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The Aalenian at the Type Locality

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With 2 plates and 3 textfigures

Introduction

The town of Aalen is situated about 70 kilometers east of Stuttgart at the northern edge of the Swabian Alb. Aalen itself and its environment have been the place of successful mining first documented in 1366.

Ferruginous oolite horizons within the lower "Braunjura" (Brown Jurassic) have been mined and melt together with pea iron-ore of the Swabian Alb. This mining continued with interruptions for some centuries until the year 1948. It has been of a great economical importance for Württemberg.

In connection with this mining activities as early as in the last century some authors studied the sequence of layers opened by the mining and the fossils of these series. Today this material is kept in several European museums and geological university institutes.

The town of Aalen was very well known to the geologists of the last century: v. ZIETEN (1830), for example, named an ammonite of the upper "Schwarzjura" (Black Jurassic) from Wasseralfingen *Ammonites aalensis* [= *Pleydellia aalensis*]. Another geologist (Ch. MAYER) used the name of the town of Aalen in a lithographic table produced in the year 1864 to denominate the layers of the lower "Braunjura" (Brown Jurassic) as follows: Etage aalénien, Aalenstufe, Aalenio, Aalen-series.

Later on the term Aalenian was used by other authors in different ways. This is discussed by RIEBER (1977) in detail.

MAUBEUGE (1964) proposed an outcrop near the village Attenhofen (today Aalen-Attenhofen) as stratotype for the upper part of the Aalenian. In the meantime the lithostratigraphy and biostratigraphy of this outcrop and of others nearby was investigated by WEBER (1964; 1967).

For the first time sections of layers opened by mining were given by SCHULER (1865) and O. FRAAS (1871). QUENSTEDT (1843; 1858) was the first who described the fossils of these layers in detail. Descriptions of the stratigraphy of the Aalenian in the region of Aalen were also given by SCHLEH (1925), BOZENHARDT (1936), GROSCHOFF (1957), v. FREYBERG (1960), MAUBEUGE (1964), and WEBER (1964; 1967).



Fig. 1. Geological sketch of the Aalen region with important outcrops in the Aalenian. (1) New brick pit near Essingen (Opalinus-Ton); (2) brick pit in Aalen (Opalinus-Ton); (3) roadside slope in Aalen-Wasseraalfingen "Gewann Hart" (columnar section, fig. 2); (4) brooklet ravine in the Braunjura β (WEBER 1964, profile 63); (5) brooklet ravine (columnar section, fig. 3; WEBER 1964, profile 62).

ALDINGER & FRANK (1944), WILD (1950), WERNER (1959), and ROGOWSKI (1971) particularly studied the sedimentology and petrography of these layers of the lower "Braunjura". A summary of the geology of the ferruginous sandstones of the Aalenian in SW-Germany can be found in the publication of FRANK, GROSCHOFF & WILD (1975). Geological mapping of the region of Aalen has been done by O. FRAAS (1871) in the scale 1 : 50 000, and by SEIBOLD (1950) in the scale 1 : 25 000 (manuscript). The new geological map of Baden-Württemberg in the scale 1 : 25 000, sheet no. 7126 (Aalen) with comments by ETZOLD & SEIBOLD is in preparation.

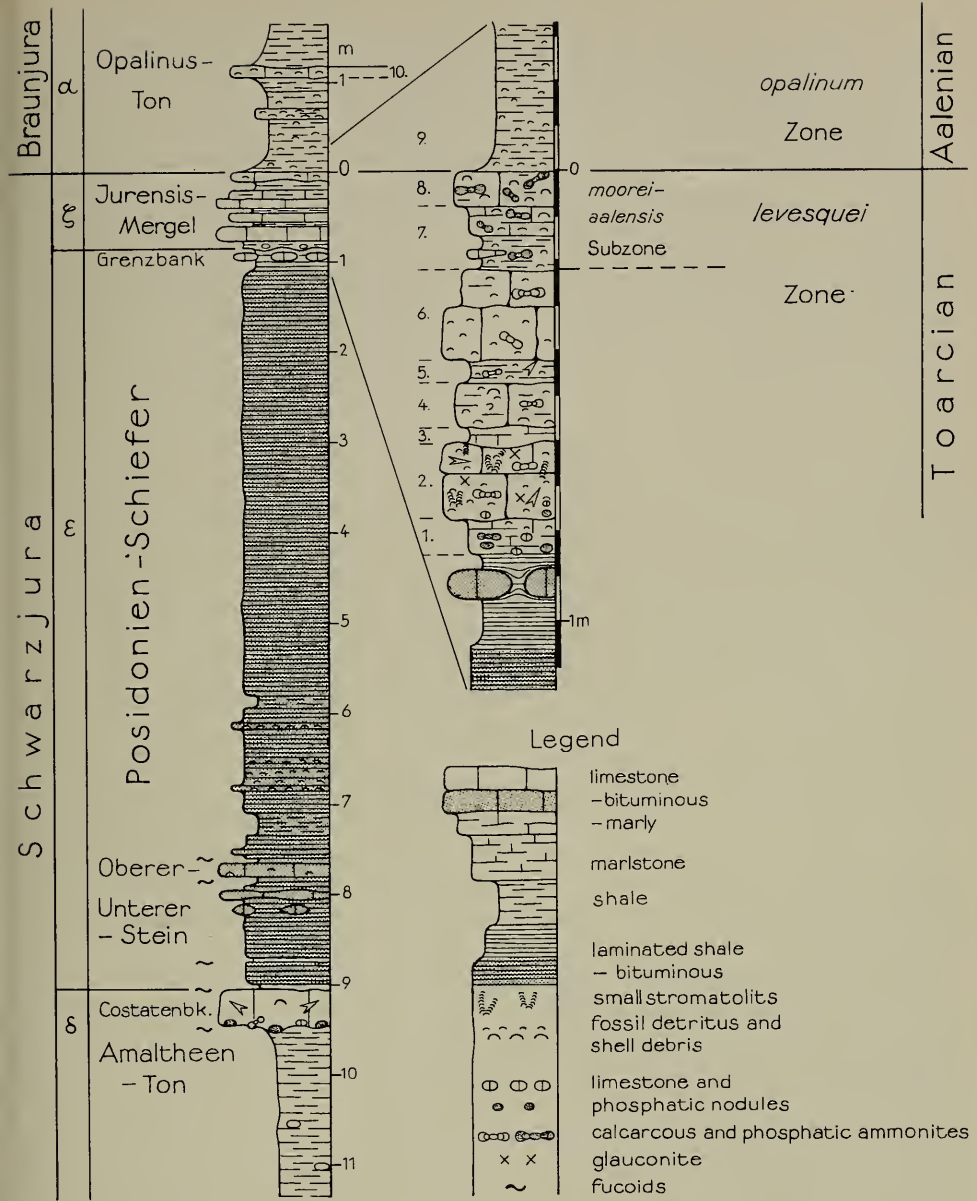


Fig. 2. Columnar section of the upper Schwarzjura (Posidonien-Schiefer and Jurensis-Mergel) and the boundary Lias/Dogger in detail. Rode-side slope in Aalen-Wasseralfingen "Gewann Hart" (co-ordinates: r = 35 83 730, h = 54 16 360).

Boundary "Schwarzjura" / "Braunjura"

The boundary "Schwarzjura" / "Braunjura" can be seen only by digging or in artificial outcrops existing for a short time as a rule. O. FRAAS (1871) was the first to describe the succession of layers in the boundary of "Schwarzjura" / "Braunjura" within the town district of Aalen-Wasseralfingen. Other sections were given by STRAUB (1946: Aalen-Hammerstadt), by BROCKERT (1959: Aalen-Wasseralfingen),

and by SEILER & VILLINGER (1966: Aalen-Dewangen and Aalen-Brausenried). All these sections belong to the "Reichenbacher Sattel" (STRAUB 1946, 58), a region where the layers of the "Schwarzjura ζ" are very condensed.

In spring 1976 there was a good outcrop of the boundary "Schwarzjura"/"Braunjura" during a road-building in the western part of Aalen-Wasseralfingen. There the layers of the "Posidonienschiefer" (Posidonia shales) with a thickness of 8 meters are followed by the "Jurensis-Mergel" (Jurense marl) of the "Schwarzjura ζ" which are rich in fossils ("Ammoniten-Breccie": ENGEL 1894) and only a bare meter thick. (The columnar section is given in fig. 2 of this paper.) The "Jurensis-Mergel" contain the following ammonites: in the layer no. 1 and no. 2 *Hildoceras* sp. and *Catacoeloceras* sp. can be found as phosphatic casts. A group of students once more investigating the same section under the assistance of J. WIEDMANN, Tübingen, besides noted *Grammoceras thouarsense* (D'ORBIGNY) out of the layer no. 2. In the layer no. 3 and no. 4 containing mainly ammonites of a bad preservation, the same students found some ammonites, which they determined as *Phlyseogrammoceras dispansum* (LYCETT) and *Dumortieria levesquei* (D'ORBIGNY) (pers. commun. J. WIEDMANN, Tübingen). In the layers no. 5 and 6 which look like the „Hammerstadter Breccie“ almost merely ammonites of the genera *Dumortieria* can be found, e. g. the common *Dumortieria radiosa* (v. SEEBACH). These ammonites suggest that probably these layers represent the „Dumortierien-Zone“ (BROCKERT 1959, 124). The „Dumortierien-Zone“ (*Dumortieria*-Zone: BUCKMAN 1910, 88) is the equivalent of the *levesquei* Subzone after DEAN, DONOVAN & HOWARTH (1961). The layers no. 7 and 8 are the richest in fossils and contain the ammonites *Dumortieria moorei* (LYCETT), *Dumortieria costula* (REINECKE), *Dumortieria nicklesi* (BENECKE), *Pseudolioceras compactile* (SIMPSON), *Pleurolytoceras hircinum* (SCHLOTHEIM), *Pleydellia subcompta* (BRANCO), *Pleydellia aalensis* (ZIETEN).

According to DEAN, DONOVAN & HOWARTH (1961) *Dumortieria moorei* is the index fossil for the *moorei* Subzone, and *Pleydellia aalensis* is the index fossil for the *aalensis* Subzone. Both ammonites appear in layer no. 7 for the first time and occur also in layer no. 8. In our profile the two subzones cannot be separated.

Layer no. 8 represents the upper limit of the Lias. Above the series of marly limestones of the "Schwarzjura ζ" slaty detritic clay-marls are following, which contain *Pachylytoceras torulosum* (ZIETEN), the index fossil of the lower part of the *opalinum* Zone, exactly at the base. Therefore the change from the "Jurensis-Mergel" to the „Opalinus-Ton“ facies (Jurense marl/Opalinum clay) coincidences with the limit Lias/Dogger. Only a few centimeters above the first occurrence of *Pachylytoceras torulosum* (ZIETEN) *Leioceras opalinum* (REINECKE) can be noticed, beside *Pleydellia* sp. indet. At the base of the layer no. 10 *Pleydellia* cf. *fluitans* (DUMORTIER) has been found.

In Aalen-Wasseralfingen, "Gewann-Hart", the lower "Braunjura α" belongs on account of its ammonite assemblage to the *opalinum* Zone. In our outcrop the Aalenian begins within layer no. 9.

Braunjura α

In the region of Aalen the aggregate thickness of the "Braunjura α" amounts to 100–110 meters. A continuous outcrop of the whole stage does not exist. Parts of the stage can be found in clay pits in the west of Aalen. Lately there is a new

outcrop in the "Opalinus-Ton" about five kilometers west of Aalen near Essingen. Contrary to the opinion of MAUBEUGE (1964) the characteristic ammonite *Leioceras opalinum* (REINECKE) of the *opalinum* Zone can be found in the outcrops of the "Opalinus-Ton" of Aalen. They are very rare and badly preserved in most cases as well as the bivalves and gastropods of these layers. Only in the highest part of the "Opalinus-Ton" a horizon exists which is rich in fossils and contains *Trigonia navis* near Aalen-Wasseralfingen according to O. FRAAS (1871).

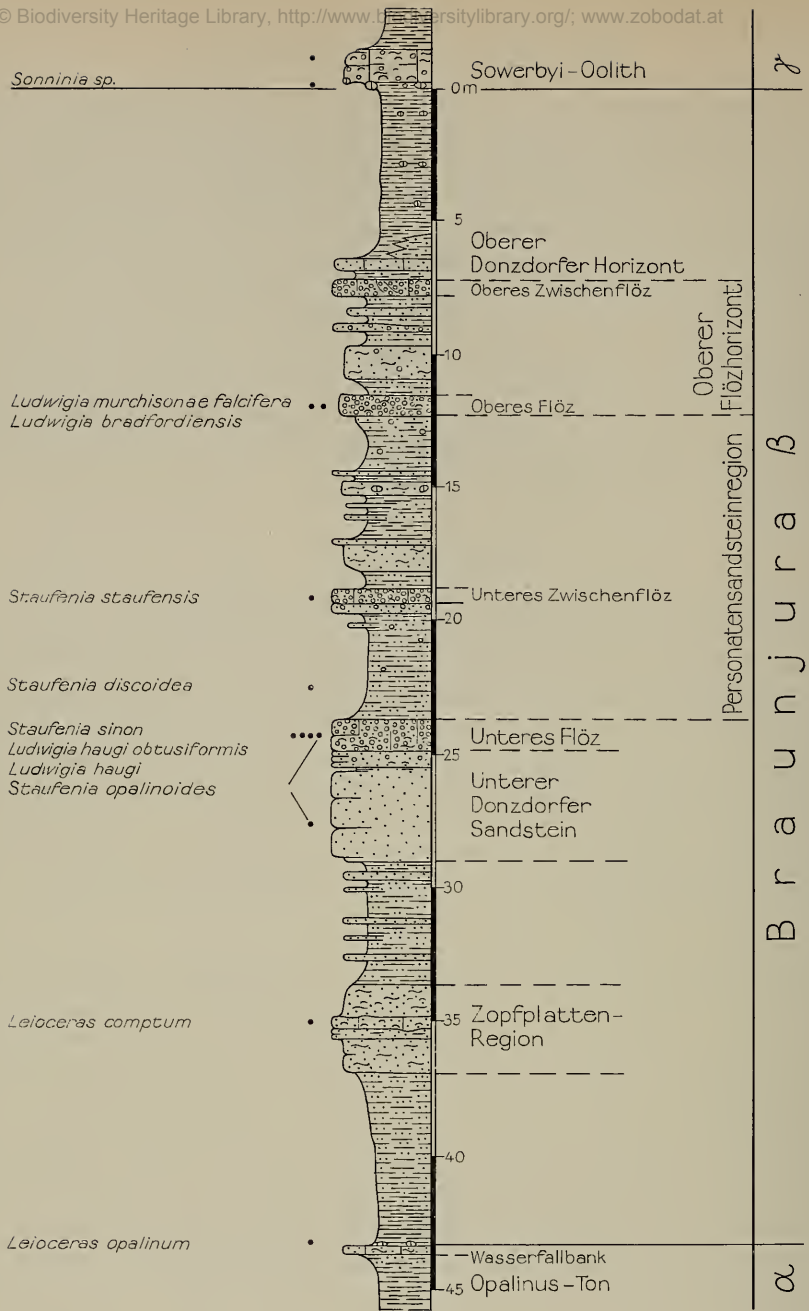
In the monotonous silty clays marly lime nodules can be found, concentrated in omission horizons. Besides these there are layers of marly limestone. They are rare and not suitable for the local stratigraphy of the "Opalinus-Ton". The upper limit of the "Opalinus-Ton" is formed by a sandy, marly limestone with a thickness of 10–20 centimeters. This layer is called "Wasserfallbank" ("waterfall bench") (see BOZENHARDT 1936, 83; WEBER 1964, profile 62).

Braunjura β

The best outcrops we have in the "Braunjura β " nowadays are situated north-east of Aalen-Oberalfingen (fig. 1 and 3). There the "Braunjura β " shows a thickness of 42 meters. It begins above the "Wasserfallbank" with slaty shales poor in fossils. These slaty shales become sandy towards the upper part. 30 centimeters above the "Wasserfallbank", already in the "Braunjura β ", WEBER (1964, profile 62) still found a specimen of *Leioceras opalinum*. 6 meters above the "Wasserfallbank" the layers turn into bioturbate clayey sandstones. These sandstones are 3 meters thick and called "Zopfplattenregion". This name refers to trace fossils as *Gyrochorda comosa* (HEER) found on bedding planes. Some of the bedding planes are very rich in body fossils, containing beside others *Leioceras comptum* (REINECKE) near Oberalfingen according to WEBER (1964, profile 64).

Above a series of shale- and sandstone-layers, 5 meters thick and without fossils, follows the "Unterer Donzdorfer Sandstein" (Lower Sandstone of Donzdorf). In former times the yellow, compact sandstones had been broken as building stones in numerous quarries. In the "Unterer Donzdorfer Sandstein" *Staufenia* (*Ancolioceras*) *opalinoides* (MAYER) appears for the first time near Aalen-Oberalfingen. The "Unterer Donzdorfer Sandstein" is followed by a series of oolitic ironstone beds (minette type) with intercalated sandstones and sandy shales. The thickness of the whole ferruginous series near Aalen-Wasseralfingen is about 18 meters. In the field the brown ironstone beds attract attention because of their rusty red colour. The iron-seams become 1–2 meters thick at the best; the Fe-content reaches about 30 %. Important for the local stratigraphy are the "Unteres Flöz" (Lower Seam), the "Unteres Zwischenflöz" (Lower Intermedian Seam), the "Oberes Flöz" (Upper Seam) and the "Oberes Zwischenflöz" (Upper Intermedian Seam). In the past the "Unteres Flöz" and the "Oberes Flöz" had been mined in Aalen and Wasseralfingen. The layers between the "Unteres Flöz" and the "Oberes Flöz" are named "Personaten-sandsteinregion" after "*Pecten personatus*" [= *Paramussium pumilus*]. The layers from the "Oberes Flöz" until the "Oberes Zwischenflöz" are named "Oberer Flöz-horizont" (Upper Seam Horizon).

Mainly the top layers of the ironstone horizons are rich in fossils. The most characteristic fossils are *Gryphaea calceola*, *Paramussium pumilus*, *Entolium demissum* and remainders of echinoderms. Probably in the "Oberes Flöz" remarkable



Legend

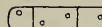
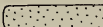


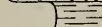
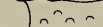
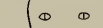
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|---|--------------------------------------|---|---------------------------------------|
|  | oolitic limestone |  | sandstone |
|  | oolitic brown ironstone, sandy shale |  | — clayey |
|  | — sandy and flaser bedded |  | shell debris |
| | |  | clay ironstone and phosphatic nodules |

Fig. 3. Columnar section of the Braunjura β according to WEBER 1964, profile 62. Brooklet ravine near Aalen-Oberalfingen (co-ordinates: r = 35 83 730, h = 54 16 360) — with ammonites found in the region of Aalen.

fossils have been found by mining in the last century: excellently preserved sea-stars and ophiuroids (pl. 2, fig. 5, 6), rests of crustaceans, of nautilids (*Cenoceras*, pl. 2, fig. 2), of fish (e. g. *Hybodus*, pl. 2, fig. 7; *Chimaera*: JAECKEL 1901; *Pholidophorus*) and of saurians (e. g. bones of *Teleosaurus*, pl. 2, fig. 8, and *Plesiosaurus*).

The "Unteres Flöz" contains *Staufenia* (*Costileioceras*) *sinon* (BAYLE), *Staufenia* (*Ancolioceras*) *opalinoides* (MAYER), *Ludwigia* (*Welschia*) *haugi* (DOUVILLÉ), and *Ludwigia* (*Welschia*) *haugi obtusifomis* (BUCKMAN) (WEBER 1964, profile 62, 63: Oberalfingen). Immediately above the „Unteres Flöz“ *Staufenia* (*Staufenia*) *discoidea* (QUENSTEDT) occurs, and in the "Unteres Zwischenflöz" *Staufenia* (*Staufenia*) *staufensis* (OPPEL). During the mining near Aalen-Wasseralfingen numerous specimens of *Ludwigia* (*Brasilia*) *bradfordensis* (BUCKMAN) and *Ludwigia* (*Ludwigia*) *murchisonae falcifera* (ALTHOFF) have been found in the "Oberes Flöz".

The final part of the "Braunjura β" is made up by very sandy shales (equivalent to the "Oberer Donzdorfer Sandstein"), 0,1–2 meters thick, followed by slaty shales with clay ironstone nodules, 5–6 meters thick. Above these shales there is an oolitic and partly clayey limestone layer named "Sowerbyi-Oolith" (= "Pectinitenbank": O. FRAAS 1871, 15), 1,5 meters thick and rich in fossils. WEBER (1964, profile 62) noted a specimen of *Sonninia* sp. out of this horizon. Already SCHLEH (1925, 2) mentioned a *Sonninia* "sowerbyi" from the upper part of the "Sowerbyi-Oolith" of the same outcrop.

The *comptum* Subzone is indicated by the occurrence of *Leioceras comptum* in the "Zopfplattenregion" in the profile near Aalen-Oberalfingen (see fig. 3). In the same outcrop the layers from the "Unterer Donzdorfer Sandstein" to the "Oberes Flöz" belong to the *murchisonae* Zone because of their ammonite fauna. The succession of the ammonites in these layers given by WEBER (1964) indicates almost the same sequence of subzones which were noted by RIEBER (1977, table 2) in the western Swabian Alb. Only the vertical range of the different species of ammonites is not known very well, because in the outcrops near Aalen-Oberalfingen the ammonites are not abundant. They are more frequent only in some layers. Until today the *concauum* Zone can be supposed in the sandy shales and in the slaty shales with nodules below the "Sowerbyi-Oolith", whence no ammonites are known. Out of this level the typical index fossils of the *concauum* Zone are given by WEBER (1964) from outcrops near Geislingen an der Steige, 35 kilometers southwest of Aalen. In the region of Aalen not only the "Braunjura γ" but probably also the Bajocian begins with the "Sowerbyi-Oolith". The "Sowerbyi-Oolith" of the Swabian Alb seems to belong partly to the *discites* Zone (PARSONS 1974, 173, fig. 3). Until today only the two specimens of *Sonninia* given by SCHLEH (1925) and WEBER (1964) are known from the "Sowerbyi-Oolith" near Aalen-Oberalfingen. Further investigations will be necessary to find indications for the *discites* Zone, the base of the Bajocian.

Literature

- ALDINGER, H. & FRANK, M. (1944): Vorkommen und Entstehung der südwestdeutschen jurassischen Eisenerze. — N. Jb. Mineral. Geol. Paläont., Abh., B, 88, p. 293–336, 4 figs.; Stuttgart.
- BOZENHARDT, TH. (1936): Zur Stratigraphie und Bildungsgeschichte des Braun-Jura β in Nordost-württemberg. — Mitt. mineral.-geol. Inst. TH Stuttgart, 28, p. 5–117; Stuttgart.
- BROCKERT, M. (1959): Zur Ammonitenfauna und Stratigraphie des Lias zeta in Baden-Württemberg. — Diss. Univ. Tübingen, 155 pp., 19 figs., 7 pls. — [Mscr.]

- BUCKMAN, S. S. (1910): Certain Jurassic (Lias-Oolite) strata of south Dorset; and their correlation. — Quart. J. Soc. London, **66**, p. 52—89; London.
- DEAN, W. T., DONOVAN, D. T. & HOWARTH, M. K. (1961): The Liassic ammonite Zones and Subzones of the North-West European Province. — Bull. British Mus. (nat. Hist.) Geol., **4/10**, p. 435—505, 13 pls.; London.
- ENGEL, TH. (1894): Die Ammonitenbreccie des Lias ζ bei Bad Boll. — Jh. Ver. vaterl. Naturk. Württemberg, **50**, p. LI—LXII; Stuttgart.
- FRAAS, O. (1871): Begleitworte zur Geognostischen Spezialkarte von Württemberg, Atlasblatt Aalen (1 : 50 000). 31 pp.; Stuttgart.
- FRANK, M., GROSCHOFF, P. & WILD, H. (1975): Die Eisenerze des Aalenium in der östlichen Schwäbischen Alb (Geislingen an der Steige, Aalen und Wasseralfingen). — In: FRANK, M., GROSCHOFF, P., GUDDEN, H., HALBACH, P., HEGENBERGER, W., SAUER, K., SIMON, P., WILD, H., ZIEGLER, J. H.: Sedimentäre Eisenerze in Süddeutschland. — Geol. Jb., D, **10**, p. 69—103, fig. 17—24, tab. 10—15, pl. 1; Hannover.
- FREYBERG, B. v. (1960): Parallelisierung der Eisenerzflöze im Dogger β Bayerns und Württembergs, Abh. Deutsch. Akad. Wiss. Berlin, Kl. III, **1**, p. 247—262, 4 figs., 2 tabs.; Berlin.
- GROSCHOFF, P. (1957): Stratigraphie der Eisenerzflöze des Braunen Jura Beta in Württemberg. — Z. Deutsch. geol. Ges., **109**, p. 17—21, 1 fig.; Hannover.
- JAECKEL, O. (1901): Über jurassische Zähne und Eier von Chimäriden. — N. Jb. Min., Beil.-Bd., **14**, p. 540—564, 3 figs., 4 pls.; Stuttgart.
- MAUBEUGE, P. L. (1964): La question de l'étage Aalénien et son stratotype. — Colloque du Jurassique à Luxembourg 1962, p. 203—215; Luxembourg.
- MAYER, CH. (1864): Tableau synchronistique des terrains jurassiques. Zürich.
- PARSONS, C. F. (1974): The *sauzei* and "so called" *sowerbyi* Zones of the Lower Bajocian. — Newsl. Stratigr., **3/3**, p. 153—180, 4 figs., 2 tabs.; Leiden.
- QUENSTEDT, F. A. (1843): Das Flözgebirge Württembergs. 558 pp., 1. Aufl.; Tübingen (H. Laupp). — (1858): Der Jura. 842 pp., 100 pls.; Tübingen (H. Laupp).
- RIEBER, H. (1977): Remarks to the Aalenium of the Swabian Alb. — Stuttgarter Beitr. Naturk., B, **29**, 5 pp., 2 tabs.; Stuttgart.
- ROGOWSKI, E. (1971): Sedimentpetrographische Untersuchungen in den Dogger-beta-Sandsteinen (Oberes Aalenium) der östlichen Schwäbischen Alb. — Arb. geol. paläont. Inst. TH Stuttgart, N.F. **65**, 117 pp., 18 figs., 6 tabs., 14 pls.; Stuttgart.
- SCHLEH, F. (1925): Eine Studie über den Braun-Jura β im nordöstlichen Schwaben und seine Eisenoolithflöze. — Thesis Univ. Tübingen, 43 pp., 2 figs.; Tübingen.
- SCHULER, [J.] (1865): Über die Bestimmung der Mächtigkeit des braunen Jura bei Wasseralfingen. — Jh. Ver. vaterl. Naturk. Württ., **21**, Vortrag VIII, p. 67—81, 1 pl.; Stuttgart.
- SEIBOLD, E. (1950): Der Bau des Deckgebirges im oberen Rems-Kocher-Jagst-Gebiet. — N. Jb. Geol. Paläont., Abh., **92**, p. 243—366, 7 figs., 12 tabs., pl. 3; Stuttgart.
- SEILER, K.-P. & VILLINGER, E. (1966): Stratigraphische und tektonische Untersuchungen im Keuper und Lias des Lein-Rems-Gebietes (Württemberg). — Oberrhein. geol. Abh., **15/1/2**, p. 61—97, 15 figs.; Karlsruhe.
- STRAUB, W. (1946): Stratigraphie und Bildungsgeschichte des Lias zeta in Mittelwürttemberg und Südbaden. — Thesis TH Stuttgart, 72 pp., 1 pl.; Stuttgart.
- WEBER, H.-S. (1964): Zur Stratigraphie und Ammonitenfauna des Braunjura (Dogger) β der östlichen Schwäbischen Alb. — Arb. geol. paläont. Inst. TH Stuttgart, N.F. **44**, 174 pp., 3 tabs., 3 pls.; Stuttgart.
- (1967): Zur Westgrenze der ostschwäbisch-fränkischen Fazies des Braunjura (Dogger) β in der Schwäbischen Alb (Württemberg). — Jber. Mitt. oberrh. geol. Ver., N.F. **49**, p. 47—54, 2 figs.; Stuttgart.
- WERNER, F. (1959): Zur Kenntnis der Eisenoolithfazies des Braunjura β von Ostwürttemberg. — Arb. geol. paläont. Inst. TH Stuttgart, N.F. **23**, 169 pp., 54 figs., 8 tabs., 7 pls.; Stuttgart.
- WILD, H. (1950): Zur Bildungsgeschichte der Braunjura- β -Flöze und ihrer Begleitgesteine in Nordost-Württemberg. — Geol. Jb., **65**, p. 271—298, 12 figs., 1 tab.; Hannover.
- ZIETEN, C. H. v. (1830): Die Versteinerungen Württembergs oder naturgetreue Abbildungen der in den vollständigsten Sammlungen, namentlich der in dem Kabinett des Oberamts-Arzt Hartmann befindlichen Petrefacten usw. 102 pp., 72 pls.; Stuttgart (E. Schweizerbart).

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Plate 1

- Fig. 1. *Dumortieria moorei* (LYCETT); upper Schwarzjura ζ ; Aalen-Wasseralfingen „Gewann Hart“; Staatl. Mus. f. Naturk. Stuttgart no. 23135. — x 1.
- Fig. 2. *Dumortieria costula* (REINECKE); upper Schwarzjura ζ ; Aalen-Wasseralfingen „Gewann Hart“; Staatl. Mus. f. Naturk. Stuttgart no. 23135. — x 1.
- Fig. 3. *Pseudolioceras compactile* (SIMPSON); upper Schwarzjura ζ ; Aalen-Wasseralfingen „Gewann Hart“; Staatl. Mus. f. Naturk. Stuttgart no. 23137. — x 1.
- Fig. 4. *Pleydellia aalensis* (ZIETEN); upper Schwarzjura ζ ; Aalen-Wasseralfingen „Gewann Hart“; Staatl. Mus. f. Naturk. Stuttgart no. 23138. — x 1.
- Fig. 5. *Pleydellia subcompta* (BRANCO); upper Schwarzjura ζ ; Aalen-Wasseralfingen „Gewann Hart“; Staatl. Mus. f. Naturk. Stuttgart no. 23139. — x 1.
- Fig. 6. *Ludwigia (Brasilia) bradfordensis* (BUCKMAN); Braunjura β , „Oberes Flöz“ (Upper Seam); Aalen-Wasseralfingen; Staatl. Mus. f. Naturk. Stuttgart no. 20374. — x 2/3.
- Fig. 7. *Staufenia (Ancolioceras) opalinoides* (MAYER); Braunjura β , „Unteres Flöz“ (Lower Seam); Staatl. Mus. f. Naturk. Stuttgart no. 23140. — x 1.

The ammonites of the Braunjura β were determined by H. RIEBER, Zürich.

The photographs were taken by H. HAEHL, Stuttgart.

The textfigures were drawn by A. DOLD, Freiburg.

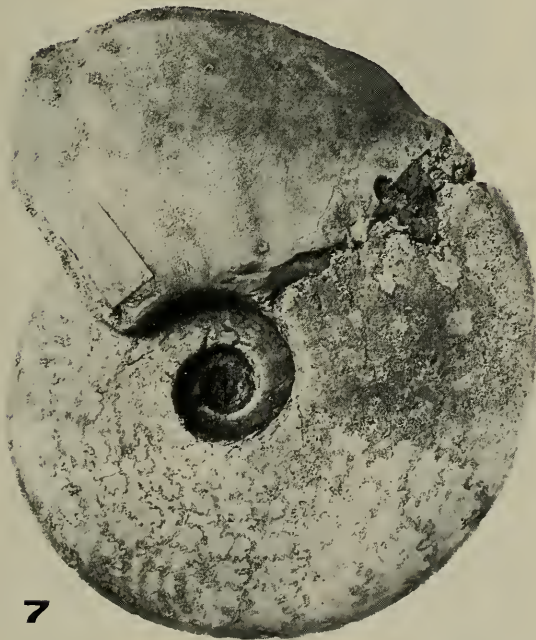
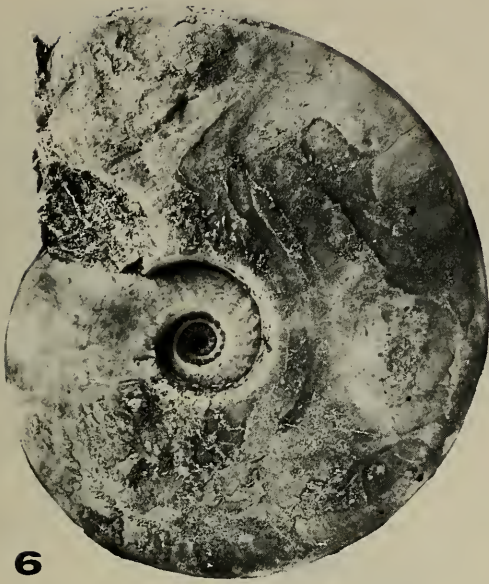
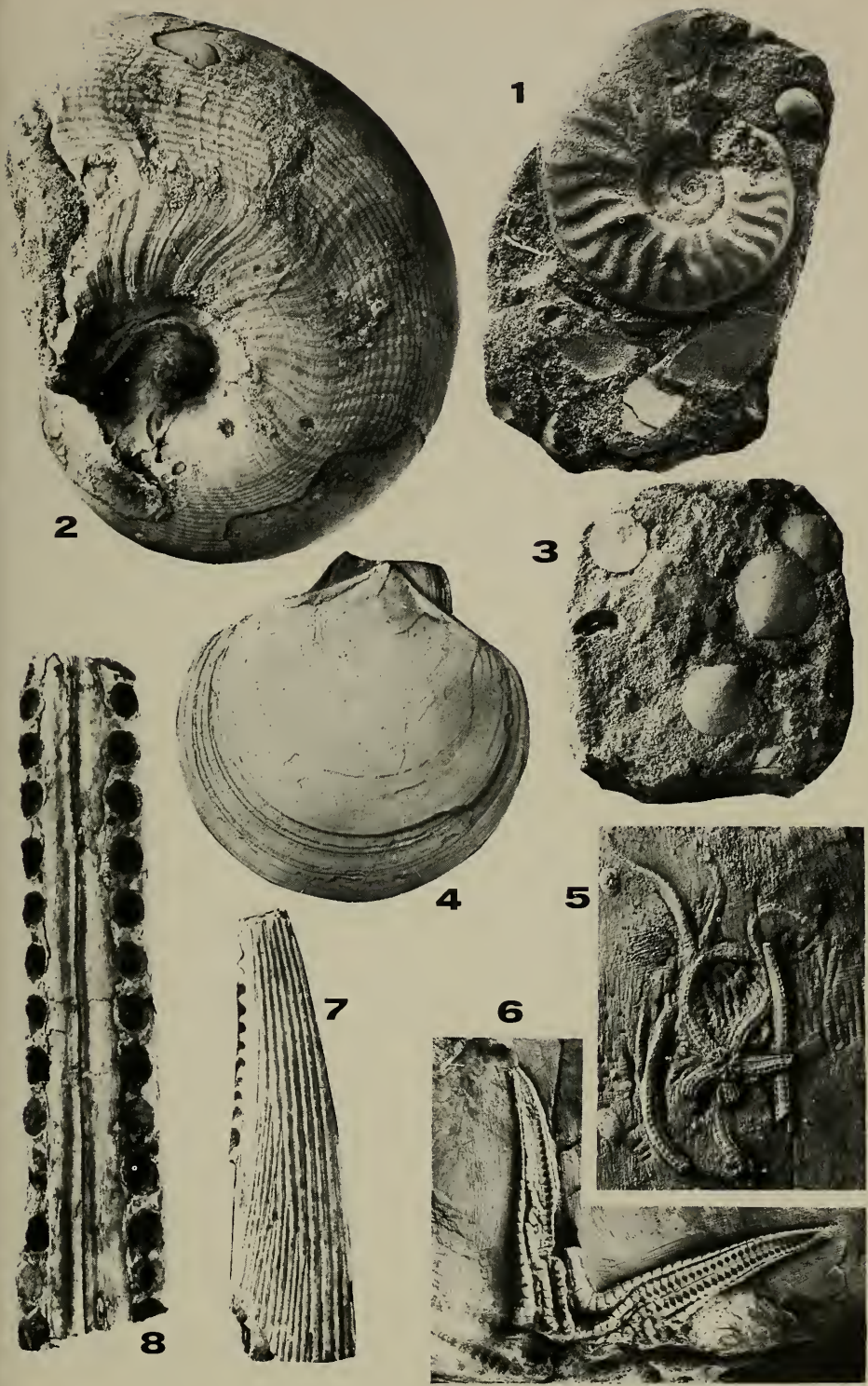


Plate 2

- Fig. 1. *Staufenia* (*Costileioceras*) *sinon* (BAYLE); Braunjura β , "Unteres Flöz" (Lower Seam); Aalen-Wasseralfingen; Staatl. Mus. f. Naturk. Stuttgart no. 8691. — x 5/4.
- Fig. 2. *Cenoceras* sp.; Braunjura β , Flözhorizont (brown ironbed horizon); Aalen-Wasseralfingen; Staatl. Mus. f. Naturk. Stuttgart no. 18160. — x 1.
- Fig. 3. *Paramussium pumilus* (LAMARCK); Braunjura β , Flözhorizont (brown ironbed horizon); Aalen; Mus. f. Naturk. Stuttgart no. 21785. — x 1.
- Fig. 4. *Entolium demissum* (GOLDFUSS); Braunjura β , Flözhorizont (brown ironbed horizon); Aalen; Staatl. Mus. f. Naturk. Stuttgart no. 23141. — x 1.
- Fig. 5. ? *Palaeocoma* sp.; Braunjura β , Flözhorizont (brown ironbed horizon); Aalen-Wasseralfingen; Staatl. Mus. f. Naturk. Stuttgart no. 23142. — x 1.
- Fig. 6. *Pentasteria* (*Archastropecten*) *mandelslohi* (MUENSTER); Braunjura β , Flözhorizont (brown ironbed horizon); Aalen-Wasseralfingen; Staatl. Mus. f. Naturk. Stuttgart no. 23143. — x 1.
- Fig. 7. Fin-spine of *Hybodus*; Braunjura β , Flözhorizont (brown ironbed horizon); Aalen-Wasseralfingen; Staatl. Mus. f. Naturk. Stuttgart no. 11537. — x 2/3.
- Fig. 8. Fragment of the upper jaw of *Teleosaurus*; Braunjura β , Flözhorizont (brown ironbed horizon); Aalen; Staatl. Mus. f. Naturk. Stuttgart no. 3978 a. — x 1/2.

The echinoderms were determined by H. HESS, Binningen, Switzerland.
The photographs were taken by H. HÄEHL, Stuttgart.



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