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Preface

In 2010 the authors met at a creativity workshop run by Dennis for an interdisciplinary team of researchers from the University of Manchester. The workshop was funded by the Engineering and Physical Sciences Research Council (EPSRC), who were trialling such workshops on some of their large grants. Dennis had much experience in teaching creativity and had written two books on the topic, but this was Nick's first experience of a creativity workshop. The workshop was a success and Nick subsequently saw how other groups with which he was involved might benefit from attending one. Since that 2010 creativity workshop we have run five more together, including one for the SIAM Leadership (during Nick's SIAM presidency) on formulating SIAM's strategy for the next few years.

This book distills our experiences into a 'how to' guide that will enable the reader to be more creative individually and to run workshops helping others to be more creative. It builds on Dennis's understanding of the creativity process, honed over many years in running many creativity workshops with groups from academia, industry, government, and sport, and Nick's experience as a mathematician trying to be creative and helping his research team to be creative.

The volume of research being done continues to grow, and it is becoming ever harder to have papers accepted for publication in the top journals and to obtain grants. Scientific research is also becoming increasingly collaborative. Knowing how to follow the six-step process described in this book to generate ideas 'on demand,' working either alone or in a group, confers a competitive advantage. It also engenders confidence, which improves personal satisfaction and encourages more ambitious targets to be set.

Although 'creativity' is the subject of many books, few are written for scientists in general and mathematicians in particular. Two of the most well-known are *An Essay on the Psychology of Invention in the Mathematical Field* (1953), by Jacques Hadamard, and George Pólya's *How to Solve It: A New Aspect of Mathematical Method* (first edition, 1945), which focuses on strategies for problem solving. We trust that our book will provide a useful addition, with its processes for idea generation and evaluation, and its wide range of examples.

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Introduction

This book is a how-to guide to help you generate great ideas.

Or, rather, even greater ideas. For we expect that if you are reading this book—probably because you work in the mathematical sciences—you will already be highly creative, for you wouldn't be working in this field if you weren't.

That said, we invite you to consider these questions:

Do you know, precisely, how your creativity happens? Can you 'turn the creativity switch on' to generate great ideas 'on demand' whenever and wherever you might need them? Or are things more 'intuitive,' in that creativity just 'happens'?

Can you coach other people, less confident than yourself as regards their personal creativity, so that they can become more creative?

If you know, precisely, how you do it, and if you are comfortable coaching others, then we trust you will find this book interesting and confirmatory. But if you're not quite sure how creativity happens, then our intention is that this book will help, and also put you in a stronger position to be a coach.

This book is, intentionally, brief, and focused on 'how to do it.' Accordingly, Chapters 1 and 2 describe a number of processes for having ideas 'on demand.' The principles and mechanics of creativity apply to any field, so Chapters 1 and 2 are largely not mathematics-specific. They lay the groundwork for Chapter 3, which gives a variety of examples from

the mathematical sciences of how people have been creative. Chapter 4 presents some thoughts on running creativity workshops, in which ideas are generated by people working together in small groups.

Finally, Chapter 5 puts creativity—generating ideas—into a broader context, describing a process by which 'good' ideas can be wisely distinguished from 'weak' ones, and also identifying some key aspects of an organization's culture that can help creativity to flourish. Both themes are of particular importance to those in leadership roles, from team leader to the most senior positions.

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