This study presents the science community and schools with a new geologic timescale for circa four billion years of Earth history. A chapter is also devoted to time scales for our moon and neighboring planets. This book details many recent advances in stratigraphy, the science of the layering of strata and its content, in radiogenic and stable isotopes chronology, and in age and duration calculations using orbital tuning models. The new scale closely links radiometrically and orbitally tuned age dates, and tries to provide comprehensive error analysis on the ages of a majority of boundaries for the geologic divisions of time. Much benefit is derived from the steady increase in formal definition of stage boundaries such that we have more stability in geologic unit definition than in 2004. This book thus presents Geologic Time Scale 2012 (GTS2012, as the successor of GTS2004).

It was in the year 2004 that two of us (FMG and JGO) with a team of 39 (geo)scientists completed ‘A Geologic Time Scale 2004’, quickly coined GTS2004, seven years after Geologic Time Scale 1989 (GTS89) by Harland et al. saw the light. GTS2004 originated from an original invitation by Alan Smith of the five persons GTS89 team to undertake its update, and publish it under the banner again of Cambridge University Press. Our optimistic aim was to not only present a standard international Geologic Time Scale with a comprehensive set of chapters on each Period of the Phanerozoic and on Precambrian, but also provide a ‘teaching’ tool of key disciplines that are the foundation of time scales.

As it turned out, GTS2004 and its rather hefty green book were well received by the geoscience community. A great many colourful time scales in laminated card-, page size-, and wall chart formats also found its way to professional and academic geoscientists, students and geology amateurs. Internet websites with the new scale, like http://www.nhm2.uio.no/stratlex/ or https://engineering.purdue.edu/Stratigraphy/ also are a great help to disseminate the new GTS information in an efficient and essentially cost free manner.

Besides being utilized as a scholarly and convenient standard, GTS2004 also provided fruit and gave impetus to a large body of new research in the fields of radiometrics, chronostratigraphy, orbital tuning and other Earth science specialties. One of the most rewarding aspects of science is always to see results becoming the springboard for exciting new developments, and unexpected new answers.

As a fruit of these intense developments we now proudly present ‘The Geologic Time Scale 2012’. We say proudly, because this even more hefty and full color GTS2012 tome, builds on a tremendous amount of new information, much of it generously assembled and contributed by a more than twice as large team of specialists than the one that ‘stitched the GTS2004 carpet’.

The fascination in creating a new geologic time scale is that it evokes images of creating a beautiful carpet, using many skilled hands. All stitches must conform to a pre-determined pattern, in this case the pattern of physical, chemical and biological events on Earth aligned along the arrow of time. It is thus that this new scale is a tribute to the truly close cooperation achieved by this new slate of outstanding co-authors. We also consider the new time scale a tribute to the scientific competence harbored and fostered by the global geosciences community.

We are deeply grateful to all co-authors and contributors, who, without reservation, accepted the challenge to be part of this dedicated team, slowly (!) stitching and weaving this carpet of time and its events that are Earth’s unique and splendid history.

The Norwegian Arctic explorer, scientist and statesman Fridtjof Nansen is quoted as once saying ‘The difficult is what takes a little time, the impossible is what takes a little longer’. To be frank, there were times when we encountered seemingly impossible obstacles in what otherwise seemed to be a fairly smooth, long distance sailing from one specialty island to the next one, and staying in touch through a dense network of emails. To say it simply: The challenge with the construction of a detailed geologic time scale spanning almost 4 billion years of Earth history is that it should not have glaring gaps in time coverage.

During the gestation of GTS2012 it took ‘a little longer’ to cover some gaps that we were frankly told would be impossible to bridge without (much) more field work, more ocean floor coring, more laboratory research, and more research money. An ‘impossible’ example is the fully orbitally tuned Mesozoic and Cenozoic time scale. Our team did not try to achieve this goal. Here we propose a fancy hybrid, using an intricate construction of deterministic orbital tuning plus cyclic rubber-banding of stages, direct dating, stratigraphic reasoning and magnetostratigraphic interpolation.
Another, and unexpected impossibility turned out to be the Upper Triassic gap in our time scale knowledge. A glaring lack of age dates, tenuous correlations and competing but startling different stage models, created a ‘quicksand’ of information. Our solution surely is a temporary one, and we consider our results to be a springboard to fill the ‘Triassic gap’, that stretches for almost 30 million years.

Looking back at the eight years it took to complete GTS2012, it is almost funny to consider that the book chapters covering the oldest rocks and ‘some time before’, i.e. Precambrian and Planetary, were completed first, followed by Late Proterozoic and Precambrian, whereas Mesozoic and particularly Paleogene and Neogene book chapters were last. We might consider that the younger record on Earth is more complete, more easily accessible and more easily decipherable, but is also creates high-resolution data swamping. Whatever the timing and delays in bringing some chapters to market, we are grateful that all authors, without exception, have strived to keep the chapters update and to the deadlines initially posted us by Elsevier Publishing. To achieve clarity and uniformity in scientific and artistic presentation, Gabi Ogg drafted all of 300+ figures (as she accomplished also for GTS2004 and GTS2008, including an up to date set of concise figures with over sixty Global boundary Stratotype Sections and Points (GSSPs). Christoper Scotese kindly provided paleogeographic map reconstructions with the chapters.

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