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Introduction: What is Stratigraphy?

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1.1 Stratigraphy: the Key to Earth History

Geology is the science of the Earth. Its aim is to understand the composition, structure and history of the Earth throughout the 4600 Ma of its existence. There are many different branches to geology: geochemistry, petrology and mineralogy are the branches concerned with the chemical and mineral composition of the Earth; sedimentology and geomorphology deal with the surface processes which shape the Earth's crust; geophysics looks at the structure of the Earth, both at the surface and at depth; palaeontology is concerned with the past life of the planet. These subjects have parallels with other physical sciences, but geology has the unique component of time: the development of the Earth in time and space. Within geology the study of time is the study of stratigraphy. Stratigraphy is the key to understanding the Earth's crust and its materials, structure and past life. It encompasses everything that has happened in the history of the planet. All geologists, whatever their speciality, are practitioners of stratigraphy: all geological study is an attempt to unravel piece by piece the history of Planet Earth.

Stratigraphy is also the art of detection. The rocks on the Earth's surface are the clues from which the Earth's history and the processes which have shaped it can be deduced. Each layer or stratum of rock contains a clue to the Earth's geography, climate, and ecology at a specific time. The job of the stratigrapher is to observe, describe and interpret a succession of such layers and other rock bodies in terms of events and processes in the history of the Earth. The rock record which contains the story of our planet can be likened to a book written in a strange language, whose pages have been ripped-out, mixed-up and partially lost. To read the story—a dramatic story of mountain building, climate change and the evolution of life—one must first place the pages of the story in the correct order and then decipher the language upon them. This is the art of stratigraphy.

1.2 The Aim and Structure of this Book

Generations of geologists have come to believe that stratigraphy is boring: simply a recital of geological time periods and of different strata. Like human history, Earth history when taught as a series of facts and dates, can be dull, but it does not have to be. When history is taught in terms of personalities and when both the cause and background to events are discussed, it can be fun, even exciting. The aim of this book is to illustrate that stratigraphy is dynamic and exciting. In order to achieve this the emphasis is placed here on understanding the patterns present within Earth history as opposed to the detailed succession of rock units which make up the stratigraphical record.

The book is divided into two parts. In the first part, we look at the basic information needed to interpret the stratigraphical record by introducing the reader to the 'stratigraphical tool kit' with which the stratigraphy of a region can be built up. Within this kit there are two basic types of tools (Figure 1.1): (1) those tools with

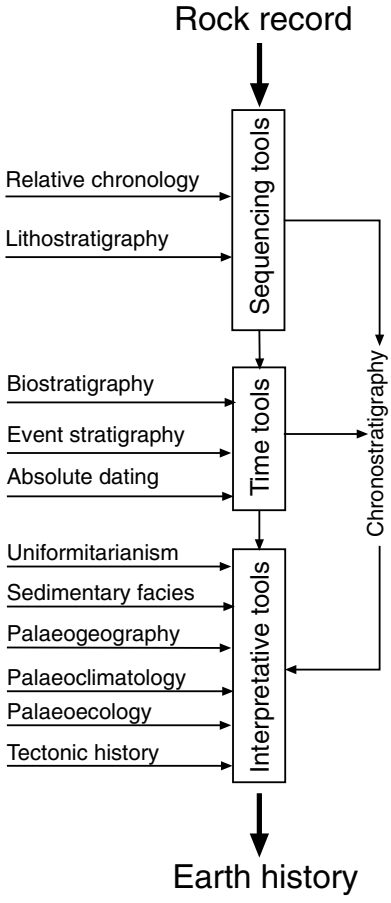

Figure 1.1 *Schematic illustration of the principal tools within the 'stratigraphical tool kit'*

which to establish the succession of rock units, and unravel their relationship in time (sequencing and time tools); and (2) those tools with which to interpret each unit in terms of an event within Earth history (interpretative tools). In the second part of the book, we set out the global pattern present within Earth history: a pattern which has been largely driven by the global concept of plate tectonics. The control of these global events in developing and preserving the stratigraphical record is then discussed and used to structure an account of the present day North Atlantic region, involving both northern Europe and North America, through geological time. A lexicon of key stratigraphical terms and their definitions is given at the rear of the book.