

---

## PATHFINDER IN PALYNOLOGY: ALFRED EISENACK (1891–1982)

by

**Hans Gocht and William A. S. Sarjeant**

Although some relevant observations were made in earlier times, the science of palynology is essentially a creation of the twentieth century. It was pioneered by a handful of individuals who often undertook their researches in an adverse scientific climate and with pathetically inadequate funding and equipment yet contrived to sow seeds of new knowledge that were soon to yield an abundant scientific and commercial harvest. That generation, sadly, is now fast fading away; Lennart von Post, Otto and Walter Wetzell, Gunnar Erdtman, Georges Deflandre, all are gone. With the passing of Alfred Eisenack, this chapter of scientific history may be considered to be ended.

Alfred Eisenack was born on 13 May 1891 in the small town of Altfelde, in the Kreis Marienburg region of West Prussia, Germany, the son of Conrad Eisenack, a bookkeeper, and Ida (née Gedau). He grew up in the shadow of the old Marienburg castle and attended high school in nearby Elbing. Alfred loved animals and plants and was a keen and perceptive observer, developing an interest in the natural sciences that was never to diminish throughout his life.

In 1911 he went to the ancient University of Jena in Thuringia, and in 1913 moved to Albertus Magnus University, Königsberg, East Prussia, to study under the Swedish paleontologist and stratigrapher Prof. Sven Tornquist (1840–1920). There Eisenack commenced a doctoral thesis on the stratigraphy of the uppermost Jurassic (Portlandian) sediments of the Lake Garda (Monte Baldo) region of northern Italy.

The onset of World War I interrupted Eisenack's studies after only seven semesters. On 4 August 1914, he volunteered for army service becoming an infantryman on 2 September. He served in the field until 30 November. During the battle of Lodz he was wounded and taken prisoner by the Russians.

Eisenack's captivity lasted six years. He was sent to a faraway prison camp in Chita, a city in eastern Siberia close to the Mongolian border. A fellow-prisoner was another German geologist, von Pontoppidan (see Note 1). From him, Eisenack received instruction in geomorphology, petrography and structural geology. He

was able to receive geological instruction from Professor Kusnetsov (see Note 2) at the Mining Academy in Chita and, during a visit to the family of one his guards, to examine marbles and collect specimens of mica in the district around Sliudianka on the shores of Lake Baikal.

In general it was an amiable captivity. With friends in the prison camp, he established and managed a chemical plant that produced alcohol and ether; he was allowed to go on a number of excursions outside the camp; and, when his health broke down, he was sent to a mineral spa for a cure. However, in the chaos that followed the Russian Revolution, he was overlooked, and it was a long time before he secured release from imprisonment. However, he was able to move into town and work as a chemist, at times in a dispensary, and other times in soap-making and meat-preserving companies. Only in 1920, under the brief White Russian rule, was he eventually repatriated. He traveled to the port of Vladivostok and by boat via the Indian Ocean back to Germany.

Home again, Eisenack resumed his geological studies at the University of Königsberg under the stratigrapher and paleontologist Prof. Karl André (1880–1959). Unfortunately, the increasingly difficult economic conditions of postwar Germany affected his parents so adversely that he was unable to complete these studies. He took the state pedagogical examinations to qualify as a schoolteacher. From 1925 to 1940 he was employed at the Bessel-Oberreal school in Königsberg, teaching chemistry, biology, mineralogy and geology, physics and mathematics. He served as a member of the commission for the examination of external (non-school) candidates and, from 1931, as head of the chemistry study seminar and fellow of the pedagogical board of examiners. On 8 June 1922, he married Helene Schulze, an East Prussian woman two years younger than himself. (She was born in Hirschfeld on 15 October 1893). His wife shared his love of nature and was to be a life-companion of a value beyond price.

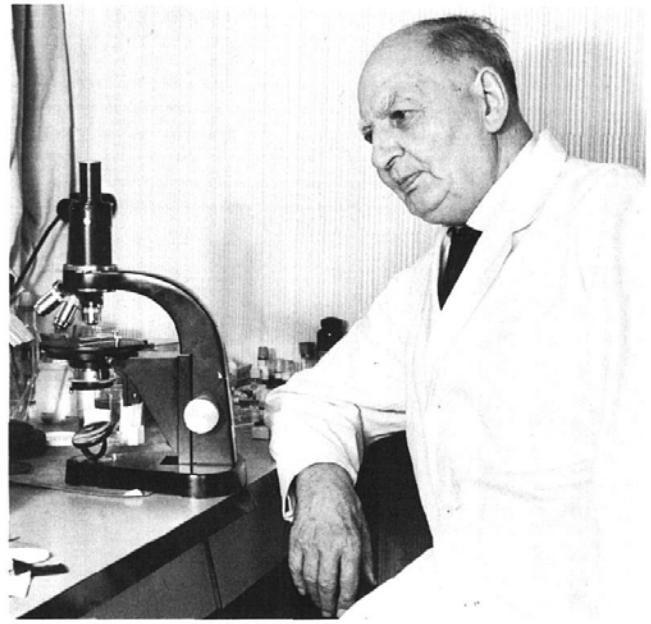
East Prussia became a new homeland for him and he acquired a deep and abiding concern with its geology.

At that time, there was such interest in the glacial drift deposits of the Baltic coastal regions of Germany that a society existed specifically for their study, the *Gesellschaft für Geschiebeforschung*, which produced its own journal, the *Zeitschrift für Geschiebeforschung*. Eisenack's particular concern was with the limestone boulders in the drift of Samland. Paul Kraft's studies of graptolite ontogeny also interested Eisenack and he hoped to make new observations of the early life stages of these stratigraphically important colonial organisms.

In the course of his investigations, Eisenack dissolved with hydrochloric acid some of the Paleozoic and Jurassic boulders from the drift. When he examined his preparations under the microscope, he found an abundance of microfossils. Some of these were familiar enough—*foraminifera*, fragments of graptolites, ostracodes—others were not so well known. At almost the same time, Otto Wetzel of Eutin (Holstein) was examining what he thought were fossil motile dinoflagellates and spinose bodies in Late Cretaceous flints, which he named "hystrichospheres"; both types of microfossils are now known to be cysts of dinoflagellates. In his own researches, Eisenack encountered unmistakable dinoflagellates in residues from Jurassic boulders and from the amber-bearing sediments (Bernsteinformation) of Samland, then considered Oligocene but now known to be of the Late Eocene. In addition, when he examined preparations from Ordovician and Silurian limestone boulders, he found spinose microfossils he considered to be "hystrichospheres" and unornamented spherical bodies he named "leiospheres." His paper *Neue Mikrofossilien des baltischen Silurs I* enabled him in 1931 to earn, at last, a university degree.

Eisenack's examination of Lower Paleozoic preparations yielded even more major discoveries. Certain flask-shaped bodies had been noted earlier by other microscopists but had never attracted proper scientific attention. Eisenack named them Chitinozoa, and proposed a number of genera and species, thus beginning the speculation on their affinity that has continued to this day. (Since that time, the value of chitinozoans as biostratigraphical indices has made them extremely important to economic geologists concerned with late Cambrian to Devonian strata.) In addition, Eisenack discovered, described, and named another group of microfossils, the melanosclerites, whose affinity likewise remains to be elucidated. His thesis *Die Melanoskleritoiden, eine neue Gruppe silurischer Mikrofossilien aus dem Unterstamm der Nesseltiere* brought him recognition in 1941 as a university lecturer and led to an appointment to the Faculty of Mathematics and Natural Sciences of the University of Königsberg.

Unfortunately, new political clouds were beginning to form during those years. Eisenack was bitter in his



(Photo: Werner Wetzel, Tübingen)

Alfred Eisenack on his 75th birthday, 1966.

comments about the Nazis in general and Hitler in particular. ("That man was responsible for the deaths of 45 million people . . . . When he visited Königsberg in 1938, I would not even walk across the street to see him.")

Frau Eisenack had heard Hitler speak as early as 1932, before the first putsch, and had predicted even then that he would bring war if he ever rose to power, a war which Germany, inevitably, would lose. When Hitler did gain power, the Eisenacks sent a number of personal possessions, including Alfred's microfossil type material, to Switzerland for safekeeping; they were to lose all else in the fall of Königsberg.

It was known by the authorities that the Eisenacks were far from being supporters of the Nazi regime. They were listed in the top category of persons considered politically unreliable and they were certain that if Germany had not lost the war, they eventually would have been imprisoned or put to death.

Alfred Eisenack did not again join the army, not only because of his age—he was over fifty—but also because he had no enthusiasm for this new war. Instead, he continued his researches as long as possible under increasingly difficult academic and political circumstances. However, he accepted duties as divisional chemist in the air-raid precautions service, an appointment carrying with it the rank of major. In 1945, while guarding a medical unit, he was again captured by the Russians. His captors threw him down, took away his boots and watch, and made him march away in his socks to imprisonment in the Soviet Union. Although

he was not a soldier, Eisenack was interned in three successive prison camps in the U.S.S.R.: Yelabuga, near the confluence of the Kama and Toima Rivers in the Tartar Autonomous Soviet Republic (23 May 1945 to September 1946); Zelenodolsk, on the River Volga 50 km west of Kazan (September 1946 to May 1949); and Oranki, south of Gorki (May to December 1949). The last two camps were in the Russian Soviet Federated Socialist Republic. Because of his age and physical condition, he was released in Frankfurt-an-der-Oder on 29 December 1949. Of this second captivity Eisenack would not speak, except, "I could not believe the Russians had changed so much." Although his physical and mental strength permitted Eisenack to survive this second captivity, it had a lasting effect. Long nights of sleeping on the bare, cold ground and other hardships left him with a heavy limp; always, thereafter, he walked with a stick. In pre-war years he had been forthcoming and good-humored; thereafter he was withdrawn, with an underlying hardness and bitterness which often made him appear to be unyielding and critical. The happiness in his marriage was the prop that sustained him.

Frau Eisenack also survived the war. When the Russian army encircled Königsberg she attempted to escape from the city by walking out along a railway line until she collapsed from exhaustion. She was seen and picked up from the railside by a trainload of German sailors, was taken aboard a U-boat and thus escaped from Königsberg before the Russians took the town. She traveled to Danzig (Gdansk), thence to Thüringia, to take refuge in her brother's home. She waited in East Germany for her husband's release; their reunion was a joyous one.

However, their home was lost to them, for East Prussia had been incorporated into the U.S.S.R. and Königsberg was renamed Kaliningrad. They began a new life in West Germany. Alfred spent a brief time in a hospital in Tuttlingen, Württemberg, and emerged on 3 January 1950, almost 60 years old, determined to build a new life.

There were three months of unemployment, during which the Eisenacks lived in Tübingen and Biberach. Then, aided by former pupils and friends, Alfred found a position in Reutlingen as commercial school councillor and secondary school teacher. On 1 October 1951 he obtained his *Venia legendi* in geology and paleontology at the University of Tübingen and was named adjunct professor. There he was to teach for six years until his retirement in 1957.

Eisenack and his wife continued to live in Reutlingen, in a house on the slopes of the Achalm. Helene baked cakes for the birds and placed them on the inside kitchen windowsill; the birds confidently flew into the room to feed and were often joined by a squirrel. It

was a charming place, and the surrounding Swabian Alps had a beauty much appreciated by Helene and Alfred Eisenack. Yet they never did truly settle in Baden-Württemberg; they longed always for the home in East Prussia to which they could never return.

These were, for Eisenack, years of a renewed and impressive scientific productivity. His research included work on graptolites, studies on the processes of fossilization, mineralogical investigations of glauconite, phosphates and oakleyite and the formation of pseudomorphs, as well as palynological studies. It was in the last-named field that his energies continued to be concentrated. He inaugurated the study of the Liassic (Early Jurassic) palynomorphs of Swabia, south Germany, and the mid-Cretaceous (Aptian) dinoflagellates of north Germany. In addition, he was official supervisor for four students who successfully presented doctoral theses (Serge von Cube, Gerhard Alberti, Johann Agelopoulos and Hans Gocht) and effectively the supervisor of two other students, Ellen Gerlach and Karl Klement, whose titular supervisor was the head of the Geological Institute in Tübingen, Otto Schindewolf (1896–1972). Through their work, Eisenack gained a fuller acquaintance with Late Jurassic, Early Cretaceous, and Eocene dinoflagellate cyst assemblages. Moreover, he was to undertake a long series of researches on Mesozoic and Tertiary dinoflagellate cyst assemblages from Australia and New Guinea with the Australian paleobotanist Isabel C. Cookson (1893–1973), who was a frequent visitor to Tübingen. Cookson became a close—if sometimes rather demanding—friend, staying with the Eisenacks in Reutlingen during her visits to Germany.

Eisenack continued active work on the slides and samples that had been preserved for him in Switzerland, writing anew on the "Oligocene" microfossils of Samland and, in a long series of papers, on the spherical, elongate, and spinose bodies from the Ordovician and Silurian of East Prussia and north Germany which, doggedly, he continued to call "hystrichospheres." Indeed, he long rejected W. R. Evitt's thesis that most Mesozoic and Tertiary species were dinoflagellate cysts, insisting on "die Einheitlichkeit der Hystrichosphären" (the unity of the hystrichospheres). The second author vividly recalls how, during his visit to Tübingen in 1961, he was subjected by Eisenack to every possible pressure of authority and argument in an attempt to force a recantation of his expressed support for Evitt's ideas. At the meeting of the Sous-Groupe Hystrichosphères of the Commission Internationale de Microflore du Paléozoïque in Paris (1963), Eisenack sat glowering silently while the tide of opinion rose against him and the sub-group was renamed "Acritarches" (acritarchs). When Eisenack produced his great catalogue of marine organic-walled microfossils, it was



named *Katalog der fossilen Dinoflagellaten, Hystriosphären und verwandten Mikrofossilien*. Ultimately, however, he had the courage to admit that his judgment had been incorrect. When the first volume of the *Katalog* dealing with Paleozoic forms appeared in 1973 it was titled *Acritarchen*.

In the postwar years at least, Eisenack was too shy and withdrawn to be very effective as a university professor. Indeed, in the stratified circumstances of the German academic world at that time, he may never have overcome a feeling of insecurity, of being only an upstart schoolteacher among the true academics. His classes were not popular for, although he was conscientious and provided solid instruction, he was a dull lecturer who used few illustrations. Moreover, the shortage of microscopes for teaching prevented him from giving the practical classes in which he might have been so much more effective. Only the strong urging of Otto Schindewolf ensured that Eisenack's classes were adequately attended! Although Eisenack continued to teach a few classes, his official retirement in 1957 must have been a relief; he was delighted to be able to throw his entire energy into research.

The two decades that followed were to be the period of Eisenack's greatest scientific productivity. They included important research on graptolites, tasmanitids, chitinozoans and melanosclerites, studies of symbiosis in fossil protists and an account of the nerve cells of Paleozoic fishes that, astonishingly, were preserved in some palynological preparations. In particular, these were years of intensive work on dinoflagellate cysts and acritarchs, their description and classification, carried out alone or in association with Isabel Cookson. Eisenack's interest was in the morphology and probable biology of these microfossils rather than in their geological significance; indeed, he wrote almost nothing on their stratigraphical application.

In his method of work Eisenack early adopted a particular technique to which he always adhered afterward. Preparation was much more than a mechanical process; he gained satisfaction in the fossils as objects in themselves. He took pride in undertaking all stages of the making of the mounts himself, from the crushing and chemical preparation of the sediment sample through the picking of specimens from a water mount with a pipette to their final examination under the microscope. He worked with an old monocular Leitz microscope and with a box camera made from a biscuit-tin, long adhering to the use of glass negatives and only reluctantly employing roll film. Yet, with this unsophisticated equipment Eisenack did his research and took photographs of the highest quality. When Professor Schindewolf offered him a much more advanced microscope with a built-in camera, Eisenack

tried, then refused it, more from pride in his own craftsmanship than from any unwillingness to move with the times.

Eisenack's achievements brought him a number of honors. These included honorary memberships in the Paleontological Society, the Society of Economic Paleontologists and Mineralogists, and the American Association of Stratigraphic Palynologists.

As they became older, Eisenack and his wife felt it necessary to leave their house and move into an apartment block, where costs were lower, demands of maintenance smaller and service—in theory, at least—more readily available. The death of Helene Eisenack on 7 May 1975, from cardiac collapse, was a shock from which Alfred never recovered. Without her, the apartment was a barren place and, at his age, the journey to his laboratory in Tübingen an increasingly arduous one. His pace of research slowed and he became unsure in his work. His hands, however, remained wonderfully steady until the very end.

Eisenack's interest in paleontology never dimmed, and the range of his research actually expanded in the ensuing seven years. He kept himself busy investigating the question of the action of microscopic organisms in the breaking down of acid resistant organic substances and phosphates, examining pseudofossils, studying fossil annelids, writing on the occurrence of microscopic glass spheres in sediments and assessing the significance of riebeckite porphyry boulders in the Quaternary drift of Samland.

When the second author visited Tübingen in 1980, Eisenack came in from Reutlingen to meet and greet him most affectionately. However, he spoke sadly of his loneliness, of weeks in the apartment when the only visit would be from a cleaner, and his feeling that the end of his life was overdue. Yet his ninetieth birthday came and was celebrated appropriately at the University of Tübingen. Later he was present, and honored, at the opening of the HEXROSE Dinoflagellate Conference in Tübingen in September 1981 but, to the regret of many delegates, he did not attend its subsequent sessions. Eisenack died just a month short of his 91st birthday, on 19 April 1982, with two papers on microfossils still in press.

Alfred Eisenack's life was one of great achievement against awesome odds. Numerous genera and species have been named after him, appropriately enough; but it is as a layer of foundations for the growing structure of palynological research that he would wish to be—and surely will be—remembered.

#### ACKNOWLEDGMENTS

We are indebted to Dr. W. K. Braun (Department of Geological Sciences, University of Saskatchewan) and

several of Eisenack's colleagues at the University of Tübingen for information about his life. Dr. G. A. Hanson (Department of History, University of Saskatchewan), Dr. R. M. Bone (Department of Geography, University of Saskatchewan) and Dr. Victor Buyniak (Department of Slavic Studies, University of Saskatchewan) furnished useful information concerning geographical localities in the U.S.S.R., and Ms. Ann Lunn (Palaeontology Librarian, British Museum [Natural History]) made helpful comments on Eisenack's contacts in Siberia. The authors have drawn also upon their own memory of conversations with Eisenack. The second author is indebted to Ms. Dagmar Pearson for help with the English translation.

#### NOTES

1. We have not been able to identify von Pontoppidan with confidence. However, Ann Lunn, Palaeontology Librarian of the British Museum (Natural History) suggests he might be Harald Pontoppidan of Hamburg, who published three papers on German and Indonesian geology between 1911 and 1914. If so, he may have died in captivity, for there are no other published papers under his name.

2. Kusnetsov ("smith") is a common Russian surname and we cannot be sure who was Eisenack's mentor. The most likely is perhaps Efrem Aleksandrovich Kuznetsov (1892–1976), who published studies on the petrology of the River Amur region and the Urals. However, his published biography (*Vestnik Moskovskogo Universiteta*, Ser. 4 Geology, no. 1, pp. 3–5, 1972) does not mention employment at the Chita Academy.

#### PUBLISHED WORKS OF ALFRED EISENACK

1930. Neue Mikrofossilien des baltischen Silurs (Vorläufige Mitteilung). *Naturwissenschaften*, 18. Jahrg.:180–181.
1931. Neue Mikrofossilien des baltischen Silurs I. *Pal. Zeitschr.*, 13(1/2):74–118.
1932. Glaukonitsteinkerne aus baltischem Untersilur. *Pal. Zeitschr.*, 14:49–52.
1932. Neue Mikrofossilien des baltischen Silurs II (Foraminiferen, Hydrozoen, Chitinozoen u.a.). *Pal. Zeitschr.*, 14:257–277.
1934. Neue Mikrofossilien des baltischen Silurs III und neue Mikrofossilien des böhmischen Silurs I. *Pal. Zeitschr.*, 16(1/2):52–76.
1934. Über Bohrlöcher in Geröllen baltischer Obersilurgeschiebe. *Zeitschr. Geschiebeforsch.*, 10(2):89–94.
1935. Mikrofossilien aus Doggergeschieben Ostpreussens. *Zeitschr. Geschiebeforsch.*, 11(4):167–184.
1935. Neue Graptolithen aus Geschieben baltischen Silurs. *Pal. Zeitschr.*, 17(1/2):73–90.
1936. *Eodinia pachythea* n.g. n.sp., ein primitiver Dinoflagellat aus einem Kelloway-Geschiebe Ostpreussens. *Zeitschr. Geschiebeforsch. Flachlandsgeol.*, 12(2):72–75.
1936. Dinoflagellaten aus dem Jura. *Ann. Protistol.*, 5:59–64.
1936. Die Form des Thallus der Siphonae *Vermiporella*. *Zeitschr. Geschiebeforsch. Flachlandsgeol.*, 12:184–186.
1937. Protozoa exkl. Foraminifera. In: Schindewolf, O. H., Ed., *Fortschritte der Palaeontologie*, vol. 1 (1935–1936):57–66, vol. 2 (1937–1938):65–69. Berlin: Verl. Gebr. Borntraeger.
1937. Was ist *Melanostrophus*? *Zeitschr. Geschiebeforsch. Flachlandsgeol.*, 13(2):100–104.
1937. Neue Mikrofossilien des baltischen Silurs IV. *Pal. Zeitschr.*, 19:217–242.
1938. Hystrichosphaerideen und verwandte Formen im baltischen Silur. *Zeitschr. Geschiebeforsch. Flachlandsgeol.*, 14(1):1–30.
1938. Die Phosphoritknollen der Bernsteinformation als Überlieferer tertiären Planktons. *Schrift. Phys.-Ökon. Ges. Königsberg (Pr.)*, 70(2):181–188.
1938. Jugendstadien eines festsitzenden Graptolithen unbekannter Stellung. *Zeitschr. Geschiebeforsch. Flachlandsgeol.*, 14(3):152–160.
1938. Katalytische Einwirkung von Tonen und anderen silikatischen Mineralien und Verbindungen auf aromatische Amine und Phenole. *Zentralbl. Miner. Geol. Pal.*, ser. A, no. 10:305–308.
1939. Die Wandung fossiler Dinoflagellaten. *Arch. Protist.*, 93(1):81–86.
1939. Chitinozoen und Hystrichosphaerideen im Ordovizium des Rheinischen Schiefergebirges. *Senckenbergiana*, 21(1/2):135–152.
1939. Einige neue Annelidenreste aus dem Silur und dem Jura des Baltikums. *Zeitschr. Geschiebeforsch. Flachlandsgeol.*, 15:153–176.
1940. Regeneration im Bereich der Graptolithen-Proscula. *Pal. Zeitschr.*, 22:100–104.
1941. *Epigraptus bidens* n.g. n.sp., eine neue Graptolithenart des baltischen Ordoviziums. *Zeitschr. Geschiebeforsch. Flachlandsgeol.*, 17(1):24–28.
1942. Die Melanoskleritoiden, eine neue Gruppe silurischer Mikrofossilien aus dem Unterstamm der Nesseltiere. *Pal. Zeitschr.*, 23(1/2):157–180.
1943. Über einige Funde von Graptolithen aus ostpreussischen Silurgeschieben. *Zeitschr. Geschiebeforsch. Flachlandsgeol.*, 18:29–42.
1944. Über einige pflanzliche Funde in Geschieben, nebst Bemerkungen zum Hystrichosphaerideen-Problem. *Zeitschr. Geschiebeforsch. Flachlandsgeol.*, 19:103–124.
1948. Mikrofossilien aus Kieselknollen des böhmischen Ordoviziums. *Senckenbergiana*, 28(4/6):105–117.
1950. Nachtrag zum Melanoskleritoiden-Problem. *Neues Jahrb. Geol. Pal., Monatsh.*, (1950/12):371–376.
1951. Über Hystrichosphaerideen und andere Kleinformen aus baltischem Silur und Kambrium. *Senckenbergiana*, 32(1/4):187–204.
1951. Retioliten aus dem Graptolithengestein. *Palaeontographica*, ser. A, 100:129–163.
1953. Die Bestimmung des Alters von Kiesel-schiefer-Geröllen mittels Mikrofossilien. *Senckenbergiana*, 34(1/3):99–103.
1954. Hystrichosphären aus dem baltischen Gotlandium. *Senckenbergiana*, 34(4/6):205–211.
1954. Foraminiferen aus dem baltischen Silur. *Senckenbergiana Lethaea*, 35(1/2):51–72.
1954. Mikrofossilien aus Phosphoriten des samländischen Unteroligozäns und über die Einheitlichkeit der Hystrichosphaerideen. *Palaeontographica*, ser. A, 105(3/6):49–95.
1955. Chitinozoen, Hystrichosphären und andere Mikrofossilien aus dem Beyrichia-Kalk. *Senckenbergiana Lethaea*, 36(1/2):157–188.
1955. Ein Graptolith aus dem Beyrichia-Kalk. *Neues Jahrb. Geol. Pal., Monatsh.*, (1955/7):273–276.
1955. Mitteilung über die Aufbewahrung einiger früher von mir beschriebenen Originale und abgebildeten Exemplare von Graptolithen und Retioliten. *Neues Jahrb. Geol. Pal., Monatsh.*, (1955/7):277–278.
1955. Neue Chitinozoen aus dem Silur des Baltikums und dem Devon der Eifel. *Senckenbergiana Lethaea*, 36(5/6):311–319.
1956. Probleme der Vermehrung und des Lebensraumes bei der Gattung *Leiosphaera* (Hystrichosphaeridea). *Neues Jahrb. Geol. Pal., Abh.*, 102(3):402–408.
1956. Beobachtungen an Fragmenten von Eurypteriden-Panzern. *Neues Jahrb. Geol. Pal., Abh.*, 104(2):119–128.

1957. Mikrofossilien in organischer Substanz aus dem Lias Schwabens. Neues Jahrb. Geol. Pal., Abh., 105(3):239–249.
1958. *Tasmanites* Newton 1875 und *Leiosphaeridia* n.g. als Gattungen der Hystrichosphaeridea. Palaeontographica, ser. A, 110(1/3): 1–19.
- 1958 (With I. C. COOKSON). Microplankton from Australian and New Guinea upper Mesozoic sediments. Roy. Soc. Vict., Proc., 70(1): 19–79.
1958. Mikroplankton aus dem norddeutschen Apt. Neues Jahrb. Geol. Pal., Abh., 106(3):383–422.
1958. Mikrofossilien aus dem Ordovizium des Baltikums. 1. Markasitschicht, Dictyonema-Schiefer, Glaukonitsand, Glaukonitkalk. Senckenbergiana Lethaea, 39(5/6):389–405.
1959. Chitinoide Hüllen aus Silur und Jura des Baltikums als Foraminiferen. Pal. Zeitschr., 33(1/2):90–95.
1959. Neotypen baltischer Silur-Hystrichosphären und neue Arten. Palaeontographica, ser. A, 112(5/6):193–211.
1959. Neotypen baltischer Silur-Chitinozoen und neue Arten. Neues Jahrb. Geol. Pal., Abh., 108(1):1–20.
1959. Was ist *Membranilarnax*? Neues Jahrb. Geol. Pal., Monatsh., (1959/7):327–332.
1959. Fossile Dinoflagellaten. Arch. Protist., 104(1):43–50.
1959. Einige Mitteilungen über Graptolithen. Neues Jahrb. Geol. Pal., Abh., 107(2):253–260.
1960. (With I. C. COOKSON). Microplankton from Australian Lower Cretaceous sediments. Roy. Soc. Vict., Proc., 72(1):1–11.
1960. (With I. C. COOKSON). Microplankton from Australian Cretaceous sediments. Micropaleontology, 6(1):1–18.
1960. (With I. C. COOKSON). Upper Mesozoic microplankton from Australia and New Guinea. Palaeontology, 2(2):243–261.
1960. Über einige niedere Algen aus dem baltischen Silur. Senckenbergiana Lethaea, 41(1/6):13–26.
1960. (With H. GOCHT). Neue Namen für einige Hystrichosphären der Bernsteinformation Ostpreussens. Neues Jahrb. Geol. Pal., Monatsh., (1960/11):511–518.
1961. Hystrichosphären als Nahrung ordovizischer Foraminiferen. Neues Jahrb. Geol. Pal., Monatsh., (1961/1):15–19.
1961. (With I. C. COOKSON). Upper Cretaceous microplankton from the Belfast No. 4 Bore, South Western Victoria. Roy. Soc. Vict., Proc., 74(1):69–76.
1961. Einige Erörterungen über fossile Dinoflagellaten nebst Übersicht über die zur Zeit bekannten Gattungen. Neues Jahrb. Geol. Pal., Abh., 112(3):281–324.
1961. (With I. C. COOKSON). Tertiary microplankton from the Rott-nest Island Bore, Western Australia. Roy. Soc. Western Australia, Jour., 44(2):39–47.
1962. Mitteilungen über Leiosphären und über das Pylom bei Hystrichosphären. Neues Jahrb. Geol. Pal., Abh., 114(1):58–80.
1962. Neue problematische Mikrofossilien. Neues Jahrb. Geol. Pal., Abh., 114(2):135–141.
1962. Einige Bemerkungen zu neueren Arbeiten über Hystrichosphären. Neues Jahrb. Geol. Pal., Monatsh., (1962/2):92–101.
1962. Neotypen baltischer Silur-Chitinozoen und neue Arten (Fortsetzung). Neues Jahrb. Geol. Pal., Abh., 114(3):291–316.
1962. Chitinozoen aus Sedimenten Gotlands (Vorläufige Mitteilung). Neues Jahrb. Geol. Pal., Monatsh., (1962/4):218–219.
1962. (With I. C. COOKSON). Additional microplankton from Australian Cretaceous sediments. Micropaleontology, 8(4):485–507.
1962. Mikrofossilien aus dem Ordovizium des Baltikums. 2. Vaginatenkalk bis Lyckholmer Stufe. Senckenbergiana Lethaea, 43(5): 349–366.
1962. (With I. C. COOKSON). Some Cretaceous and Tertiary microfossils from Western Australia. Roy. Soc. Victoria, Proc., 75(2): 269–273.
1963. Zur *Membranilarnax*-Frage. Neues Jahrb. Geol. Pal., Monatsh., (1963/2):98–103.
1963. Sind die Hystrichosphären Zysten von Dinoflagellaten? Neues Jahrb. Geol. Pal., Monatsh., (1963/5):225–231.
1963. Hystrichosphären. Biol. Rev., 38:107–139.
1963. Melanoskleriten aus anstehenden Sedimenten und aus Geschieben. Pal. Zeitschr., 37(1/2):122–134.
1963. Über einige Arten der Gattung *Tasmanites* Newton 1875. Grana Palynol., 4(2):203–216.
1963. Mitteilungen zur Biologie der Hystrichosphären und über neue Arten. Neues Jahrb. Geol. Pal., Abh., 118(2):207–216.
1963. *Cordosphaeridium* n.g., ex *Hystrichosphaeridium*, Hystrichosphaeridea. Neues Jahrb. Geol. Pal., Abh., 118(3):260–265.
1964. Zur Frage rezenter Hystrichosphären. Neues Jahrb. Geol. Pal., Monatsh., (1964/2):108–113.
1964. Erörterungen über einige Gattungen fossiler Dinoflagellaten und über die Einordnung der Gattungen in das System. Neues Jahrb. Geol. Pal., Monatsh., (1964/6):321–336.
1964. Mikrofossilien aus dem Silur Gotlands. Phosphatische Reste. Pal. Zeitschr., 38(3/4):170–179.
1964. Mikrofossilien aus dem Silur Gotlands. Chitinozoen. Neues Jahrb. Geol. Pal., Abh., 120(3):308–342.
1964. (With K. W. KLEMENT). Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien. Band I. Dinoflagellaten. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, ii + 888 pp., 9 pls., 420 figs.
1965. (With M. FRIES). *Peridinium limbatum* (Stokes) vergleichen mit der tertiären *Deflandrea phosphoritica* Eisenack. Geol. Fören. Stockholm Förh., 87:239–248.
1965. Mikrofossilien aus dem Silur Gotlands. Hystrichosphären, Problematika. Neues Jahrb. Geol. Pal., Abh., 122(3):257–274.
1965. Die Mikrofauna der Ostseekalke. 1. Chitinozoen, Hystrichosphären. Neues Jahrb. Geol. Pal., Abh., 123(2):115–148.
1965. Über einige Mikrofossilien des samländischen und norddeutschen Tertiärs. Neues Jahrb. Geol. Pal., Abh., 123(2):149–159.
1965. Erhaltung von Zellen und Zellkernen aus dem Mesozoikum und Paläozoikum. Nat. Mus., 95(11):473–477.
1965. (With I. C. COOKSON). Microplankton from the Browns Creek Clays, SW Victoria. Roy. Soc. Victoria, Proc., 79(1):119–131.
1965. (With I. C. COOKSON). Microplankton from the Dartmoor Formation, SW Victoria. Roy. Soc. Victoria, Proc., 79(1):133–137.
1965. (With I. C. COOKSON). Microplankton from the Paleocene Pebble Point Formation, Southwestern Victoria. Roy. Soc. Victoria, Proc., 79(1):139–146.
1966. Über *Chuarina wimani* Brotzen. Neues Jahrb. Geol. Pal., Monatsh., (1966/1):52–56.
1966. Symbionten in fossilen Protisten. Pal. Zeitschr., 49(1/2):103–107.
1966. Zur Biologie primitiver Foraminiferen aus baltischem Ordovizium und Gotlandium. Neues Jahrb. Geol. Pal., Abh., 125 (Festband O. H. Schindewolf):382–400.
1966. Phosphatisierte Reste aus dem Beyrichia-Kalk. Neues Jahrb. Geol. Pal., Abh., 126(1):92–99.
1966. Einige Bemerkungen über Retioliten und Graptolithen. Neues Jahrb. Geol. Pal., Monatsh., (1966/10):577–588.
1966. Über einige Probleme bei fossilen Dinoflagellaten. Arch. Protist., 109:207–222.
1967. (With I. C. COOKSON). Some Early Tertiary microplankton and pollen grains from a deposit near Strahan, Western Tasmania. Roy. Soc. Victoria, Proc., 80(1):131–140.
1967. (With I. C. COOKSON). Some microplankton from the Paleocene Riverbank Bed, Victoria. Roy. Soc. Victoria, Proc., 80(2): 247–258.
1967. Foraminiferen aus dem Ordovizium und Gotlandium des baltischen Gebietes. Neues Jahrb. Geol. Pal., Abh., 128(3):244–274.
1967. *Axisphaeridium* n.g., eine axialsymmetrische Hystrichosphäre aus dem baltischen Ordovizium. Neues Jahrb. Geol. Pal., Monatsh., (1967/7):398–400.
1967. Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien. Band I. Dinoflagellaten, 1. Ergänzungs-



- lieferung. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, iii + 241 pp., 92 figs.
1968. Über die Fortpflanzung paläozoischer Hystrichosphären. Neues Jahrb. Geol. Pal., Abh., 131(1):1–22.
1968. Problematika aus baltischem Ordovizium und Silur. Neues Jahrb. Geol. Pal., Abh., 131(3):305–309.
1968. Mikrofossilien eines Geschiebes der Borkholmer Stufe, baltisches Ordovizium, F<sub>2</sub>. Hamburg, Geol. Staatsinst., Mitt., 37:81–94.
1968. (With I. C. COOKSON). Microplankton from two samples from Gingin Brook No. 4 Borehole, Western Australia. Roy. Soc. Western Australia, Jour., 51(4):110–122.
1968. Über Chitinozoen des baltischen Gebietes. Palaeontographica, Ser. A, 131(5/6):137–198.
1969. (With I. C. COOKSON). Some microplankton from two bores at Balcatta, Western Australia. Roy. Soc. Western Australia, Jour., 52(1):3–8.
1969. Zur Systematik einiger paläozoischer Hystrichosphären (Acritarcha) des baltischen Gebietes. Neues Jahrb. Geol. Pal., Abh., 133(3):245–266.
1969. Bemerkungen zur Systematik der fossilen Dinoflagellaten. Neues Jahrb. Geol. Pal., Monatsh., (1969/6):337–343.
1969. Kritische Bemerkungen und Richtigstellungen im Gebiet der fossilen Dinoflagellaten und Acritarchen. Neues Jahrb. Geol. Pal., Abh., 134(2):101–116.
1969. Einige ordovizische und silurische Foraminiferen des baltischen Gebietes. Pal. Zeitschr., 43(3/4):199–204.
1970. (With I. C. COOKSON). Cretaceous microplankton from the Eucla Basin, Western Australia. Roy. Soc. Victoria, Proc., 83(2):137–158.
1970. (With I. C. COOKSON). Die Familie der Lecaniellaceae n.fam.—Fossile Chlorophyta, Volvocales? Neues Jahrb. Geol. Pal., Monatsh., (1970/6):321–325.
1970. *Xenotheka klinostoma* und ihre systematische Stellung. Neues Jahrb. Geol. Pal., Monatsh., (1970/8):449–451.
1970. Mikrofossilien aus dem Silur Estlands und der Insel Ösel. Geol. Fören. Stockholm Förh., 92(3):302–322.
1971. Chitinozoen—ein ungelöstes Rätsel der Paläontologie. Mikroskopion, 20:8–10.
1971. Die Mikrofauna der Ostseekalke (Ordovizium). 3. Graptolithen, Melanoskleriten, Spongien, Radiolarien, Problematika nebst 2 Nachträgen über Foraminiferen und Phytoplankton. Neues Jahrb. Geol. Pal., Abh., 137(3):337–357.
1971. Anomalien bei fossilen Dinoflagellaten. Pal. Zeitschr., 45(1/2):75–78.
1971. Weitere Mikrofossilien aus dem Beyrichienkalk (Silur). Neues Jahrb. Geol. Pal., Monatsh., (1971/8):449–460.
1971. (With I. C. COOKSON). Cretaceous microplankton from Eyre No. 1 Bore core 20, Western Australia. Roy. Soc. Victoria, Proc., 84(2):217–226.
1971. (With G. KJELLSTRÖM). Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien. Band I. Dinoflagellaten. 2. Ergänzungslieferung. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, iii + 215 pp., 104 figs.
1972. Chitinozoen und andere Mikrofossilien aus der Bohrung Leba, Pommern. Palaeontographica, ser. A, 139(1/3):64–87.
1972. Kritische Bemerkung zur Gattung *Pterospermopsis* (Chlorophyta, Prasinophyceae). Neues Jahrb. Geol. Pal., Monatsh., (1972/10):596–601.
1972. Beiträge zur Chitinozoen-Forschung. Palaeontographica, ser. A, 140(4/6):117–130.
1972. (With G. KJELLSTRÖM). Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien. Band II. Dinoflagellaten. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, iii + 1132 pp., 6 pls., 410 figs.
1973. Kleinorganismen als Zerstörer säurefester organischer Substanzen und von Biophosphaten. Pal. Zeitschr., 47(1/2):8–16.
1973. (With F. H. CRAMER and C. R. DIEZ). Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien. Band III. Acritarcha, Teil 1. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, iii + 1104 pp., 4 pls., 452 figs.
1974. Beiträge zur Acritarchen-Forschung. Neues Jahrb. Geol. Pal., Abh., 147(3):269–293.
1974. Einige neue Graptolithen aus dem Ordovizium des Baltikums, ferner über *Epigraptus* und andere Idiotubidae. Neues Jahrb. Geol. Pal., Monatsh., (1974/11):664–674.
1974. (With I. C. COOKSON). Mikroplankton aus australischen mesozoischen und tertiären Sedimenten. Palaeontographica, Abt. B, 148(1/3):44–93.
1975. Beiträge zur Anneliden-Forschung, I. Neues Jahrb. Geol. Pal., Abh., 150(2):227–252.
1975. (With G. KJELLSTRÖM). Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien. Band I. Dinoflagellaten. 3. Ergänzungslieferung. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, iii + 254 pp., 114 figs.
1975. (With G. KJELLSTRÖM). Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien. Band II. Dinoflagellaten. 1. Ergänzungslieferung. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, iii + 518 pp., 202 figs.
1976. Ein konkretionäres Pseudofossil. Neues Jahrb. Geol. Pal., Monatsh., (1976/4):193–196.
1976. Beitrag zur Graptolithen-Fauna Schwedens. Neues Jahrb. Geol. Pal., Monatsh., (1976/7):400–404.
1976. Weiterer Beitrag zur Chitinozoen-Forschung. Neues Jahrb. Geol. Pal., Monatsh., (1976/11):641–652.
1976. Mikrofossilien aus dem Vaginatenkalk von Hälludden, Öland. Palaeontographica, ser. A, 154(4/6):181–203.
1976. (With F. H. CRAMER and C. R. DIEZ). Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien. Band IV. Acritarcha, Teil 2. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, xxiv + 863 pp., 317 figs.
1977. Mikrofossilien in organischer Substanz aus den Middle Nodular Beds (Wenlock) von Dudley, England. Neues Jahrb. Geol. Pal., Monatsh., (1977/1):25–35.
1978. Phosphatische und glaukonitische Mikrofossilien aus dem Vaginatenkalk von Hälludden, Öland. Neues Jahrb. Geol. Pal., Monatsh., (1978/1):1–12.
1978. Mikrofossilien in organischer Substanz aus dem Unteren Wenlock von Wrens Nest, Dudley, England. Neues Jahrb. Geol. Pal., Monatsh., (1978/5):282–290.
1978. Pseudo-Mikrofossilien aus Asphalt. Neues Jahrb. Geol. Pal., Monatsh., (1978/10):590–594.
1978. Beitrag zur Glaukonit-Forschung. Neues Jahrb. Geol. Pal., Monatsh., (1978/11):641–656.
1979. (With I. C. COOKSON). Einige Algen aus Sedimenten der Kreide Australiens. Neues Jahrb. Geol. Pal., Monatsh., (1979/2):77–82.
1979. Glaskügelchen in Sedimenten. Neues Jahrb. Geol. Pal., Monatsh., (1979/9):529–531.
1979. *Nollia eifelensis* (Acritarcha), ein *Pyrocystis*-ähnliches Mikrofossil aus dem Unter-Devon der Eifel. Senckenbergiana Lethaea, 60(1/3):51–53.
1979. (With F. H. CRAMER and C. R. DIEZ). Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien. Band V. Acritarcha, Teil 3. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, viii + 532 pp., 220 figs.
1979. (With F. H. CRAMER and C. R. DIEZ). Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien. Band VI. Acritarcha, Teil 3. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, xxx + 534 pp., 224 figs.
1981. (With H.-J. HERBERT). Zwei Geschiebe von Riebeckit-Porphyr aus dem Geschiebemergel des Samlandes (Ostpreussen). Eiszeitalter und Gegenwart, 31:79–82.

1981. Beiträge zur Anneliden-Forschung, II. Neues Jahrb. Geol. Pal., Monatsh., (1981/12):705–720.
1981. (With G. KJELLSTRÖM). Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien. Band I. Dinoflagellaten, 4. Ergänzungslieferung. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, iii + 124 pp., 60 figs.
1981. (With G. KJELLSTRÖM). Katalog der fossilen Dinoflagellaten, Hystrichosphären und verwandten Mikrofossilien. Band II. Dinoflagellaten, 2. Ergänzungslieferung. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, iii + 462 pp., 189 figs.
1982. Einige problematische Mikrofossilien. Neues Jahrb. Geol. Pal., Monatsh., (1982/10):629–636.
1983. (With I. C. COOKSON). Mikrofossilien aus australischen mesozoischen und tertiären Sedimenten. Zweiter Teil. *Palaeontographica*, ser. B, 184(1–3):23–63.

#### PUBLICATIONS CONSULTED

- GOCHT, H., 1971. Alfred Eisenack 80 Jahre, 13.5.1971. Tübingen: Südwestpresse, Schwäbisches Tagblatt.
- GOCHT, H., and WILLE, W., 1981a. *Pionier an Mikrofossilien*. Tübingen: Südwestpresse, Schwäbisches Tagblatt.
- , 1981b. Alfred Eisenack zum Gedächtnis. *Attempo*, 68:60–61.
- MARTINSSON, A., 1982. Alfred Eisenack deceased. *Chitinozoan Newsl.*, 4:6–7.