Chapter 52
TÜBINGEN: The Palaeontologial Collection of Tübingen

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52.1 General Information

The Palaeontological Collection of the University of Tübingen comprises an estimated number of one million objects and it is one of the largest university collections in the world (Fig. 52.1a, h). Among the great diversity of fossil remains in our collection (Fig. 52.1b), the type specimens of more than 1,700 publications are available. Of particular value are the type specimens published by Friedrich August von Quenstedt (Fig. 52.1c) and by Friedrich Freiherr von Huene (Fig. 52.1d). Further original specimens are associated, among many others, to the publications of Auer, Branco, Broili, Bronn, Fraas, Hauff, Heer, Hemleben, Hennig, Jaeger, Koken, Mosbrugger, Naef, Pompeckj, Schindewolf, Schlegelmilch, Seilacher, Westphal, Wiedmann, Wendt and Zittel.

The origins of the Palaeontological Collection in the medieval town of Tübingen go back to the foundation of the university in 1477 when first lectures were given on "stones" in general (Engelhardt and Hölder 1977). The collection as such was first systematically organised in 1837, when Friedrich August von Quenstedt (1809–1889) became in charge of the collection and gave his own lectures (Koken 1904; Hennig 1919, 1923; Werneburg 2016). From this time on, the collection was assigned both to science and to teaching. Up to this date, our main aim is to provide access to the unique material for national and international scientists. Moreover, in being associated to the University of Tübingen, staff of the Palaeontological

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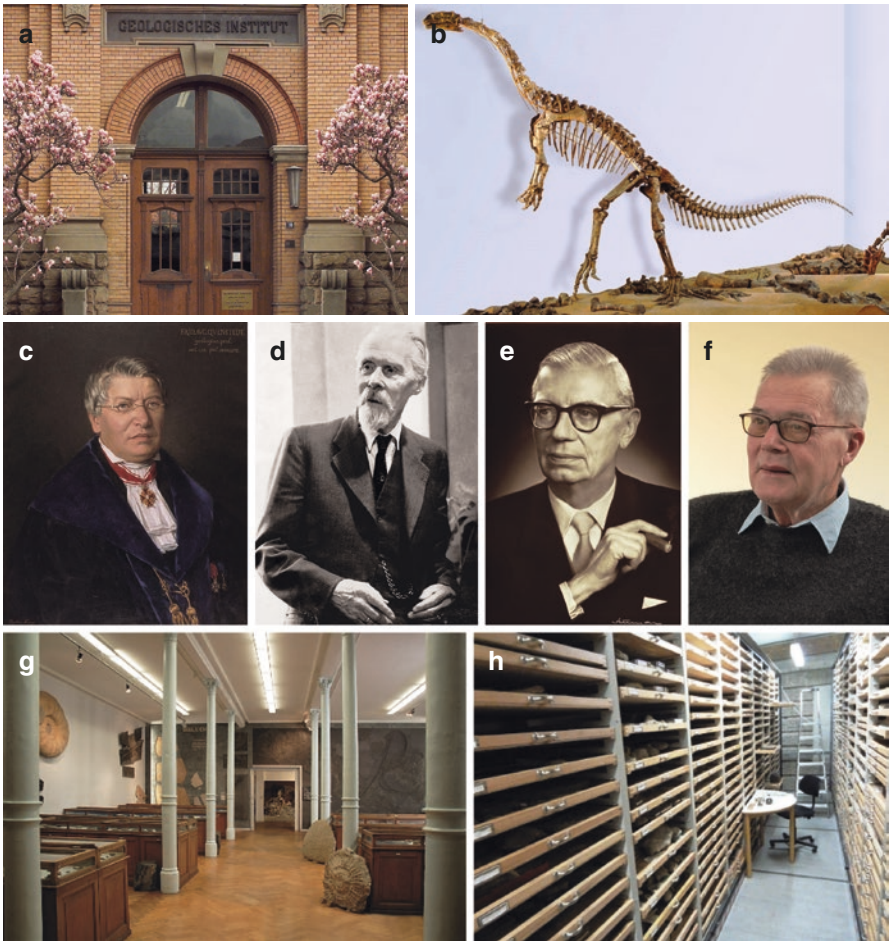

Fig. 52.1 (**a**) Entrance to the Palaeontological Collection Tübingen, Sigwartstraße 10 (built 1903). It is flanked by two flowering magnolias, which belong to the oldest lineage of living flowering plants (Angiospermae). Close relatives existed at the 'age of dinosaurs' and they were indigenous in middle Europe until the end of the last glacial period. (**b**) Mounted skeleton of *Plateosaurus engelhardti*, the so-called "Swabian Dragon", from Keuper-formation of Trossingen, Baden-Württemberg. (**c**–**f**) Famous researchers of the Palaeontological Collection: (**c**) Friedrich August von Quenstedt (1809–1889), (**d**) Friedrich Freiherr von Huene (1875–1969), (**e**) Otto Heinrich Schindewolf (1896–1971), (**f**) Adolf ('Dolf') Seilacher (1925–2014). View into (**g**) the historicising stratigraphical hall and into (**h**) a part of our compactus collection. Photos of this chapter were made by Wolfgang Gerber or are from the archive of the Palaeontological Collection

Collection feels obliged to teach students on how to handle palaeontological findings and to introduce them to palaeontological research (incl. field excursions).

The acronym of the collection "GPIT" is based on the old name of the institute: "Geologisch-Paläontologisches Institut Tübingen". Since 2010, the Palaeontological Collection and its exhibition is mainly managed and organised by employees of the

'Senckenberg Centre for Human Evolution and Palaeoenvironment (HEP)'. The vast majority of specimens, however, are property of Tübingen University. The collection is closely associated to the Department of Geology (Fachbereich Geowissenschaften) and, as such, we have access to a variety of laboratories, including labs for palaeontological preparations and thin sections.

52.2 Research

Comprehensive parts of the collection stem from the 19th and early 20th century. Tübingen and its collections were not destroyed during World War I and II (Seidl 2016), which makes our collection also valuable for researchers interested in the early development of German natural history collections.

Several invertebrates were included to the collection between 1950 and 1970 mirroring the research focus of the institute at the time. A number of valuable private collections were donated to the institute and enrich our comprehensive inventory. Just recently, the palaeontological material of the Herbarium Tubingense (Kretschmer 1974) was integrated into the collection.

Of particular importance are the collections and associated publications of Friedrich August von Quenstedt (1809–1889; Fig. 52.1c) on the Triassic and the Jurassic of the South German Scarplans (Quenstedt 1885). The famous vertebrate palaeontologist Friedrich Freiherr von Huene (1875–1969; Fig. 52.1d) collected and published, among others, on Triassic land vertebrates (Turner 2009). Otto Heinrich Schindewolf (1896–1971; Fig. 52.1e), an influential invertebrate palaeontologist and evolutionary theorist, worked on ammonites of the Jurassic and the Cretaceous. The founder of modern palaeoichnology, Adolf ('Dolf') Seilacher (1925–2014; Fig. 52.1f), created an exceptional collection of trace fossils. Since 2009, studies on Neogene terrestrial environments enriched the collection by more than 20,000 mainly mammalian fossils (Böhme et al. 2014).

In recent times, several national and international Bachelor-, Master-, Ph.D.- and Postdoc-projects are performed using fossil material from our collection, and we are part of the 'European Synthesys program for museum visits'. Current research in Tübingen, which comprehensively uses the material of the collection, is associated with several working groups. Among other topics, they study (1) terrestrial palaeoclimatology with a focus on Miocene fauna and stratigraphy of Eurasia (Böhme and Vasilyan 2014), (2) invertebrate palaeontology with a focus on echinoderm ecology and taphonomy (Mancosu and Nebelsick 2016), (3) terrestrial micropalaeontology (Junginger et al. 2014), (4) feeding ecology using stable isotope chemistry methods (Bocherens et al. 2015), and finally vertebrate (5) taxonomy (Maisch 2010), (6) functional (Hohloch 2013) and (7) comparative anatomy (Werneburg et al. 2015).

External visitors mainly work on vertebrate fossils stored in our collection, including ichthyosaurs and other marine reptiles, therapsids and plateosaur dinosaurs. Several (type) specimens await treatment with modern methods such as

micro-computed tomography (μCT) to score for new taxonomically and phylogenetically relevant characters (Laaß et al. 2017).

Our comprehensive and valuable invertebrate and plant collections (Christner and Kühner 1989) are little known to the research community yet. One reason for this is that currently only a minor part of the collection is already catalogued and little information is accessible online. Specialists visiting and working in the collection, however, use to find and identify valuable material.

52.3 Educational Work

In order to teach and entertain earth history, biodiversity and organismic research to the public, a number of fascinating and unique fossils are presented in the exhibition. As such, the exhibition is an integrated part of the collection. Its structure and the preparation techniques used have a strong historicising character (Fig. 52.1g). This highlights the historical and scientific value of the collection. School and university students as well as kindergarden groups and the public are regularly guided through the exhibition.

Already in the entrance hall, the visitors can find a number of exceptionally preserved ichthyosaurs with embryos and marine crocodiles from the Posidonia Shale of the Lower Jurassic from Holzmaden (184 million years old).

The "Swabian dragon" is the colloquial name of *Plateosaurus*, an early prosauropod dinosaur from the Upper Triassic (Fig. 52.1b). The original skeletons from Trossingen quarry are shown (Weishampel and Westphal 1986). They are presented in an original manner as arranged by the excavator, Friedrich Freiherr von Huene, himself. A strongly armored *Kentrosaurus* from Tanzania and track slabs of the hand-beast *Chirotherium* belong to this impressive ensemble.

The fauna of the Jurassic sea is shown in the 'marine reptile hall' (Fig. 52.2a). We do not only show skeletons of ichthyosaurs of Posidonia Shale but also a number of marine crocodiles (Fig. 52.3d), plesiosaurs (Liebau and Westphal 1995), sharks and bony fishes, which lived in Germany and England about 200 to 145 million years ago. Among those specimens are large predators such as the 15-m long temnodontosaurs and bones of the coelacanth. Several skeletons of pterosaurs round-up the presentation of vertebrate findings associated to the Jurassic sea, the Tethys Ocean. A large concentrate-lagerstätte of ammonites and nautilids gives an impression of the diversity of Jurassic marine invertebrate fauna (Fig. 52.3e). In addition to those, up to 6-m long mesosaurs, top predators of the Cretaceous sea, are on display. In one hall, there are skeletons of the Upper Triassic placodont *Henodus chelyops*, an exceptional, turtle-like sauropterygian reptile, which is only known by eight specimens from the Goldersbach near Tübingen-Lustnau (Fig. 52.2b). Next to it, the holotype of the famous Upper Triassic stem turtle *Proganochelys quenstedti*, preserved as a steinkern of the shell (Quenstedt 1889), is one of the "secret" highlights of the exhibition.

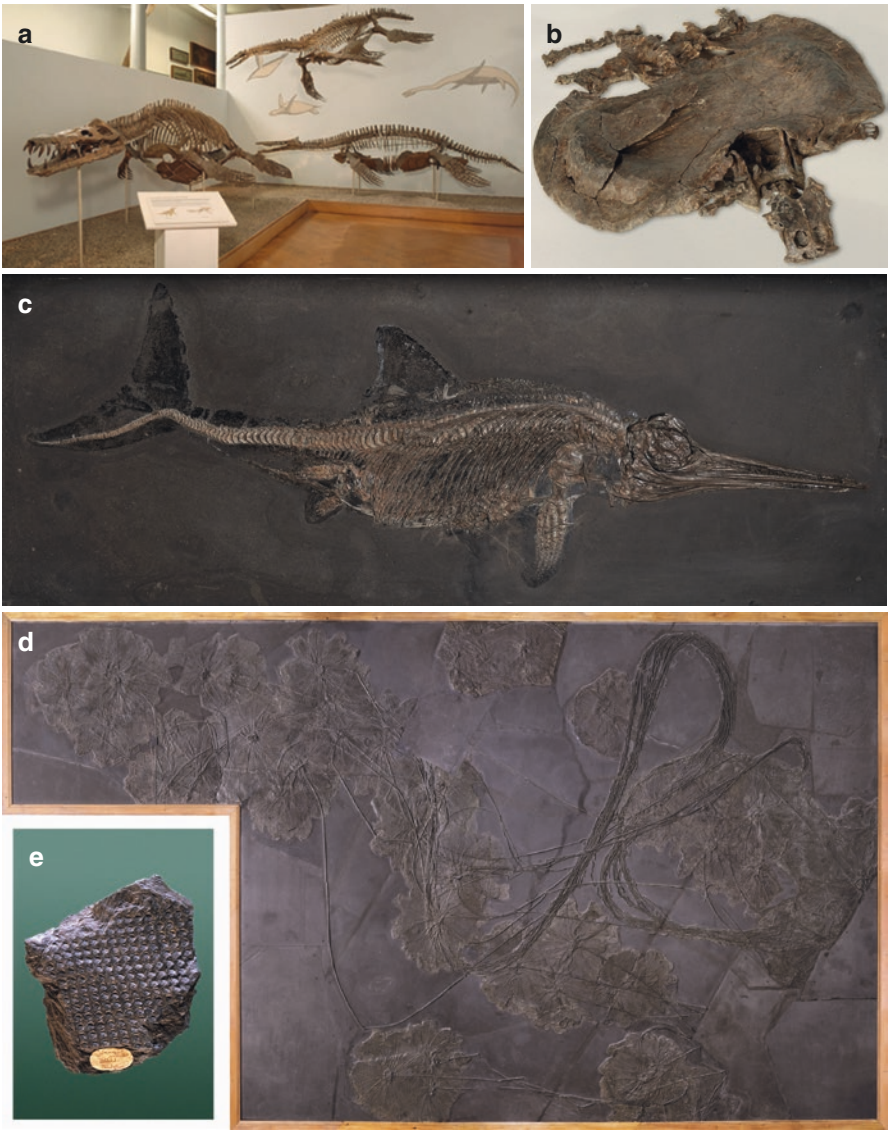

Fig. 52.2 (**a**) View into the marine reptile hall showing three plesiosaurs from the Middle Jurassic of Great Britain. (**b**) Skeleton of the turtle-like placodont *Henodus chelyops* from the Gipskeuper formation of Tübingen-Lustnau. (**c**) The ichthyosaurier *Stenopterygius quadriscissus* with soft tissue preservation. (**d**) The Jurassic sea lilie *Seirocrinus subangularis*, the so-called "Swabian medusa head", is related to sea urchins and starfishes. It is attached to driftwood. (**e**) Tree trunk imprint of the carboniferous species *Sigillaria oculata*. These clubmosses were up to 30-m high and their remains comprehensively contributed to the formation of coal deposits

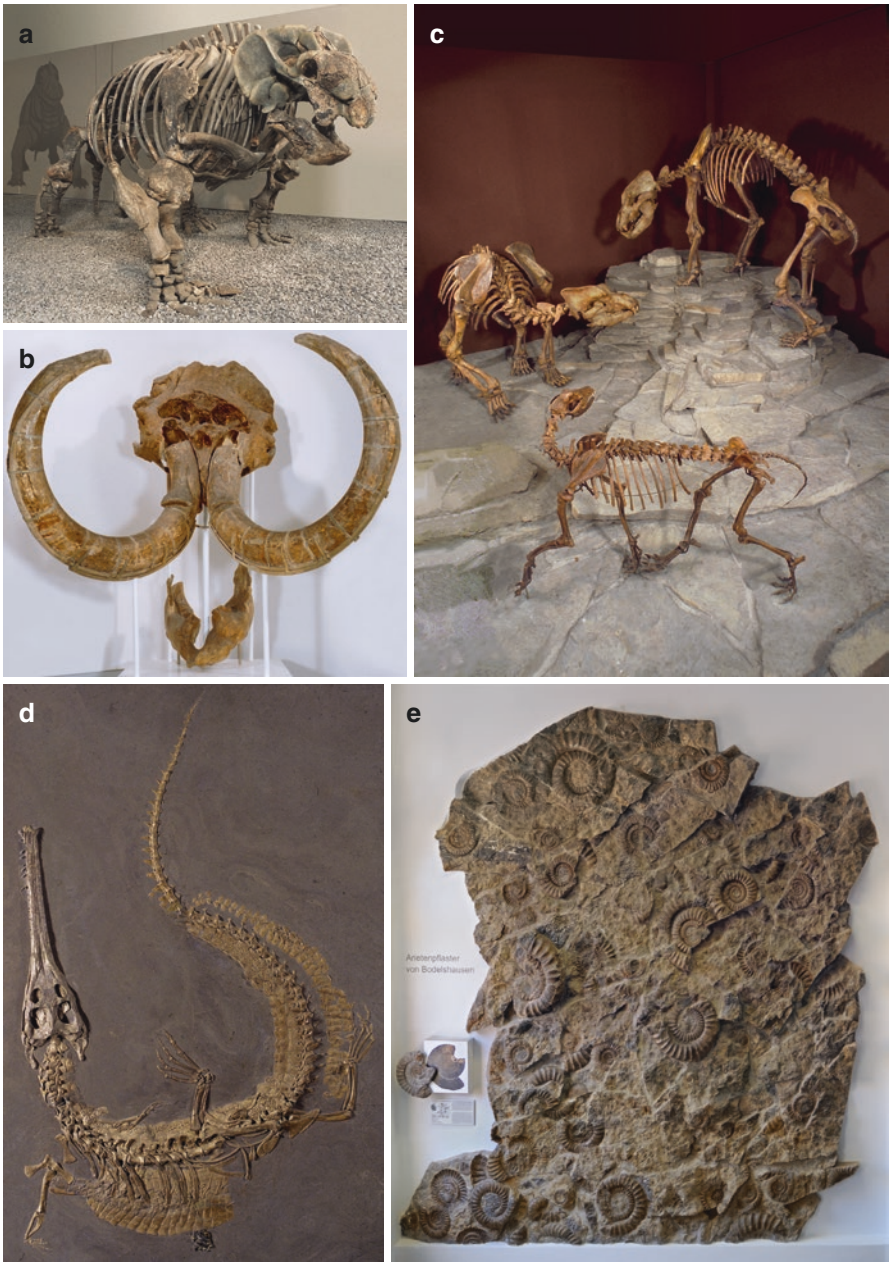

Fig. 52.3 (**a**) Skeleton of the synapsid *Stahleckeria potens* from the Middle Triassic of Brasil. (**b**) Skull of a Pleistocene woolly mammoth (*Mammuthus primigenius*) from Horn am Neckar. (**c**) Skeletons of two cave bears (*Ursus spelaeus*) and a wolf (*Canis lupus*) from Pleistocene sediments of Erpfingen bear's den at the Swabian Jura. (**d**) Skeleton of the marine crocodile *Steneosaurus bollensis* from the Posidonia Shale formation of Holzmaden. (**e**) Arietite ammonites and nautilid conchs from the lower Jurassic of Bodelshausen near Tübingen

Below the "Swabian Medusa head", which is a 4½-m tall colony of sea lilies from the Posidonian Shale of Ohmenhausen near Reutlingen (Fig. 52.2d), a comprehensive collection of fossils from all geological eras are shown in their stratigraphical sequence. The major steps of evolution within the last 500 million years are presented. The particular charm of this hall is how it resembles the natural history collections of the late 19th century with historical vitrines and collection cupboards made of oak (Fig. 52.1g). One of those cupboards contains an East Prussian amber collection with exceptional insect inclusions (Wichard et al. 2018).

The development of mammalian ancestors begins in the Paleozoic. The "reptilian-like" groups of therapsids (Fig. 52.3a) already show some adaptations that are typical for modern mammals including a specialised set of teeth, the posture of the limbs as well as the development of fur. Thanks to Friedrich von Huene, who did excavations in Africa and South America (Huene 1927), the university houses one of the most important collections of therapsids in the world (Westphal 1988; Kammerer et al. 2014). In the therapsid hall, as casts, also fossil humans and their close relatives are shown. In addition, the extremities of North American sauropod dinosaurs, which reached a live weight of up to 37 tons, are presented because the mammalian ancestors developed "in the shadow" of these herbivore reptiles (Fraser and Sues 1994).

Baden-Württemberg federal state belongs to the classical areas of geology and palaeontology. A great number of unique fossils permits an insight to the different ecosystems of Württemberg area through earth history. The oldest sediments were accumulated about 300 million years ago. Within the last ten thousands of years the sediments of the Erpfingen bear's den were formed. Its original cave bear skeletons can be observed in Tübingen (Fig. 52.3c). Opposite to them, an impressive skull of a mammoth from Horb am Neckar is on display (Fig. 52.3b).

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