

Book review

W. Maier 2017 *Der Weg zum Menschen. Ausgewählte Schriften zur Evolutionsbiologie der Wirbeltiere*. Scidinge Hall Tübingen 2017, 549 Pages

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Received: 8 June 2017 / Accepted: 17 June 2017 / Published online: 30 June 2017
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This book presents a coherent view of evolution which is organismal and historical, one that feeds from and respects tradition but looks forward in aiming at providing a documentation of patterns in which scenarios are presented and integration of anatomy, physiology and behavior is attempted. Not bad. It is a peculiar book, because it is in some details and formalities a little outdated, and yet it is quite timely in others. The latter does not come from the topicality of the subjects but because the approach and the historical take on problems are timeless—relevant today and hopefully in the future.

This book is very personal as it is tied to the biography of its author, Wolfgang Maier. W. Maier (b. 1942) was Professor of Systematic Zoology at the University of Tübingen from 1988 until his retirement in 2007, although he is still actively publishing academic research papers (Fig. 1). His previous work had been in Frankfurt, first as PhD student under the direction of the late Dietrich Starck (1908–2001), an anatomist who wielded substantial influence via his textbooks (e.g., *Vergleichende Anatomie der Wirbeltiere*) and his students, such as W. Maier. The academic history of W. Maier is recapitulated in a series of essays, and in fact the book presents modified versions of previously original research papers or essays along the career of its author. Many of the chapters are based on talks given in the context of ‘Ringvorlesungen’ at the University of Tübingen, evening lectures for the general public.

This book is organized in five sections, with several chapters in each: (1) methodology and science history, (2)

phylogeny of animals, (3) origin and diversification of mammals, (4) selected aspect of head morphology, and (5) primatology and anthropology.

During the twentieth century, the University of Tübingen was home to a series of influential researchers and teachers, but its importance goes back further back in time (Werneburg 2016). We learn that Tübingen was the first place in Germany in which a Faculty of Mathematics/Natural Sciences independent of Medical or philosophy faculties was created. The essay on Zoology in Tübingen provides a chronology and overview of who was who and major discoveries or events. Among the remarkable figures was Carl Kielmeier (1765–1844), who at the beginning of the nineteenth century was highly influential by virtue of his lectures and teaching in anatomy and the natural sciences in general. Kielmeier published brief statements that predate the ‘biogenetic law’ of recapitulation in ontogeny of phylogeny, later made known in an explicitly evolutionary context by Ernst Haeckel. Some of the historical essays do not concern Tübingen but other places in Germany and abroad, as in the discussions on Carl Gegenbaur’s and Ernst Gaupp’s work, those on Darwin and his time, or those on Morphology and the Evolutionary Synthesis of the mid-twentieth century.

Systematic Zoology in Tübingen during W. Maier’s tenure is not just about those topics covered in this book. It also concerns the work of many researchers, generously hosted by Maier in Tübingen who worked on subjects of their own interest and decision thanks to the resources and intellectual freedom made possible by W. Maier. I was one of those who benefited from this rare situation. Indeed, much like his own advisor Starck, the influence W. Maier has had on future generations is not only a result of his published scholarship, but also reflected among the students who observed and internalized Maier’s comparative

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Fig. 1 Wolfgang Maier in the ‘Arbeitszimmer’ of the late Dietrich Starck, where the latter typed in a typewriter many of the classic textbooks of the comparative anatomy of the second half of the twentieth century. Photo by Ingmar Werneburg, Frankfurt 4. May 2017

ontogenetic approach towards evolutionary biology. Maier’s commitment to anatomical and phylogenetic research resulted in many original bodies of work (e.g., on myoseptal evolution; Gemballa and Britz 1998) and enabled the careers of a number of researchers from Europe and the Americas who were fortunate enough to spend time in Tübingen. The commitment to comparative anatomical work of perinatal stages was in the form of huge investment of resources in a histological collection of mammals. This was in part investigated in many Masters and doctoral theses. Many ongoing works profit from this collection and its curation should be secured. During the tenure of W. Maier in Tübingen, the teaching of Gerhard Mickoleit in vertebrate phylogeny, taken over by Erich Weber, could continue for many years, and it is in this time that Mickoleit (2004) published his celebrated work on vertebrate phylogeny: *Phylogenetische Systematik der Wirbeltiere* (see review by Janvier 2007).

One of the book chapters treats the origin of life (p. 149). Zimmer and Emlen (2016), in arguably the best college-level textbook on evolutionary biology, stated that the origin of life is not part of ‘evolution’. I agree, and I would have left this out. But W. Maier cites Darwin in how evolution does start with the origin of life, and this book is not shy in treating some major topics. Even with only a brief introduction, this book discusses the origin of multicellularity, of major ‘phyla’ at the beginning of the Cambrian, the origin of chordate animals and that of land vertebrates.

Given the breadth of topics covered and the coherent view and presentation, the literature cited is quite comprehensive. But some misses and outdated details are almost unavoidable. For example, the reported total

number of species of monotremes, marsupials and placentals as currently recognized even in conservatives estimates is outdated (p. 341) as even the standard work (Wilson and Reeder 2005) reported a total of 5416 species—thus many more than stated in the book.

Chapter 11 concerns the nature of bone, cartilage, tendons and muscle. This is fundamental knowledge effectively summarized. This short chapter feeds mostly from historical and more recent works in the literature in German, as in Kummer (1985) on ‘Kausale Histogenese’. Those looking for a more detailed overview of skeletal tissues could check the notable book of Hall (2015).

The subject of brain changes associated with mammalian evolution and those of cranio-sensory organs on skull architecture are treated in integrated fashion with other subjects. Studies of brain size continue to flourish in recent times (e.g., Weisbecker and Goswami 2010), but here the aim was not to provide an updated overview but to present some basic anatomical facts in their phylogenetic and functional context.

The evolution of the hyobranchial apparatus of gnathostomes is discussed in a general and effective way (p. 313). Diapsids are more derived than synapsids when compared to the last common ancestor of Amniota, and this is nicely illustrated in a figure of great didactic value.

The most valuable chapters are those in which the author himself has made original contributions, and in my biased opinion I would say these are those concerning the developmental head anatomy of mammals. Much of the work involves sophisticated considerations of the anatomy of early synapsids integrated with ontogeny-informed data on extant taxa, covering monotremes, marsupials and placentals. The attempt to integrate an understanding of function of the structures at major evolutionary transitions is impressive. This kind of work has a very Germanic flair and American authors would be reminded of works of Fuzz Crompton or Farish Jenkins as comparable in scope and importance.

Among the prominent topics on mammals is the origin of their middle ear configuration, the secondary palate, the akinetic nature of the skull, and of the lateral side wall of the skull. Careful reading of the essays on mammalian anatomy provide valuable ideas for projects and research areas—as in the investigation of the mimic musculature (p. 324) or of the kinetic nature of the mammalian skull in some point of ontogeny (p. 316).

The book contains some original figures that will be appreciated by chondrocranium aficionados—as for example that of the ‘mouse–deer’ *Tragulid javanicus* (p. 287), or the nasal cartilages of *Erinaceus*, *Talpa* and the tenrec *Setifer* as outgroup (p. 327). The illustration of a cross section in which a mesethmoid is labeled (p. 275) will not escape those of us aware of the controversy on the

presence of this bone across mammals (Sánchez-Villagra and Forasiepi 2017).

Like some other chapters, those on primate and human evolution enjoy a holistic and organismic take on the subject, but are outdated in some details (Lordkipanidze et al. 2013); so their reading can be recommended always together with some more recent reviews (Lieberman 2011; Stringer 2013).

Like much of W. Maier's work, this book will appeal to vertebrate paleontologists. This is because the groups for which the book is strongest—lineages of amniotes—have a fossil record including stem forms that document evolutionary transitions and acquisition of traits. Several works of W. Maier have been contributions in reviewing the soft tissue structures associated with osteological features, solving some homology questions and providing functional and ecological scenarios of change.

The title of the book 'Der Weg zum Menschen' ('The path to humanity') could be wrongly interpreted as teleological and old-fashioned, in placing humans as the end or in focus—as opposed to one of many branches of the tree of life. Actually, it well reflects the author's biography, as the driver of his dedication to science was understanding our own species. His doctoral thesis was on the musculature of some Old World monkeys, and it is revealing that in a book concerning anatomy, this particular subject is missing. In these days of specialization and focus, a PhD subject often becomes the focus of an entire career, but not in the case of W. Maier.

At the end, in a concise but rich way, the author presents an autobiographical essay on his academic career. I most enjoyed the rather dry prose in this, as the subtle humor is nevertheless there and I appreciated the lack of self-aggrandisement or what one could call in German 'pathetische Selbstbetrachtung'—perhaps roughly translated as 'lofty navel gazing'. I worked 5 years in Tübingen as 'Wissenschaftlicher Assistent' for W. Maier. My position was not equivalent to anything in the anglo-saxon system, as it was some kind of super-postdoc/junior lecturer position while obtaining further qualifications after the PhD.

Lost in translation—like much in this book were it in English. At 20 Euros this 551 pages book is a bargain. Ingmar Werneburg, the publisher, is to be congratulated for this effort.

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