Preface

Before 10 AM, March 18, 1989, I was a process geomorphologist who had researched the coastal evolution of rock platforms and sand barriers along the New South Wales coastline of eastern Australia. I was aware of tsunami, and indeed had written about them, but they were not my main area of research. No one had considered that tsunami could be an important coastal process along the east coast of Australia. On that March morning in brilliant sunshine, with the hint of a freshening sea breeze, my life was about to change. I stood with my close colleague Bob Young, marveling at a section of collapsed cliff at the back of a rock platform, at Haycock Point south of Merimbula. We saw a series of angular, fresh boulders jammed into a crevice at the top of a rock platform that did not appear to be exposed to storm waves. Unlike many before us, we decided that we could no longer walk away from this deposit without coming up with a scientific reason for the field evidence that was staring us in the face. After agonizing for over an hour and exhausting all avenues, we were left with the preposterous hypothesis that one or two tsunami waves had impinged upon the coast. These tsunami were responsible, not only for jamming the rocks into the crevice, but also for the rock-fall that had put the rocks on the platform in the first place. We did not want a big tsunami wave, just one of about 1–2 m depth running about 5–6 m above the highest limits of ocean swell on the platform. Over the next 8 years that wave grew immensely until we finally found evidence for a mega-tsunami overwashing a headland 130 m above sea level at Jervis Bay along the same coastline. Subsequent discoveries revealed that more than one wave had struck the New South Wales coast in the last 7,000 years, that mega-tsunami were also ubiquitous around the Australian coast, and that the magnitude of the field evidence was so large that only a comet or asteroid impact with the Earth could conceivably have generated such waves. From being a trendy process geomorphologist wrapped in the ambience of the 1960s, I had descended into the abyss of contentious catastrophism dredged from the dark ages of geology when it was an infant discipline. Bob Young subsequently retired in 1996, but his clarity of thinking about the larger picture and his excellent eye for the landscape are present in all of our publications and reflected in this textbook. There was not a day in the field with Bob that did not lead to excitement and discovery.

Between 1995 and 1999, I worked closely with Jon Nott from James Cook University in Cairns, Queensland. Bob Young trained Jon, so I have lost none of Bob's appreciation for landscape. Jon and I enthusiastically continued field research in remote locations. To stand with Jon at Point Samson, Western Australia, and both realize simultaneously that we were looking at a landscape where a mega-tsunami had washed inland 5 km—not only swamping hills 60 m high, but also cutting through them—was a privilege. Few geomorphologists who have twigged for the first time to a catastrophic event have been able to share that experience in the field with anyone else. Jon, Bob, and I formulated the Australian examples of tsunami signatures described in Chap. 3, while Jon developed the equations for boulder transport also used in this chapter. David Wheeler did the fieldwork that first identified the dramatic tsunami chevron-shaped dunes at Steamers Beach, Jervis Bay. Since 2002, I have had the fortune of working with Simon Haslett of the University of Wales. By chance, a brief academic visit to the shores of the Bristol Channel in Wales with time to inspect medieval churches led us to stumble across what we believe was a tsunami on January 30, 1607. Much of the material about this event in the book is due to Simon's ability to search for, and interrelate, obscure manuscripts, and his dogged attention to detail in the field. I have then had the privilege of working with three enthusiastic, talented and determined researchers: Slava Gusiakov of the Institute of Computational Mathematics and Mathematical Geophysics, Siberian Division Russian Academy Of Sciences, Novosibirsk, Russia; Dallas Abbott of Lamont-Doherty Earth Observatory, Columbia University; and Bruce Masse at the Los Alamos National Laboratory, New Mexico. They have come up with convincing evidence that recent comet impacts with the ocean do occur. All of us have withstood the rebuff of peers that goes with ideas on catastrophism in an age of *minimal astonishment*. I hope that this book conveys to readers the excitement of our discoveries about tsunami. Finally, I am indebted to Clive Horwood of Praxis Publishing, Dr. Philippe Blondel from the Department of Physics, University of Bath, and to Springer Publishing for allowing me to publish two further editions of this book.

It is difficult to write a book on tsunami without using equations. The relationships amongst tsunami wave height, flow depth at shore, boulder size, and bedform dimensions were crucial in our conceptualization of mega-tsunami and their role in shaping coastal landscapes. In this third edition, the formulae have been either simplified further or kept to a minimum. Wherever I have used equations, I have tried to explain them by including a supporting figure or photograph. Terms used in equations are only defined once where they first occur in the text, unless there could be confusion about their meaning at a later point in the book. For reference, all terms and symbols are summarized at the beginning of the text. Many dates are only reported by year. Where ambiguity could exist, the terms AD (Anno Domini) or BC (Before Christ) are used. If there is no ambiguity, then the year refers to AD. In some cases the term BP is used to measure time. This refers to years *before present* and is commonly used when reporting radiocarbon or thermoluminescence dates. Before present is difficult to explain to the general public, but refers to time before 1950! Units of measurement follow the International System of Units except for the use of the terms kilotons and megatons. There are many definitions of the terms meteorite, asteroid, and comet. We have used the terminology favored by those studying the possibility of near Earth objects (NEOs) colliding with the earth. A comet is any object consisting mostly of ice. An asteroid is any object consisting of rock and larger than 50 m in diameter. If it is less than 50 m in diameter, then the object is a meteoroid. If an asteroid impacts with the Earth, it is still an asteroid, whereas if a meteoroid impacts with the Earth, it is called a meteorite.

A major change to this edition is the inclusion of references in the text. It may make the book more difficult for a lay person to read, but it satisfies some academic criticism of previous editions. This book is not intended to be a comprehensive literature review or an encyclopedia. The breadth of coverage precludes a complete review of the literature on many topics. All references to publications can be found at the end of chapters. Some articles and data were acquired from the Internet. The Internet addresses in these cases are also referenced. Such material may not be readily available because internet addresses change or are terminated. Worse, content can disappear totally from the internet.

The first edition of this book was written as a summary and description of tsunami as a hazard. The scenarios were meant as a casual warning to our civilization. This intent failed on December 26, 2004 when the Indian Ocean Tsunami claimed over 200,000 lives and there was nothing anyone at the time could do about it. The second edition was then written as a wake-up call to save lives from future tsunami events. The Tōhoku Tsunami of March 11, 2011 saw this objective defeated. This third edition is another call for attention and action by nations and communities that live near any water body to acknowledge that tsunami are a deadly hazard. I don't anticipate a fourth edition.

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