Introduction

The gods condemned Sisyphus to eternally push a rock to the top of a mountain, whence the stone would fall back of its own weight. They had thought, with some reason, that there is no more dreadful punishment than futile and hopeless labor …

(Albert Camus, *The Myth of Sisyphus*, 1942)

Sisyphus was ‘the craftiest of men’ according to the ancient Greeks. His cunning, his lack of scruples and the ingenuity of his deceptions infuriated the gods, who punished him for his trickery by endless labor in the underworld. Raising a stone towards the top of a hill only to see it roll backwards seems the epitome of futility, yet Camus’s essay on the myth of Sisyphus – written as World War II was raging – raises the intriguing possibility that, ultimately, Sisyphus was a happy man, identified with and fully accepting his apparently hopeless task.

Building science and technology capabilities in developing countries appears to be a Sisyphean task. Time and again investments are made, people are trained, institutions are built, and policies are designed and implemented – often with considerable effort – only to see them fall apart and disappear without trace. Jorge Sábato, the Argentinean physicist who pioneered science and technology policy studies in Latin America, used to say, ‘It takes 15 years of hard work to build a world-class research facility, but only two years to destroy it’ (personal communication). Developing country policy-makers and politicians, many of whom are unaware of the ways in which science and technology contribute to improve the human condition, have frequently adopted policies and taken decisions that destroyed research and innovation capabilities built over many years of hard work. Thus the pertinence of the Sisyphus myth to characterize what has happened and is happening in Africa, Latin America, the Middle East, South and South-East Asia, and even countries in Eastern Europe and the former Soviet Union, as science and technology capabilities built over decades erode and vanish.

But there is more. Even if our scientific and technological Sisyphus were to reach the top of the hill and, resolutely defying the Gods, managed to stay there, he would only see other hills to climb awaiting him. Hard-won achievements in building science, technology and innovation capabilities appear diminished – perhaps insignificant – as the furious pace of advance at the frontiers of scientific research and technological innovation makes evident
the widening chasm between what most developing country researchers and innovators accomplish with great effort, and what their developed country counterparts appear to do with relative ease.

Perhaps, as Camus has suggested, attempting an impossible task makes Sisyphus proud and even happy. Indeed, the manifest futility of the attempt to catch up with the leading scientific and technological nations liberates us from the fear of failure. Moreover, what may appear to be minor achievements against the backdrop of the swift displacement of the science and technology frontier can yield substantive benefits for people in the developing regions. It is in this sense that efforts to build domestic capabilities to generate, acquire and utilize knowledge become crucial to improve the human condition. In addition, the fact that a handful of developing countries have managed to build advanced research and innovation capabilities in just a few decades is a source both of comfort and inspiration.

This Sisyphean challenge is the subject of the present book. The main argument is that developing countries – where more than three-quarters of humanity lives, mostly in poverty – must judiciously invest scarce resources to build their capacities for creating, acquiring and utilizing scientific and technological knowledge, and that this should be done without ignoring their heritage of indigenous knowledge and techniques. As the scientific and technological hills to climb will continue to proliferate – making Sisyphus’s task even more daunting – it is also essential to devise ways of keeping the rock on the top of the hill, of preventing the results of past capacity building efforts from being wiped out.

But how to mobilize knowledge to improve the human condition? How to face this Sisyphean task with aplomb and a sense of – why not? – resigned and even fatalistic optimism? This book attempts to answer these questions. It offers a set of concepts for examining the interactions between knowledge, innovation and development, for exploring how to create science and technology capabilities in different types of developing countries, and for placing the role of international science and technology cooperation in perspective. It builds on a large body of work of literature accumulated during the last several decades, and particularly on a series of papers, monographs and books I have written since the early 1970s.

The book is aimed at all persons interested in the role that modern science and technology play in human affairs, to students of the relations between knowledge and development, and particularly at policy- and decision-makers in the public, private, civil society and academic sectors concerned with the disparities between rich and poor countries. The approach adopted has been highly eclectic, drawing from many disciplines (history, economics, sociology, engineering, political science, philosophy), from personal experience (as researcher, advisor, consultant, manager, policy-maker, teacher) and from the
contribution of many colleagues from around the world. The general idea has been to produce a short introductory text that could provide an overview of the many different issues related to the Sisyphean task of building science and technology capabilities in the poor countries.

Following this introduction, the first chapter presents a conceptual model that, starting from an account of the diffusion of Western science, provides an integrative framework for relating knowledge, technology and production, and also for attempting a redefinition of what is meant by ‘development’. The second chapter contains a historical overview of the interactions between knowledge, technology and production during the last several centuries, as well as a brief account of the way they relate to each other at the beginning of the 21st century. The third chapter characterizes the main features of the ‘knowledge explosion’ that has taken place during the last three decades, focusing on the way in which research, innovation and the techno-economic paradigm have evolved recently.

The fourth chapter deals with the ‘knowledge divide’ that has emerged between rich and poor countries and, using the material of the preceding chapters together with statistical information, develops a composite index of ‘science and technology capacity’ to place countries along a continuum and to classify them in four broad categories. The fifth chapter focuses on the strategies and policies appropriate to create and consolidate science and technology capabilities in the different types of developing countries, and on the role of international cooperation. A few concluding remarks and suggestions for future research complete the book, which is complemented by two appendices and a bibliography.

As the sources of material for this book are numerous, references have been kept to a minimum and are provided in the text only when the ideas can be traced specifically and exclusively to a particular author. The bibliography contains the main sources consulted during the preparation of this book.

Although it builds on a large body of my previous work, and particularly on research supported by the Carnegie Corporation of New York, this book has been prepared during 2002–03 as part of a joint project between FORO Nacional/Internacional–Agenda: PERÚ in Lima, Peru, and the Center for Global Studies at the University of Victoria, British Columbia, Canada. The Rockefeller Foundation provided support for the joint project, which led to the preparation of this book and to the compilation of an inventory of international science and technology cooperation programs. The participants in a technical workshop held in Lima and Urubamba in early October 2002 provided most valuable suggestions and comments on a first version of this book (see the acknowledgements in the preface).

The challenge of pulling together a large body of work into a short book has been most difficult and stimulating. I hope the result offers some ideas and
encouragement to those facing the Sisyphean challenge of mobilizing knowledge and innovation to improve the human condition in the 21st century.

NOTES

1. See the bibliography for a list of this material.
2. The inventory can be found at http://www.globalcentres.org/html/project1.html.