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SKELETONS OF *SEIROCRINUS SUBANGULARIS* CRINOIDS (CRINOIDEA, ECHINODERMATA) (MILLER, 1821) FROM THE COLLECTION OF THE NATURE EDUCATION CENTRE OF THE JAGIELLONIAN UNIVERSITY

Bartłomiej Kajdas

Nature Education Centre of the Jagiellonian University, Krakow
ORCID 0000-0002-1674-726X

Mariusz A. Salamon

Institute of Earth Sciences of the University of Silesia in Katowice
ORCID 0000-0001-9399-2798

Joanna Głaz

Academy of Fine Arts in Krakow
ORCID 0009-0004-4667-8383

Bartosz J. Płachno

Institute of Botany of the Jagiellonian University in Krakow
ORCID 0000-0001-5579-5101

Introduction

The Nature Education Centre of the Jagiellonian University in Krakow, at 5 Gronostajowa Street, has several hundred thousand specimens deposited in four departments: zoological, geological, anthropological, and paleobotanic. Only a small part of them (about 10,000 specimens) can be admired in the permanent exhibition titled *History of Life on Earth*. The core of the zoological collection is made up of arthropods, molluscs, and vertebrates. Among the latter many specimens are represented by rare taxons or those threatened with extinctions, e.g., the kakapo (*Strigops habroptila*, G.R. Gray, 1845), the Galapagos tortoise (*Chelonoidis niger*, Quoy & Gaimard, 1824), or tuatara (*Sphenodon punctatus*, Gray, 1842). The Centre's collection also boasts the only in Poland skull of a Steller's sea cow (*Hydrodamalis gigas*, Zimmermann, 1780), extinct as of 1768. The geological part of the collection is made up of almost 250 collections composed of nearly 20,000 fossils, 16,000 mineral specimens, and several thousand petrographic ones. The anthropological department boasts a rich craniological collection composed of skulls from all over the world. Apart from the skulls of old residents of Krakow the collection also contains objects from Finland, Africa, Mongolia, Siberia, or unique cranes of the Ainu people, an ethnic minority in Japan. The latter items were given to the Jagiellonian University by Marshal Józef Piłsudski's brother Bronisław. In the paleobotanic department there are plant fossils, mainly from the Carboniferous, Mesozoic, and Neogene sediments. A substantial part of the collection is still being inventoried.

Cabinet of Natural History in Krakow

In the late 18th century, Prof. Jaśkiewicz, court doctor of Stanislaus Augustus, headed the Chair of Natural History and Chemistry of the Crown's Main School. It was on his initiative that the Mineralogical Museum, operating at the Cabinet of Natural History, was created. It amassed a rich collection of rocks and minerals, as well as fossils. A hundred years later, in 1886, the Mineralogical Museum was divided into Mineralogical and Geological Cabinets. At that point the paleontological, geological, and certain petrographic specimens became part of the Geological Cabinet. In the 1970s, the Geological Museum of the Institute of Geological Sciences of the Jagiellonian University was founded; until 2017, it was located at 2a Oleandry Street in Krakow. At that point the former collections of the Mineralogical and Geological Cabinets were reunited again.

Turbulent history of the slab with *Seirocrinus*

The slab with the crinoid fossil (ACNO. CEP-DG-775, Fig. 1) was purchased for the Mineralogical Cabinet in the academic year 1849/1850 from the German company Krantz which has been selling minerals, rocks, and fossils uninterruptedly since 1830. Although crinoid fossils coming from the Holzmaden region (Baden-Württemberg, Germany) are not rare in paleontological collections, such large specimens (170 x 107 cm together with a frame) are scarce in Polish collections.



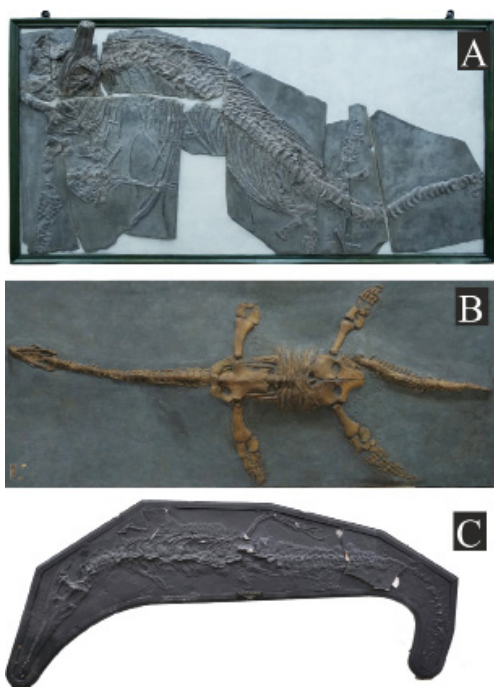
1. Slab with a *Seirocrinus subangularis* crinoid fossil, Early Jurassic, Bad Boll, Germany, Nature Education Centre, Jagiellonian University, Krakow, ACNO. CEP-DG-775, Photo S. Florjan, 2023

The †*Seirocrinus* genus was distinguished by Torsten Gislén¹ only in 1924, therefore all the earlier catalogues and labels feature the old name: *Pentacrinites*.²

Additionally, in the academic year 1851/1852 a slab with an almost complete fossilized skeleton of an ichthyosaurus and plaster replicas of the skeletons of Jurassic marine reptiles were bought: a plesiosaur (purchased in 1875) and a crocodylomorph (purchased in 1847). The fossils and plaster casts were originally hung in the rooms of the Mineralogical Cabinet in the Cabinet of Natural History in the edifice of the Kołłątaj College at 6 Święta Anna Street (Figs. 1, 2).

The first mention of the purchase of fossils for the Mineralogical Cabinet appeared in 1864 in the publication *Zakłady Uniwersyteckie w Krakowie. Przyczynek do dziejów oświaty krajowej podany i pamięci pięciuset-letniego istnienia Uniwersytetu Krakowskiego poświęcony przez C.K. Towarzystwo Naukowe Krakowskie* in Chapter V 'Katedra i Gabinet Mineralogiczny. Wiadomość podana przez Profes. Dra Aloizego Altha',³ pp. 254–255. Below its fragment is presented (Fig. 3).

Although the specimens were purchased by the Mineralogical Cabinet, owing to various restructuring processes they disappeared from the Accession Book of the



2. Other slabs with fossils transferred from the Institute of Geological Sciences of the Jagiellonian University to the Nature Education Centre, Jagiellonian University. A. Ichthyosaur *Stenopterygius* sp., Early Jurassic, Ohmden, Germany (ACNO.CEP-DG-7264-N); B. Plaster copy of the plesiosaur *Thalassiodracon hawkinsi*, purchased in 1875, Early Jurassic, Somerset, Great Britain (specimen under conservation; ACNO.CEP-DG-7282-N); C. Plaster copy of the skeleton of the crocodylomorph *Mystrisaurus laurillardii* purchased in 1847, Early Jurassic, around Holzmaden, Germany (specimen before conservation; ACNO.CEP-DG-7281-N), Photo S. Florjan, 2023 (A, B) and A. Czekaj, 2022 (C)

Mineralogy Cabinet (e.g., in the 1932 Catalogue they were no longer in the Chair's stock), and became part of the collection of one of the two newly-created departments: Geological or Paleontological (necessary documents are missing in this respect). The mention of the slabs with fossils appeared again in 1925.⁴ Władysław Szajnocha recalled that both slabs, with the plaster casts, were in the staircase of the building at 6 Świętej Anny Street, which at the time belonged (partially) to the Geology Department (the Mineralogy Department had changed address several years earlier) (Fig. 4).

The conditions at the Kołłątaj College in the 19th century must have been greatly unfavourable, since Alojzy Alth⁵ mentioned the fact twice in his report (Fig. 5).

The same problems were described almost 20 years later in the letter of the Dean of the Faculty of Philosophy dated 14 May 1881: *The worst conditions were observed in the lecture hall by the Mineralogical Cabinet where, as some have written, 'the water leaked through the ceiling on a rainy day, the floor began to rot, humidity everywhere (...)' this threatening the collections.*⁶

No information, however, has been found when and why the slabs with the fossils were covered with paint. Meanwhile, when looking at the state of preservation of the slab with crinoids gradually uncovered in the course of conservation works it can be claimed with certainty that the pyrite contained in the rock when exposed to high humidity, and possibly even direct contact with water, oxidized weakening the rock's durability. It is likely that the first layer

of paint was to prevent the slab from further degradation and crumbling of its surface. At the same time this led to subsequent technological and aesthetical transformations in the course of which successively new plaster layers were introduced filling in the form losses and blending monochromies. What worked to the disadvantage of the object was also the quality of the wooden base made of three softwood planks glued contiguously, deformed and cracked in the course of time, this resulting not only in its losing its load capacity, but also in exerting stress on the rock.

Importantly, during the conservation works (Fig. 6) it was discovered that the slab must have fallen, and, smashed into numerous parts, it was incorrectly reassembled (Fig. 6d), this leading to the loss of its compositional coherence. The repair works undertaken copied the historically applied technique of assembling elements with the use of gypsum mortar. Four chronological layers covering the repairs (removed during the conservation, since they negatively affected the object's aesthetical and technical condition) could be distinguished. The oldest identified fillings were those made with light cream gypsum mortar, covered with a layer of paint. Slightly later the form cavities were filled in again, while the surface was covered with black oil paint. The chronologically subsequent layer was made with very hard greenish mortar used to embed the chipped off pieces. It also covered the rock to a great degree. The gluing and mounting of the elements was strengthened on the back with a thick paper layer. Additionally, the larger sections of the slab were drilled through and attached to a wooden base with the use of metal screws (together with the greenish plaster fillings they demonstrate that the works were contemporary). The object was once again repainted black with oil paint. The youngest intervention was the painterly layer applied possibly after 1975, which was the year when an engraved labelling plate was attached. The layer did not cover the surface under it. As a result of the conservation the genuine vertical slab layout was restored.

Although not showing any damage (the edges of the slab separations seem 'genuine'), the above-mentioned slab with the ichthyosaurus (Fig. 5a) was also repainted (twice⁷). The painting may have resulted from the desire to make all the slabs homogenous or from an attempt to prevent destruction which the slab with crinoids suffered under the unfavourable conditions in the building at 6 Święta Anna Street. It is also likely that later through this painting the genuine fossil was to be made look like the plaster slabs, which would help hiding them during the Nazi occupation. The repainted copies (despite having been described as genuine on the engraved plates) were treated as plaster copies, particularly in the recent years.

In the post-WW II period (as of 1951), the Minister of Higher Education closed down the Departments of Geology, Mineralogy, and Paleontology at the Jagiellonian University, and integrated them with the AGH University. For the next six years the Department of Geology and the Department of Mineralogy remained AGH's units, although they continued to occupy their former premises belonging to the Jagiellonian University close to the Main Square in Krakow.

In 1957, the geological sciences returned to the Jagiellonian University. With a new restructuring, the Department of Physical Geology at the AGH University's Chair of

Następnie w roku 1848 dokupiono jeszcze niektóre odlewy gipsowe i 30 sztuk mineralów; w r. 1849 wynosiła liczba kupionych mineralów 52, darowanych 15; w r. 1850 kupionych było 22, darowanych przez ś. p. ANTONIEGO SZASTRA 41, przez p. MITKIEWICZA 18, jednak wszystkie te z Azji, najwięcej z gór Altajskich i z Syberyi; inne pomniejsze dary wynosiły sztuk 23. Kupiony został także piękny duży egzemplarz *Pentacrinites subangularis Mill*: z formacji liasowej z pod Ohmdu w Württembergu.

W r. 1851 przybył ładny dar hr. MORSZTYNA zawierający 100 sztuk skał z Wezuwiusza, zakupiono zaś piękny egzemplarz dużego gadu *Ichthyosaurus communis* z Boll w Württembergu i 23 mineralów.

Klatka schodowa musiała być także zużyta na pomieszczenie dużego zbioru głównie galicyjskich materiałów budowlanych (piaskowców, wapieni, gipsów etc.), uzyskanych przeważnie na wystawie krajowej przemysłowo-rolniczej we Lwowie w r. 1894, oraz takich bardzo wielkich płyt amonitów, pni drzewa kopalnego, sferosyderytów oraz kłów mamutowych, które dla swoich rozmiarów w salach nie dały się odpowiednio pomieścić.

Ze starych jeszcze w r. 1850 i 1851 nabytych okazów zawieszono tutaj dwie płyty liasowego łupku: z Boll w Wirtembergu ze szkieletem *Ichthyosaurus communis* i z Pentacrinus subangularis z Ohmdu, oraz trzy odlewy gipsowe: gadów *Mystrisaurus Laveillardi* (zakupione w r. 1847) i *Plesiosaurus communis* i odcisków stóp z niemieckiego psiego piaskowca.

Sprawienie tych nowych szaf, miało z innego względu tę niekorzyść, że było przyczyną odebrania Gabinetowi jednej mniejszej sali, tak, że obecnie zbiór cały mieścić się musi w jednej tylko sali, która nie daje się w zimie ogrzewać, a dlatego przez kilka miesięcy wszelka praca w Gabcinie staje się niemożliwą.

5. Zbiór geologiczny jeszcze nie jest systematycznie ułożony; nastąpi to w ciągu bieżącego roku, skoro tylko nadchodząca wiosna pozwoli pracować w nieogrzewanym Gabcinie.

3. Mention of the purchase of new fossils for the Mineralogical Cabinet, A. Alth, V. *Katedra i Gabinet Mineralogiczny. Wiadomość podana przez Profes. Dra Aloizego Altha*, w: *Zakłady Uniwersyteckie w Krakowie. Przyczynek do dziejów oświaty krajowej podany i pamięci pięciuset-letniego istnienia Uniwersytetu Krakowskiego poświęcony przez C.K. Towarzystwo Naukowe Krakowskie*, Kraków 1864, pp. 254–255

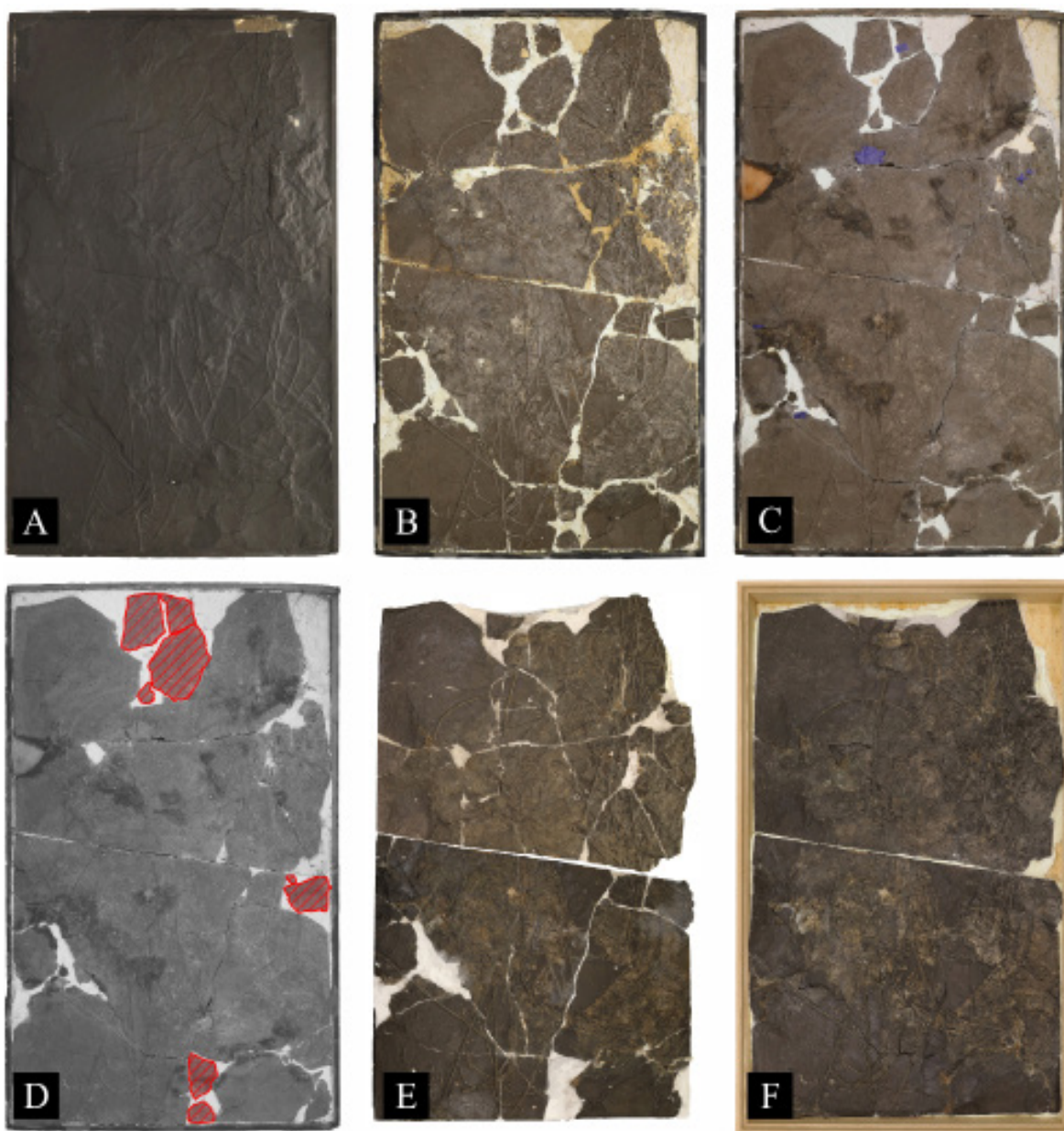
4. Another mention of fossils purchased from Krantz in the inter-war period, W. Szajnocha, *Czterdziestolecie Gabinetu Geologicznego Uniwersytetu Jagiellońskiego (1886–1925)*, Kraków 1926, p. 15

5. The inadequate conditions for preserving specimens at 6 Święta Anna Street were pointed to on a number of occasions, A. Alth, V. *Katedra i Gabinet Mineralogiczny. Wiadomość podana przez Profes. Dra Aloizego Altha*, w: *Zakłady Uniwersyteckie w Krakowie. Przyczynek do dziejów oświaty krajowej podany i pamięci pięciuset-letniego istnienia Uniwersytetu Krakowskiego poświęcony przez C.K. Towarzystwo Naukowe Krakowskie*, Kraków 1864, p. 257 and p. 261

Geology and the Department of Geochemistry at the Chair of Mineralogy and Petrography of the AGH University were closed down, and the Chair of Geology and Chair of Mineralogy and Petrography at the Jagiellonian University were established. Both Chairs kept their former seats, while the Chair of Paleontology was as a whole moved (possibly

together with its collections) to the AGH University. There are no inventories which could explain in the collection of which Chair the fossil slabs were over that period.

In 1962, the institutions were moved to a new building at 2a Oleandry Street at Campus II of the Jagiellonian University. The Chair of Geology and the Chair of Mineralogy



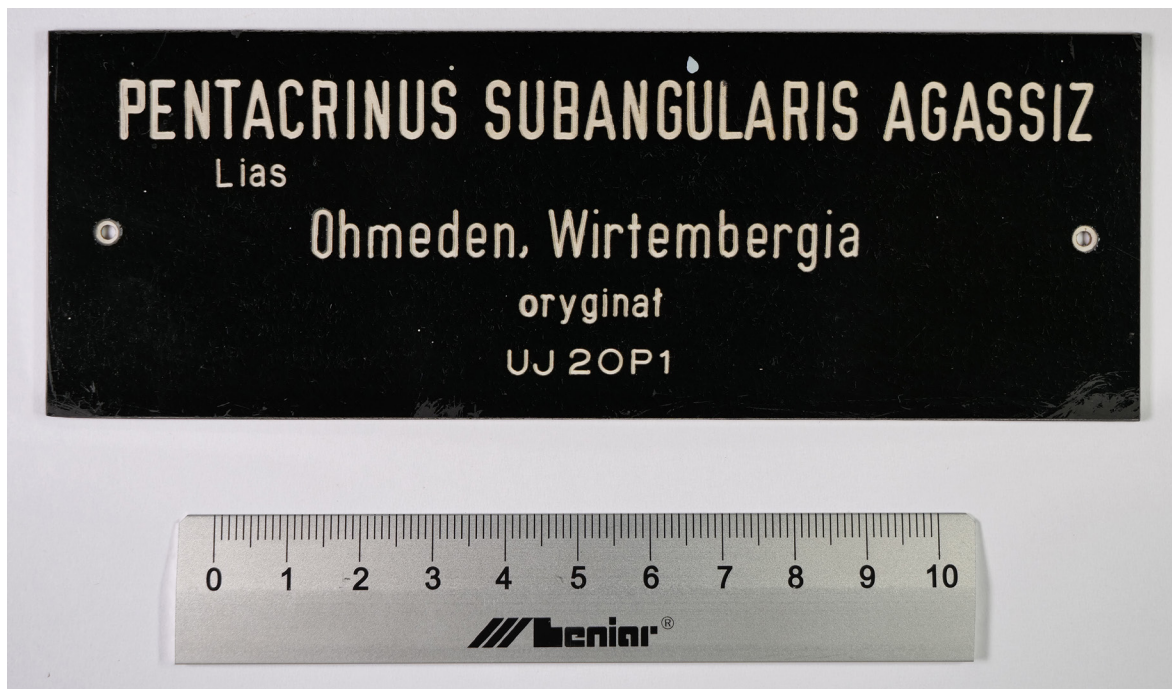
6. Progress of conservation work on the *Seirocrinus subangularis*. A. Slab before conservation; B. Slab after the removal of painting over/uncovering of the rock from under the paint-over layer; C. Slab after the removal of plaster filling covering the rock; D. Broken slab fragments fixed incorrectly; E. Slab following consolidation and filling in the mould cavities on two slab fragments; F. Slab after the colour unification performed within the two slab fragments, Photo J. Glaz, 2023

and Petrography found home there, however, the Chair of Paleontology of the Jagiellonian University, as of 1951 functioning as the Department of Paleontology of the AGH University, did not decide to return to the Jagiellonian University. At that point the Department of Paleozoology of the Jagiellonian University was established; in 1974, Prof. Stanislaw Geroch was assigned its head.

In 1975, both large slabs with the genuine fossils: the crinoids and the ichthyosaurus as well as four plaster casts were incorporated into one of the collections being currently founded: *20P: Originals and Casts of Crinoids, Reptiles, and Reptile Footprints*. This collection was created as a result of the inventorying of the collections after the Institute of

Geological Sciences of the Jagiellonian University had been moved to the building at 2a Oleandry Street. At that moment black engraved plates were attached to every slab (Fig. 7).

From that period we have also some photographs preserved recording the putting up of the slab with the ichthyosaurus in the building of the Institute of Geological Sciences. It can be assumed that all the slabs were put up while the *20P* collection was being created. Particularly since in one of the available photos a poster of a study session held by the AGH University can be seen; it allows to date the process of hanging the slab to 1974–1975. The *29th Study Session of the AGH University, the 34th Alumni Reunion on the Contribution of Mining Sciences to Economic Development on the 30th*



7. Engraved plaque from the 1970s originally placed on the slab with the crinoid fossil. Erroneous species identification on the plaque, Photo S. Florjan, 2023

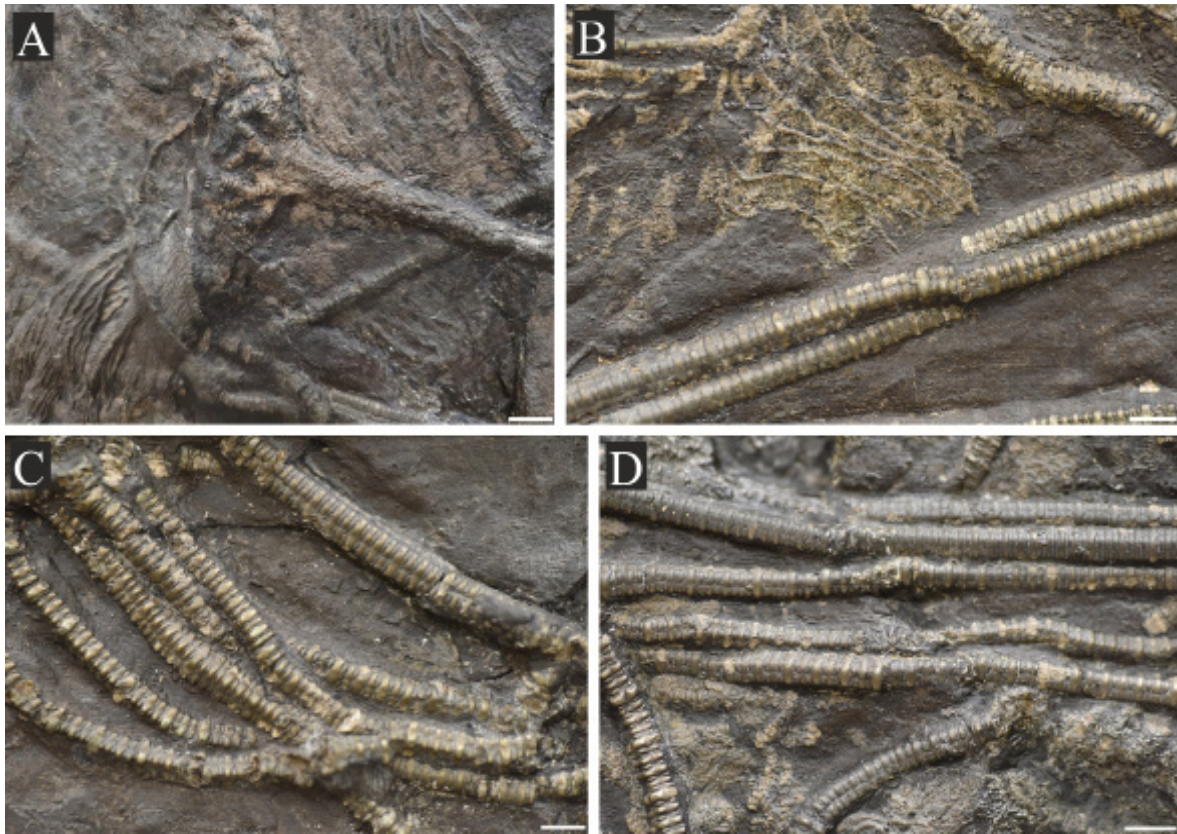
Anniversary of the People's Republic of Poland: Section of Underground Technology for Exploiting Deposits. Section of Opencast Technology took place in 1974. It is likely that it was then that the fossils were brought to the building of the Institute of Geological Sciences, however, there is no information available on the history and the place where the slabs were deposited between 1925⁸ and 1975.

The black-painted fossils and plaster casts found home in the staircase of the Institute. The slab with crinoids was hung between the second and the third floor. It is likely that from the moment of putting them up in late 1974/early 1975 they remained in the same place until late 2016. In January and February 2017, the Institute moved from the building at 2a Oleandry Street to a newly-raised edifice on the Campus of the 600th Anniversary of the Jagiellonian University Revival at 3a Gronostajowa Street. Initially, it was planned that the four impressive fossils would be put up on the walls of the Institute's new buildings, so the specimens were not transferred together with other museum collections to the Nature Education Centre. However, since no appropriate place for exposing them was found, the slabs were deposited in collection storage. In July 2022, in agreement with Director Mariusz Kędzierski of the Institute of Geological Sciences the set of large slabs covered with black paint (two original fossils and two plaster casts, Figs. 1, 2) was transferred to the Nature Education Centre. In the second half of 2022, search for ways of removing the paint layers from the slabs was begun. Consultations with respect to the slabs' conservation were started with professional fossil preparators and art conservators. Finally, both slabs were entrusted to two conservation companies. That with the ichthyosaurus was being cleaned by ICOS from January to March 2023. As part of the renovation the black paint

was removed, the plasters fixing the slab in the frame were sanded, cavities in the frame were filled, and its genuine green colour was restored. The cleaning and conservation of the slab with crinoids was conducted by Joanna Glaz in January–April 2023. In order to reduce contact of the pyrite fossils with water, the painting layers were initially removed with a laser, followed by tedious cleaning, and the reconstructing and fixing it to a new wooden frame (Fig. 6). The slab with the plaster cast of the *Plesiosaurus* (Fig. 2b) is still under conservation. The renovation of the plaster cast of the crocodylomorph (Fig. 6c) is to take place in 2024. Finally, all the slabs, both the genuine fossils and the plaster copies, will be displayed at the geological exhibition at the Nature Education Centre of the Jagiellonian University.

An unintentional suicide living upside down, namely what *Seiocrinus subangularis* was (Miller)

Seiocrinus, next to *Pentacrinites* was one of the two genera belonging to Pentacrinidae crinoids (*Crinoidea*, *Echinodermata*) whose representatives appeared in fossil records in the late Triassic (the Norian, about 230 million years ago) and were present there until the Middle Jurassic (the Baton; about 168 million years ago).⁹ The species belonging to that genus came from Northern America (Canada, USA), Asia (Indonesia, Turkey), Europe (England, Austria, Bulgaria, France, Luxembourg, Germany, Portugal, Romania, Switzerland), and lately Africa (Algeria and Morocco).¹⁰ The most characteristic feature of that crinoid was an extremely long stem, reaching at times as many as 26 metres.¹¹ This part of its skeleton was composed of hundreds of thousands of small elements, so-called columnal which stacked



8. A detailed photo showing elements of the morphological structure of *Seirocrinus subangularis*. A. Proximal part of the stem with the crown; B. Stems and *cirri*; C. Median stem parts; D. Median stem parts with *cirri*. Scale: 1 cm, Photo B. Płachno, 2023

up formed the stem (Fig. 8). The surface of columnal in *S. subangularis* was unique and unrepeatable (see e.g., Fig. 197 in Hess's study from 1992¹²). There were lateral tentacles growing from the stem: the so-called *cirri* made up of short slender tightly pressed elements of rhomboidal outline (Fig. 8). They were squeezed into diagonal grooves on the stem's surface (e.g., Chart 2, Figs. 1, 2 in¹³; Figs. 2B, 3B-H in¹⁴). Their basic task was to attach the creature to a drifting log which allowed crinoids to travel across ocean surfaces. For this very reason Pentacrinidae representatives are called pseudoplanktonic crinoids. In the view of some scholars,¹⁵ these animals could go on drifting like this even for 20 years. Paul B. Wignall and Michael J. Simms¹⁶ defined the lifestyle of *S. subangularis* in compliance with the 'all or nothing' rule. This means that crinoids were in abundance on a piece of a drifting log, reaching like this enormous sizes. At the same time other pieces of wood had no crinoids at all. The quoted authors accounted for this with the fact that the larvae of those animals preferred to colonize the logs on which adults were present. And so the continuous increase in the number of new individuals systematically loaded the log even further in the result of which each family group committed a gradual unintentional suicide.

The stem of *Seirocrinus* was crowned with a dense fan of

long arms which could even be 50 cm long.¹⁷ Hans Hess added that owing to the fact that logs floated near the water surface or just below it, large specimens were forced to hang down. Vladimir G. Klikushin suggested that *Pentacrinides* actively filtered food through densely packed *cirri*, which created currents carrying food towards the arms.¹⁸ That view was refuted by Hess who claimed that *Seirocrinus* showed a preference for settling spots of the least resistance, namely these tree fragments which had no bark, and they fed using different mechanisms.¹⁹

Acknowledgements

The renovation of the fossil slabs was financed with the own resources of the Nature Education Centre of the Jagiellonian University. The Nature Education Centre of the Jagiellonian University would like to extend gratitude to Dr Mariusz Kędzierski, Director of the Institute of Geological Sciences of the Jagiellonian University, and to the Council of the Institute of Geological Sciences of the Jagiellonian University for transferring the above-described slabs to the Centre, which allowed their restoration and ultimately making them available to a broader public; furthermore, we are grateful to Marek Wawrzkiwicz, PhD, to IR Laser, and to Marcin Błaszczuk, PhD, for their contribution to the conservation process.

Abstract: The Nature Education Centre of the Jagiellonian University in Krakow has in its collection a spectacular fossil of a Jurassic crinoid, in literature known as *Seirocrinus subangularis* (Miller). Only several museums in Central Europe can boast such a perfectly preserved and complete specimen of *Seirocrinus*. As seen against Polish museum collections the slab in question is an outstanding object. That very form was a cosmopolitan and pseudoplanktonic crinoid species spread throughout

Asia, Europe, and Northern America, yet it has never been documented in Poland. The particular specimen reached Poland in the mid-19th century from Germany to enrich the collection of the Mineralogical Cabinet. The paper presents the turbulent history of the slab with some dozen specimens of echinoderms on it, the story which will shortly have a happy end, since it will be permanently placed as a geological exhibit at the Nature Education Centre of the Jagiellonian University.

Keywords: Nature Education Centre of the Jagiellonian University, Krakow, fossils, crinoids, echinoderms, the Jurassic.

Endnotes

- ¹ T. Gislén, 'Echinoderm Studies', *Zoologiska Bidrag från Uppsala*, 1924, 1-9.
- ² The species was described by Miller in 1821 as an extinct species (hence the cross before the name) †*Pentacrinites* Blumenbach, 1804 (genus name, author's name, and the year of the genus's description) in the extinct family †Pentacrinidae, under the name †*Pentacrinites subangularis* Miller, 1821'. Subsequently, it was moved to the next genus known in the family: †*Seirocrinus* Gislén, 1924: the cross before the name means an extinct species, while the recording of the description author's name and the year in brackets shows that the species had been previously described within a different species.
- ³ A. Alth, V. Katedra i Gabinet Mineralogiczny. Wiadomość podana przez Profes. Dra Alojzego Altha, w: *Zakłady Uniwersyteckie w Krakowie. Przyczynek do dziejów oświaty krajowej podany i pamięci pięciuset-letniego istnienia Uniwersytetu Krakowskiego poświęcony przez C.K. Towarzystwo Naukowe Krakowskie*, Kraków, 1864, pp. 234-265.
- ⁴ W. Szajnocha, *Czterdziestolecie Gabinetu Geologicznego Uniwersytetu Jagiellońskiego (1886-1925)*, Kraków 1926, p. 60.
- ⁵ A. Alth, op. cit.
- ⁶ U. Bęczkowska, *Kolegium Kółkątaja*, Kraków 2020, p. 172.
- ⁷ J. Szczepanik-Łukasiewicz, A. Kłosowska, *Konserwacja skamieniałości z ichtiozaurów z kolekcji UJ dokumentacja powykonawcza*, Kraków 2023, p. 37.
- ⁸ W. Szajnocha, op. cit., passim.
- ⁹ H. Hess, Ch.G. Messing, *Treatise on Invertebrate Paleontology, part T, Echinodermata 2, Crinoidea 3*, Lawrence 2011, p. 261.
- ¹⁰ M.A. Salamon, M. Benyoucef, M. Benzaggah, T. Brachaniec, I. Hoşgör, S. Jain, B.J. Płachno, O. Rahmonov, 'Unlocking the secrets of the Early Jurassic of Gondwana: first record of pseudoplanktonic crinoid *Seirocrinus* (Crinoidea, Pentacrinidae) from Africa', *Historical Biology*, 2023 (being printed) and literature quoted there.
- ¹¹ M.J. Simms, 'British Lower Jurassic crinoids', *Monograph of the Palaeontographical Society*, 1989, Publication 581 (part of vol. 142 for 1998), pp. 1-103.
- ¹² H. Hess, 'Lower Jurassic Posidonia Shale of Southern Germany', in *Fossil Crinoids*, ed. by H. Hess, W.I. Ausich, C.E. Brett, M.J. Simms, Cambridge 1999, pp. 183-196.
- ¹³ V.G. Klikushin, *Fossil pentacrinid crinoids and their occurrence in the USSR*, Sankt Petersburg 1992, pp. 1-358.
- ¹⁴ A. Seilacher, R.B. Hauff, 'Constructional morphology of pelagic crinoids', *Palaios*, 19 (2004), pp. 3-16.
- ¹⁵ A.W. Hunter, D. Casenove, C. Mayers, E.G. Mitchell, 'Reconstructing the ecology of a Jurassic pseudoplanktonic raft colony', *Royal Society Open Science*, 7 (2020).
- ¹⁶ P.B. Wignall, M.J. Simms, 'Pseudoplakton', *Palaeontology*, 33 (1990), pp. 359-378.
- ¹⁷ H. Hess, *Lower Jurassic Posidonia Shale...*, passim.
- ¹⁸ V.G. Klikushin, op. cit., passim.
- ¹⁹ H. Hess, *Part T (revised), vol. 1, chap. 19: Paleocology of pelagic crinoids*, Treatise Online, 16 (2010), pp. 1-33.

Bibliography

- Alth Alojzy, 'V. Katedra i Gabinet Mineralogiczny. Wiadomość podana przez Profes. Dra Alojzego Altha', in: *Zakłady Uniwersyteckie w Krakowie. Przyczynek do dziejów oświaty krajowej podany i pamięci pięciuset-letniego istnienia Uniwersytetu Krakowskiego poświęcony przez C.K. Towarzystwo Naukowe Krakowskie*, (Kraków: Drukarnia „Czasu” W. Kirchmayera nakładem c. k. Towarzystwa Naukowego, 1864, pp. 234-265.
- Bęczkowska Urszula, *Kolegium Kółkątaja*, (Kraków: Księgarnia Akademicka, 2020).
- Hess Hans, 'Lower Jurassic Posidonia Shale of Southern Germany', in: *Fossil Crinoids*, ed. by H. Hess, W.I. Ausich, C.E. Brett, Michael J. Simms, (Cambridge: Cambridge University Press, 1999), pp. 183-196.
- Hess Hans, Messing Charles G., *Treatise on Invertebrate Paleontology, part T, Echinodermata 2, Crinoidea 3*, (Lawrence: The University of Kansas, Paleontological Institute, 2011).
- Hess Hans, *Part T (revised), vol. 1, chap. 19: Paleocology of pelagic crinoids*, Treatise 16, 2010, pp. 1-33.
- Hunter A.W., Casenove D., Mayers C., Mitchell E.G., 'Reconstructing the ecology of a Jurassic pseudoplanktonic raft colony', *Royal Society Open Science*, 7 (2020), <http://dx.doi.org/10.1098/rsos.200142>.
- Gislén Torsten, 'Echinoderm Studies', *Zoologiska Bidrag från Uppsala*, 1924, pp. 1-9.
- Klikushin Vladimir G., *Fossil pentacrinid crinoids and their occurrence in the USSR*, (Sankt Petersburg: Leningrad Palaeontological Laboratory, 1992), pp. 1-358.
- Salamon Mariusz A., Benyoucef Madani, Benzaggah Mohamed, Brachaniec Tomasz, Hoşgör İzzet, Jain Sreepat, Płachno Bartosz J., Rahmonov Oimahmad, 'Unlocking the secrets of the Early Jurassic of Gondwana: first record of pseudoplanktonic crinoid *Seirocrinus* (Crinoidea, Pentacrinidae) from Africa', *Historical Biology*, 19 (2023), DOI: 10.1080/08912963.2023.2243471.
- Seilacher Adolf, Hauff Rolf B., 'Constructional morphology of pelagic crinoids', *Palaios*, 19 (2004), pp. 3-16.
- Simms Michael J., 'British Lower Jurassic crinoids', *Monograph of the Palaeontographical Society*, 1989, Publication 581 (part of vol. 142 for 1998), pp. 1-103.
- Szajnocha Władysław, *Czterdziestolecie Gabinetu Geologicznego Uniwersytetu Jagiellońskiego (1886-1925)*, odbitka z III. Rocznika Polskiego Towarzystwa

Geologicznego w Krakowie za rok 1925, wydane go z zasiłku Wydziału Nauki Ministerstwa W.R.iO.P., Kraków 1926.

Szczepanik-Lukaszewicz Joanna, Klosowska Anna, *Konserwacja skamieniałości z ichtiozaurem z kolekcji UJ dokumentacja powykonawcza*, typescript, archive of the Nature Education Centre of the Jagiellonian University, Kraków 2023.

Wignall Paul B., Simms Michael J., 'Pseudoplakton', *Palaeontology*, 33 (1990), pp. 359-378.

Bartłomiej Kajdas, PhD

Doctor in earth sciences specializing in geology, a geologist, soil scientist. Since 2020 curator of the Geological Department at the Nature Education Centre of the Jagiellonian University. Populariser of science and co-host of social media of the Nature Education Centre of the Jagiellonian University; bartlomiej.kajdas@uj.edu.pl.

Prof. Mariusz Salamon (post-doctoral degree)

Professor of geological sciences, a paleontologist: graduate from the University of Silesia in Katowice. He specializes in taxonomy and ecology of fossil echinoderms. Author of over 130 scientific papers and numerous taxa new to science; mariusz.salamon@us.edu.pl.

Joanna Głaz, MA

A licenced art conservator at the Studio of Conservation and Restoration of Stone Sculpture, Stucco, and Ceramics of the Department of Conservation and Restoration of Old Art of the Jan Matejko Academy of Fine Arts in Krakow. She specializes in conservation of movable objects made of stone; she is particularly bonded with the art of the borderland; jglaz@asp.krakow.pl.

Prof. Bartosz J. Płachno (post-doctoral degree)

Professor of biological sciences, a biologist, a botanist; graduate from the Jagiellonian University in Krakow; grant holder of the Foundation for Polish Science and the Minister of Science and Higher Education. Member and President of the Developmental Biology Commission of the Polish Academy of Learning. Author of over 170 publications. A specialist in cytology, anatomy, and plant embryology, he is also interested in history of science (historic scientific appliances, historic scientific collections), art, and fossil echinoderms; bartosz.plachno@uj.edu.pl.

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