it. Based on a well-received course taught by the author, *Experimental Design for Biologists* fills this gap.

Experimental Design for Biologists explains how to establish the framework for an experimental project, how to set up a system, design experiments within that system, and determine and use the correct set of controls. Separate chapters are devoted to negative controls, positive controls, and other categories of controls that are perhaps less recognized, such as "assumption controls," and "experimentalist controls." Furthermore, there are sections on establishing the experimental system, which include performing critical "system controls."

Should all experimental plans be hypothesis-driven? Is a question/answer approach more appropriate? What was the hypothesis behind the Human Genome Project? What color is the sky? How does one get to Carnegie Hall? The answers to these kinds of questions can be found in *Experimental Design for Biologists*. Written in an engaging manner, the book provides compelling lessons in framing an experimental question, establishing a validated system to answer the question, and deriving verifiable models from experimental data. *Experimental Design for Biologists* is an essential source of theory and practical guidance in designing a research plan.

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GLASS

EXPERIMENTAL DESIGN FOR BIOLOGISTS

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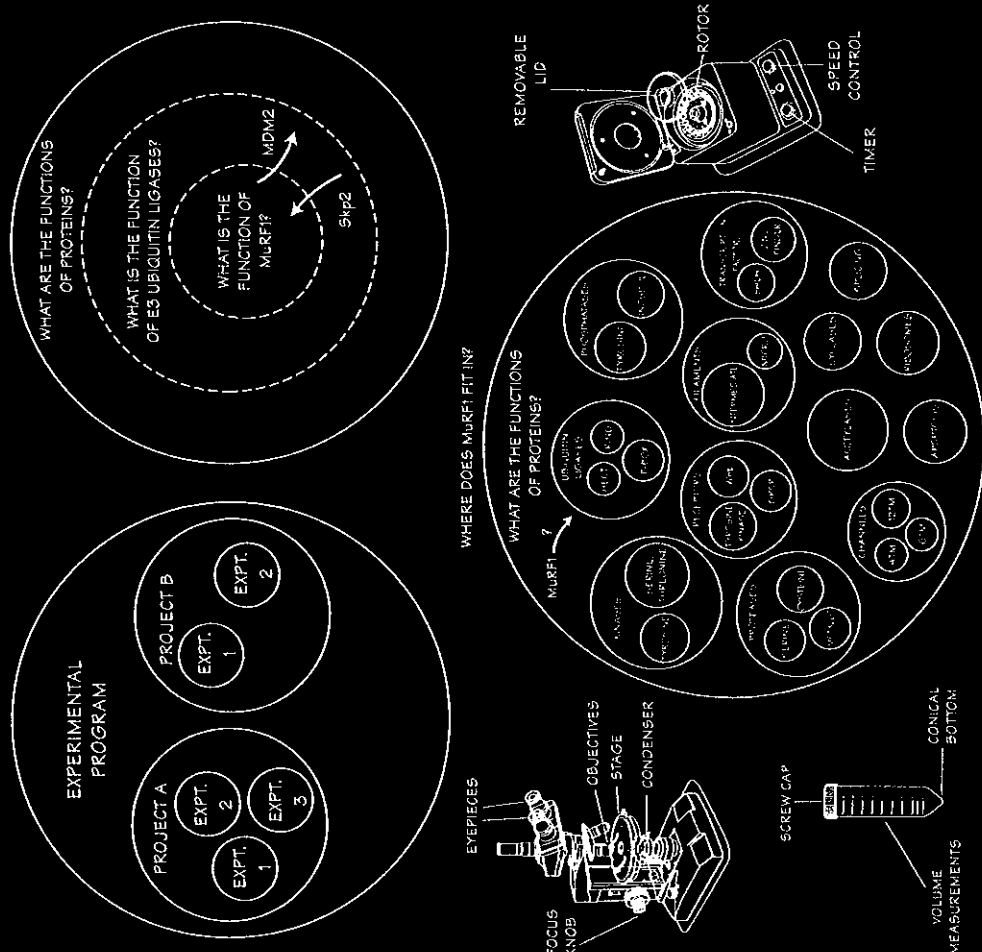


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EXPERIMENTAL DESIGN FOR BIOLOGISTS

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Preface

THIS BOOK IS A PRODUCT OF A SHORT COURSE on Experimental Design that I developed while still working at Regeneron Pharmaceuticals and I would like to express my thanks to all who gave feedback on that course. Like many ideas, the decision to turn the course into a book came about after a little too much wine with dinner—a dinner with fellow scientists Dan Finley, Fred Goldberg, and Allan Weissman—at which we were discussing both the odd fact that experimental design was not commonly taught to prospective biologists in graduate school, and the obvious discontinuities between the demands of Critical Rationalism as written and the way that science was actually practiced.

Of course, this book still would not have been produced were it not accepted by a publisher. Therefore, I am extremely grateful to David Crotty at Cold Spring Harbor Laboratory Press for agreeing to take the project on behalf of the Press. Siân Curtis then edited the manuscript in an extremely able fashion, with the help of Ginger Peschke and Maria Smit. The project was overseen by Jan Argentine and her colleagues at the Press. Thanks very much to Siân and Jan for their steady feedback and enthusiasm. Thanks so much also to Rena Steuer for expert production guidance, to Susan Schaefer for typesetting, and to Denise Weiss for her design expertise.

A great deal of help in writing this was lent by Kumar Dharmarajan. Kumar is a former student and intern in my laboratory, who was a medical student at Columbia when much of the book was written. He was thus able to take on the role of the “prospective audience” and gave invaluable feedback on each chapter, identifying passages that were unclear and asking questions that helped in the rewriting. Thanks very much to him for spending so much time on this project. Brian Clarke in my lab also read a large chunk of the manuscript and highlighted some sections that needed clarification.

Woody Fu is a former student who now has many jobs, including artist and cartoonist. He provided three cartoons for this book, and they came out so well that I am sorry we did not make greater use of his talents.

Thank you very much to the folks at Novartis, where I now work, for supporting this project. Novartis places a great emphasis on continuing education, and it was a