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Julius PIA
an universally distinguished earth scientist

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Introduction

This article is an attempt based on TRAUTH (1947) enriched with some unpublished data to give a better picture of the life of Julius PIA who died 50 years ago in Vienna.

He was not only a pioneer of modern palaeoalgology, starting his most important works in the first decades of our century, but also an excellent mapping geologist, an expert of fossil mammals, a specialist in Triassic stratigraphy, a well known specialist of cephalopods, and he had even ideas about the origin of carbonates. In addition to this Julius PIA, who worked at the Museum of Natural History in Vienna, was always interested to give his knowledge to other people – to the simple reader of a newspaper, as well as to his students at the University of Vienna.

An intensive travel activity enabled him to collect material from all over Europe, due to his world– wide contacts to geologists he was provided with material from all over the world. So it is not surprising, that PIA was even in his life–time a very famous geologist and palaeontologist. His works are more than a mere benefit to different divisions of earth sciences; concerning fossil algae his work is that of a pioneer.

His parents and the early years

He was born on 28th July 1887 in Purkersdorf, a suburb west of Vienna, where his parents stayed for summer holidays. The house of his birth is still standing at Bahnhofstraße 2 (now "Hotel Wien West"). The owner of the house – a villa showing remains of the past centuries architecture of the so called "Gründerzeit"– was Georg SENFELDER, an innkeeper. Purkersdorf was in these decades a health resort for many Viennese citizens; this is due to the opening of the railway in 1858. The frequency of trains leaving Vienna illustrates very well the importance of this town. In 1885 every day 36 trains left the Westbahnhof in Vienna, 17 of these trains had their final destination in Purkersdorf. PIA was baptized on 14th August 1887 in the church of Purkersdorf; his complete name is: Julius Eduard Ernest PIA.

His parents were Dr. Julius Johann PIA, a judge ("Landgerichtsrat"), born in Vienna, and Frederike Amalia (maiden name: LEHRNER). The wedding of his parents was on 2nd June 1886 in the beautiful baroque "Karlskirche" in Vienna.

The roots of his father go back to Italy in the region of Piemont, where his great–grandfather Johann Martin PIA emigrated to start a career as a merchant in Vienna; this profession had also his grandfather. The ancestors of his mother lived in Burgenland, a federal province of Austria.

As a boy he went to primary school at home. Some years he spent in Vienna and some in Ried im Innkreis (Upper Austria), then he started with the grammar school in the eighth district ("Piaristengymnasium") from 1897 – 1900. Afterwards the family moved to Linz, due to the promotion of his father. As a young person he had the idea of studying astronomy, but dropped this idea, because he was not good enough in mathematics. On 14th July 1905 when

Julius Fiala

he finished the grammar school with "excellent success" he made the decision to study geology.

The years as a student

In autumn 1905 his father retired and was ennobled by Emperor Franz Joseph I., so he and his children were allowed to call themselves "Edler von". In the same year Julius started the military service as a one– year volunteer in the "Feldkanonenregiment Nr. 40" in Linz. About this time PIA mentioned 1932: "Die bisher unangenehmste Zeit meines Lebens" (= Up to now the most disagreeable time in my life).

On 2nd October **1906** he started to study geology at the University of Vienna. 1907 he joined the "Geologische Gesellschaft in Wien" (= Geological Society of Vienna) in their first year of existence. He was influenced by his academic teachers V. UHLIG, C. DIENER, O. ABEL, B. HATSCHEK, and R. v. WETTSTEIN, attending lessons from geology, palaeontology, zoology and botany. He was quite interested even in philosophy. KANT, BERKELY and SCHOPENHAUER were his favourites, the philosophy of India was fascinating him, too. He started his field work unter the supervision of V. UHLIG in the Höllengebirge (Northern Calcareous Alps, between the lakes Attersee and Traunsee). During the summerperiods of 1908 – 1911 he spent about four months there. The investigation of the algae he found there – he was especially fascinated by some well weathered specimens of *Diplopora annulata* – was the initial idea for his thesis (PIA 1912a). The geological part of this field work is summarized in PIA (1912b).

Inspired by V. UHLIG to concentrate the work on dasyclad algae, he started his thesis, studying 193 thin sections (his own collection, material from the K.K. Geologische Reichsanstalt (=Geological Survey of Austria) and from the Geological Institute of Vienna University). From this thin sections he made 155 (!) hand drawings. To learn more about dasyclad algae he spent some time in Munich to study GÜMBEL's material. In Munich he started cooperation with ROTHPLETZ. On 28th March 1911 PIA graduated as "Dr. phil."

The early years at the museum

On 24th May 1911 he started as a assistant at the Geological Department of the Museum of Natural History in Vienna. There he was responsible for the collection of fossil plants and fossil mammals as well as for the library of the department.

1912 he worked on a collection of Liassic cephalopods which was bought by the museum. The results were published soon (PIA 1914a), other works dealing with cephalopods followed (PIA 1914b, 1914c).

In the 1914c paper he states, that the philosophic elements of his ideas are based on I. KANT. This particular work deals with the ideas of DARWIN.

In August **1913**, after the death of the director of the Geological Department E. KITTL, PIA started as "Voluntär mit Adjutum", receiving regular payment.

On 2nd May 1914 he married at the Piaristen Church ("Maria Treu") Maria Anna (=Marianne) Aloisia MÖLLER (born 18.10. 1885 in Vienna; died 22.10.1973 in Innsbruck). She has studied palaeontology, writing a thesis on cephalopods and corals from the Ernstbrunn Limestone (MÖLLER 1911). She worked until 1934 as a teacher for natural sciences and mathematics at a grammar school

Fig. 2: Strozzigasse 31 in the 8th district of Vienna, the house where Pia lived.

("Albertgasse") in the 8th district in Vienna.
On 17th May 1915 their first child Julius PIA (jun.) was born. Some years later, on 13th January 1921 their daughter Eva-Maria was born. She is still living in Innsbruck. The whole PIA family was roman catholic; the priest who married Julius PIA and Maria MÖLLER was Dr. Pius PARSCH, a very famous theologist. He also baptized PIA's Children. The house of PIA's family, Strozzigasse 31, is still standing in the 8th district in Vienna (fig. 2).

His military career

During World War I PIA started in August 1914 as a second lieutenant in fights against Russian soldiers in Poland. From 17th January 1915 until 9th May 1915 he was at the hospital because he suffered from a serious desease (typhoid fever). Then he became first lieutenant. From May 1915 until March 1916 he was in Galizia. Afterwards he spent some time in Northern Italy.
1918 (9.2.–29.4.) he attended a course in Vienna for war-geology. Then until 1st October he acted as commander of a group of war-geologists in Trento (Northern Italy). In general, he was a very successful soldier during the war, receiving a lot of awards ("Signum laudis" in bronze [20.2.1916] and silver [1.3.1917] with swords, "Karl – Truppenkreuz" [17.8.1917] "Hindenburgkreuz"). Even during the war he used every free time for collecting material for the museum and carried out some geological studies (PIA 1918b, 1918c). Also during holidays he used to work on geology (PIA 1917, 1918d). But some material he collected e.g. in 1915 was published many years later (PIA 1924e, 1924f). In autumn 1918 he started again to work at the museum.

His university career

To get the "venia legendi" he wrote on 18th February 1919 to the faculty of the university. For a probation lecture he suggested three different titles:
1. "Algen als Gesteinbildner".
2. "Über die Beziehungen zwischen Gestalt und Lebensweise der Cephalopoden".
3. "Zur Frage der Lückenhaftigkeit der Alpinen Juraformation."
The third one was chosen. He gave this lecture, which was accepted, on 4th June. On the 30th Sept. 1919 he got the "venia legendi" for palaeontology.
On the 16th Sept. 1927 he was "tit. ao. Prof." 1928 he wanted to become an "extraordinarius" for plantpalaeontology, two years later he wanted another "extraordinariat" for stratigraphy, but both were refused because of PIA's high wishes . On the 5th May 1937 he was entitled as "hon. Prof." for systematic palaeontology with special respect to the "Leitfossilienkunde" (=stratigraphy).

Back to the museum

In autumn **1918** when he started again his scientific work at the museum, his special task still was the collection of fossil plants and mammalia. He started a series of publications with a catalogue of dasyclads of the museum's collection (PIA 1919).
In this work he mentions his most important and very wellknown work "Die Siphonae Verticillatae vom Karbon bis zur Kreide" (PIA 1920b). In spite of a lot of administrative work at the museum PIA was a very fast worker. In our days we would call him a workaholic (comp. fig. 3: one page from one of his books

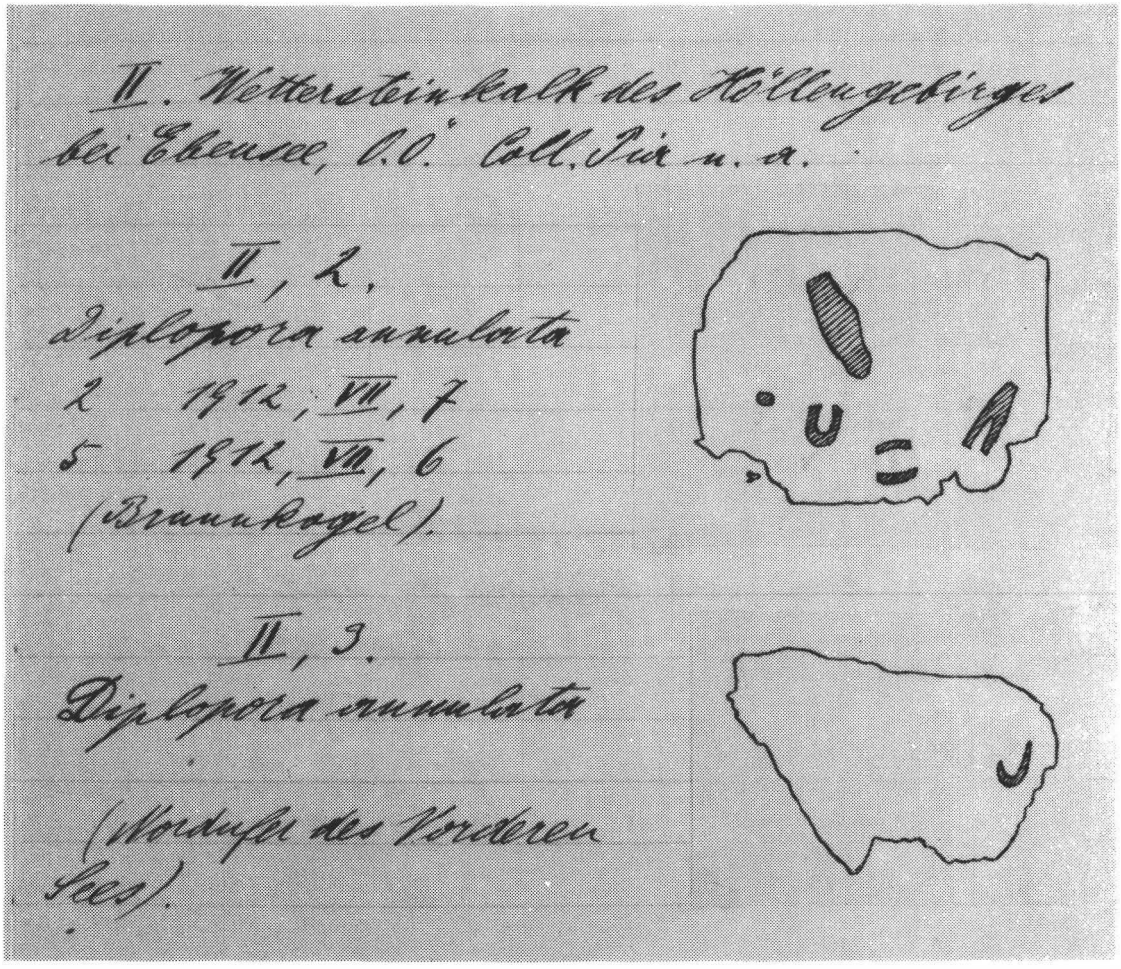

Fig. 3: Page from his personal notebook.

shows how carefully he has worked). In the sommer months of 1919 he went to Carinthia (Gailtaler Alpen) and Salzburg (Steinernes Meer, Tennengebirge) supported by the Austrian Academy of Sciences (PIA 1920c). He also gave a talk on 7th November 1919 (PIA 1920a) about the Alpine Jurassic especially in Northern Italy – remaining experiences from his time as a soldier.

On 7th of January **1920** the manuscript of his most important work "Die Siphonae Verticillatae vom Karbon bis zur Kreide" was finished (PIA 1920b). Fig 4 shows the first page of PIA's original manuscript. In this and the following year he spent again some time in the Tennengebige area together with the Austrian Academy of Sciences. In spring of **1921** he had two talks about cephalopods (comp. summary in PIA 1923c).

1922 he went to London to discuss problems of the Dolomites with Maria M. OGILVIE GORDON. In PIA 1922 he presented a phylogenetic tree of dasyclads.

1923: At the 1st June he read a paper about geological maps (PIA 1925a), on the 14th December he reported about "Zur Tektonik der Dolomiten" together with Maria M. OGILVIE GORDON. In the same year he also studied some material which was sent to him from Eastern Asia (Pia 1924d).

1924 was a year of intensive activities. PIA was in contact with STOLLEY to dicuss some stratigraphical problems of diatoms. RAINERI sent him some material, because he doubted some of her algal genera (PIA 1924b). PIA visited the Carnic Alps, the Karawanks and again the Tennengebirge and Karwendel mountains. In September he joined the Meeting of the Palaeontological Society in Eichstätt (South Germany). His 1924c paper, which was issued in November 1924, deals with some remains of GÜMBEL's material of Late Jurassic dasyclads from the Franconian Alb (Southern Germany).

This material was sent to him from Munich. The original material was already lost, nevertheless he established two new species. Another work deals with material he received from Yugoslavia. PIA regrets, that it is impossible to solve stratigraphical questions without field studies (PIA 1925b). In PIA 1924a he worked with statistical methods in tectonic studies. In "Wanderungen im unteren Lammertale" (PIA 1924h) he explained geology in a popular way. In winter 1924/25 Maria M. OGILVIE GORDON studied PIA's material.

In the year **1925** he went to the Lake Garda area. On the occasion of the 75-year anniversary of the Geological Survey, 35 earth scientists got the honour of being "Korrespondent der Geologischen Bundesanstalt", PIA was one of them (25th May). At the Academy of Sciences on 20th of November he presented the stratigraphy of the German Triassic (PIA 1926a).

1926 he wrote an informative book about the lithification of plants. From calcareous algae to coal–building plants all major plant groups are discussed herein (PIA 1926c).

In **1927** his important article "Thallophyta" was published in HIRMER: "Handbuch der Paläobotanik". During spring time he went to Gutenstein in Lower Austria for collecting some algae. Then he was getting seriously ill (measles). On 12th August in Stuttgart he read a paper about the correlation of the Alpine and the German Triassic (PIA 1926b); afterwards he collected material

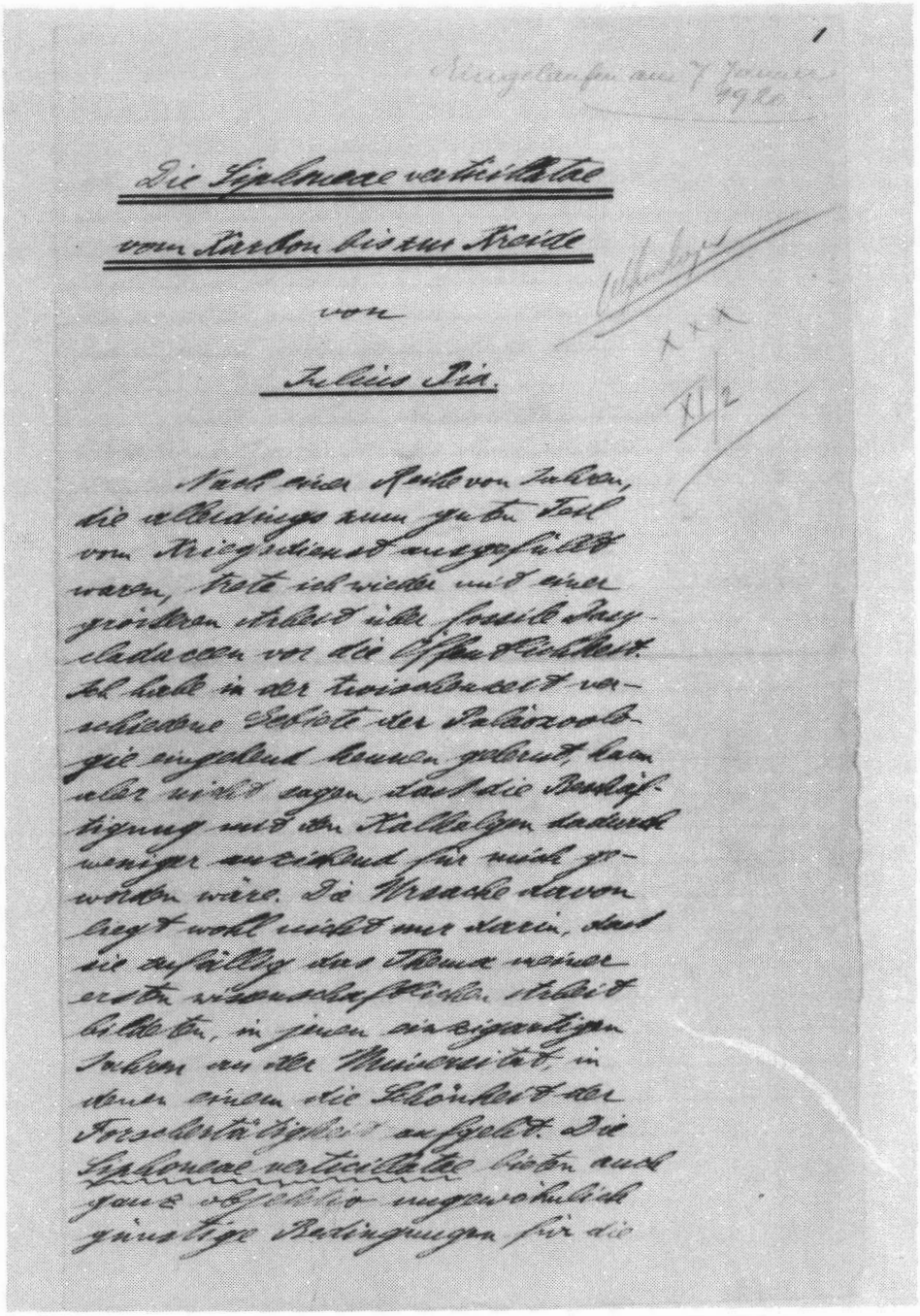

Fig. 4: Original manuscript from his most important work about fossil dasyclads.

in the German Muschelkalk (=Middle Triassic; PIA 1927c). PIA 1927a deals with the history of palaeontology in Vienna.

During **1928** he was unable to undertake any field studies, because he suffered from a nephritis. Nevertheless he was very busy; on 16th March the manuscript for 1928b is finished. In PIA 1928c he thanked his friends at the museum for their generous help supporting his work during his long illness.

In **1929** he gave a lecture for the Geolgical Society in Vienna ("Zur Korallenriff-theorie des Schlerndolomites"; PIA 1930c). He also went to Karlsruhe where he joined the annual meeting of the German Geological Society, speaking at the 4th of August about general problems in stratigraphy (PIA 1929a). Then he went to the Black Forest area in Germany and also to Carinthia in Austria.

On 7th March **1930** again he spoke about differences between German and Alpine Triassic (PIA 1931). He traveled to the 5th International Botanical Congress in Cambridge, speaking about Palaeozoic algae (PIA 1930h, 1931e, 1931f). Afterwards he studied material in the British Museum in London and visited outcrops in Bristol, Yorkshire and Gloucester (PIA 1931b, 1931c, 1932b, 1932c). In the paper PIA 1930d he described material which was provided by his friend F. TRAUTH; TRAUTH himself got the material from Burma. PIA 1930e is about some remains of a new species of a Quaternary pig; a work totally different from any other papers so far.

1931 he made a great expedition to Yugoslavia. One of his aims was the study of calcareous tufa, the results were published later (PIA 1933b, 1934b, 1935b, 1935c). In addition to this he made excursions to the Carniac Alps, the Dolomites and to Lower Austria. In a lecture (13th Febr. 1931) he read about: "Geologische und algologische Bilder von der Reise nach England". One work deals with diatoms (PIA 1931i). Again he presented two papers on the German Triassic (PIA 1931g, 1931h) and also on Russian algae (PIA 1931d).

1932 he again went to Carinthia, to the Southern Alps, and to Tuscany where he studied trace fossils. In this year he wrote a guide about the collections of the museum (1932a), a coral paper (PIA 1932d) and a publication about Russian material which was sent to him (PIA 1933a). In January (18th) he became a correspondent of the Palaeontological Society of America. On 19th February he was elected as president of the Geological Society in Vienna for two years, on the same day he spoke about his travel to Yugoslavia. On the 31st May he became a "Korrespondent der Österreichischen Akademie der Wissenschaften."

1933 was the year when he went to Greece. On 3rd March he lectured about "Über Kalkbildung durch Tiere". In the same year some important works about the origin of limestones and the role of various organisms in this processes were issued (PIA 1933c, 1933d, 1933e, 1933f, 1933g).

In **1934** he traveled to Lower and Upper Austria and Carinthia. On 23th November he read about "Über immergrüne Eichen im Alluvium Niederösterreichs" (PIA 1935e, 1935f). The work PIA 1934c is based on a cooperation with D. ANDRUSOV from Praha. In this year another work about limestones was finished (PIA 1934a). Furthermore an outstanding work of 544 pages (!) on fossil mammals (PIA & SICKENBERG 1934 =1934d) was presented.

In September **1935** he joined the 5th International Botanical Congress in Amsterdam (PIA 1935f, 1936a) and afterwards the 2nd International Congress on Carboniferous Stratigraphy in Heerlen (PIA 1937d, 1937e). In Brussels he studied algae (PIA 1936c) and the collection of recent and Tertiary whales; before going back home, he did fieldwork in Northern England and Southern Scotland. PIA 1935a is a scientific reply to G. ARTHABER dealing with the correct use of Triassic stages. One reprint, which is now at the Museum of Natural History in Vienna has a personal dedication from PIA to ARTHABER at the front page ("Herrn Prof. Dr. G. v. Arthaber ergebenst Überreicht in der Hoffnung, daß die gute Nachbarschaft nicht gelitten hat. Verf.").

In **1936** he again went to Tuscany and to Southern Tyrol. The work PIA 1936b is a revision based on the original material of Rita RAINERI who lent PIA her thin sections. On 19th November the manuscript of a large work about boring algae was accepted (PIA 1937a). He worked also on some material from India (PIA 1936e, 1936f)

In April **1937** some famous geologists (among them F. E. SUESS) proposed PIA as "Wirkliches Mitglied" of the Academy of Sciences, to follow C. DIENER. The nomination, however, was refused. On 5th May he became "Honorarprofessor" of the University of Vienna. In a letter to the dean (8th June 1937) he refused to hold lectures for two or three students and explained all his problems concerning the university. In July he made a fieldtrip to Switzerland from Lake Constance to Lake Geneva. He also continued his studies on material from India (PIA 1937h, 1937k, 1938a). Beyond that a voluminous work about the Dolomite mountains around Prags has been published (PIA 1937j). A short notice on whales of Miocene sediments near Vienna should also be mentioned (Pia, 1937g). Finally he wrote an article about the applications of different languages in natural science (PIA 1937l).

In **1938**, the year when Austria was linked to Germany, he went to Styria and Istria. The work PIA 1938b is again dealing with *Thaumatoporella*. C. TEICHERT provided him material from Australia (PIA 1940).

In **1939** he went to Franconia in Germany. PIA 1939a is a so-called "Sammelbericht", giving information about the latest literature, PIA used to write such "Sammelberichte" regularly.

In **1940** he started his last great field work in the Salm Mountains NE of Grünau in Upper Austria. In January (26th) he lectured about "Zur geologischen Geschichte des Donautales" (PIA 1939b), in May (24th) about "Die Ältesten Urkunden des Lebens auf der Erde" (PIA 1940d) and finally in November (29th) he gave a review about fossil calcareous algae ("Übersicht über die fossilen Kalkalgen und die geologischen Ergebnisse ihrer Untersuchung"; PIA 1940e, 1942b). A journey back to his geological roots is his work 1940a. The "Höllengebirge" is the area where he has started field work for his thesis. Together with Maria M. OGILVIE GORDON who already died 24th June 1939, he edited a comprehensive publication on the Langkofel Mountains in the Dolomites.

In **1941** he continued the field work of the last year, the result was announced in PIA 1941b and published in PIA 1943b. PIA 1941e is about recent algae from the Adriatic Sea and their fossil relatives, PIA 1941f is a popular work on

the geological significance of algae.
In **1942** together with the secretary of the department, L. ADAMETZ he wrote a paper (PIA 1942c) on a probable mercury occurence in Austria.
On 14th of December 1942, he refers about the geology of Scandinavia (PIA 1944). PIA 1943a is a paper presented at the Academy of Sciences on 17th December 1942. Probably PIA was personally there, but TRAUTH (1947: 29) stated, that PIA didn't feel well during December 1942. Christmas time he spent at home, then he had to go to hospital.
On 2nd January 1943 he died.
1944 the 8th "Sammelbericht" was published by S. v. BUBNHOFF (=PIA 1944).

PIA and fossil algae

In honour to Julius PIA a number of taxa were called after him, e.g.:
FLORIN (1929): genus *Piaea*
FROLLO (1938): *Cayeuxia piai*
BACHMAYER (1941): *Petrascula piai*
CONTI (1946): *Lithophyllum Piai*
GOWDA (1959): genus *Piania*
RADOICIC (1962) genus *Pianella*
DRAGASTAN (1971): *Griphoporella piae*
DRAGASTAN (1978): *Pseudotrinocladus piae*
In general PIA's exceedingly creative work is still significant for further (palaeo)algological studies, e.g.:
– he created terms like D (d)... for outer (inner) diameter of dasyclads;
– he established fossil algae of high stratigraphical significance;
– he realized the importance of algae for carbonate sedimentation;
– he pointed out the great importance of algae as facies indicators;
– he used algae for separating palaeobio–geographic areas.

Acknowledgements

For writing this article there where just a few days time left in July, where many people are staying at their holidays. So special thanks are due to all who helped me: W. PILLER, K. OBERMÜLLER (Palaeontological Institute at the Univ. of Vienna), to A. SCHUMACHER, F. RÖGL and H. SCHMITZ (Museum of Natural History Vienna), to the staff from the archives from the University of Vienna, to the staff of the library at the Austrian Academy of Sciences, to all the friendly people at various ministries and to F. STOJASPAL (Geological Survey of Austria).
Although this recent work compiles a lot of PIA's life and work, it has to be admitted, that there are still some subjects which should be matter of further studies, especially all his lectures and his university career.

1912a Neue Studien über die triadischen Siphoneae verticillatae. – Beitr. Pal. Geol .Öst.-Ung. u. Or., 25, 25–81, 7 pls., 24 figs., Wien – Leipzig. (Dissertation.)

1912b Geologische Studien im Höllengebirge und seinen nördlichen Vorlagen.– Jahrb.Geol.Reichs-anst., 62, 557–612, 2 pls., 14 figs., Wien.

1914a Über eine mittelliassische Cephalopodenfauna aus dem nordöstlichen Kleinasien. – Ann. Naturh. Hofmus., 27 (1913), 335–388, 3 pls., 7 figs., Wien.

1914b Untersuchungen über die liassischen Nautiloidea. – Beitr. Pal. Geol. Öst.-Ung. u. Or., 27, 19–86, 7 pls., 1 fig., Wien.

1914c Untersuchungen über die Gattung *Oxynoticeras* und einige damit zusammenhängende allgemeine Fragen. – Abhandl. Geol. Reichsanst., 23, I – IV u. 1–179, 13 pls, 5 figs., Wien.

1915 *"Diplopora debilis* GÜMB." u. *"Griphoporella curvata* GÜMB. sp.". In: SPITZ, A. & DYRENFUTH, G.: Monographie der Engadiner Dolomiten zwischen Schuls, Scanfs und dem Stilfserjoch. – Beitr. Geol. Karte Schweiz, 62 p., 1 pls., 11 figs., Bern.

1917 Adatok a chocsdolomit korának meghatározásához. – Különlenyomat a Mag. Kir. Földt. Intez. 1916, 227–229, Budapest.

1918a "Familie: Dasycladaceae (Endl.) Cram. em." In: TRAUTH, F.: Das Eozänvorkommen bei Radstadt im Pongau und seine Beziehungen usw. – Denkschr. Akad. Wiss., m.-n. Kl., 95, 209–213, 1 Textfig. u. pl. I, fig. 1–2, Wien.

1918b Kriegsgeologische Übersichtskarte der Veronesischen Alpen (1 75.000). Mit Erläuterungen. – K. u. k. Kriegsvermess. 10, Geologengr.

1918c Schottermaterialkarte der Sebastiano- und Hessen-Rainerstraße vom Sommosattel bis Tonezza (1 : 25.000). – K. u. k. Kriegsvermess. 10, Geologengr.

1918d Zur Altersbestimmung des Chocsdolomites. – Jahresbericht Kgl. Ung. Geol. Reisanst. f. 1916, 256–258, Budapest. (Deutsche Übertragung der Veröffentlichung sub 1917.)

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1920a Zur Frage der Lückenhaftigkeit des alpinen Jura, besonders in den Lessinischen Alpen. (Vortrag.) – Mitt. Geol. Ges., 12 (1919), 116–134, 2 pls., Wien.

1920b Die Siphoneae verticillatae vom Karbon bis zur Kreide. – Abhandl. Zool.-bot. Ges., 11/2, 1–263, 8 pls., 27 Textfig., Wien.

1920c Bericht über die im Sommer 1919 mit Unterstützung der hohen Akademie der Wissenschaften ausgeführten geologischen Aufnahmen. – Anz. Akad. Wiss., m.-n. Kl., 57, 199–201, Wien.

1921a Zur Kritik des Gattungsbegriffes. (Vortrag.) – "Verhandl." Zool.-botan. Ges., 70, 145–152, Wien.

1921b Über einige geologische Beobachtungen (in der Eishöhle im Tennengebirge). – Anz. Akad. Wiss., m.-n. Kl., 58, 82–83, Wien.

1922 Einige Ergebnisse neuerer Untersuchungen über die Geschichte der Siphoneae verticillatae. – Zeitschr. indukt. Abstammungs- u. Vererbungsl., 30, 63–98, 1 pl., Berlin.

1923a "VI. Geologische Beobachtungen." In: "Die große Eishöhle im Tennengebirge (Salzburg) (Eisriesenwelt). Ausführlicher Bericht über die Ergebnisse der Höhlenexpedition der Akademie der Wissenschaften in Wien, 1921." – Speläol. Jahrb., 4, 48–65, 2 Textfig. (Gis. 16 u. 17), 5 pls. (Taf. XVII–XXI), Wien. – Wenig verändert in: Speläol. Monographien, 6 (1926), p 106 ff., Wien.

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1925c Über die ethologische Bedeutung einiger Hauptzüge in der Stammesgeschichte der Cephalopoden. – Ann. Naturhist. Mus., 36, 50–73, 3 Textfig., Wien.

1925d Untersuchungen über die Tektonik der Lessinischen Alpen und über die Verwendung statistischer Methoden in der Tektonik, I. Teil. – Denkschr. Naturhist. Mus. Wien, 2, Geol. paläont. Reihe, S. I–VI u. 1–230, 61 Textfig., 5 pls., Verlag F. Deuticke, Leipzig u. Wien.

1924a Über einen neuen Versuch zur Anwendung statistischer Methoden in der Tektonik. – Geol. Rundschau, 15, 123–143, 12 Textfig., Berlin.

1924b Geologisches Alter und geographische Verbreitung der wichtigsten Algengruppen. Österr. Botan. Zeitschr., 73, 174–190, Wien – Leipzig.

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1924f Über einen merkwürdigen Landpflanzenrest aus den Nötscher Schichten. (Karbon der Gegend von Bleiberg in den östlichen Gailtaler Alpen.) – Sitzber. Akad. Wiss., m.-n. Kl., Abt. I, 133, 543–558, 1 pl., Wien.

1924g Der Stand unserer Kenntnisse von den ursprünglichsten Gefäßpflanzen (Psilophytales). (Sammelreferat) – Zeitschr. indukt. Abstammungs- u. Vererbungsl., 35, 292–309, 4 Textfig., Berlin.

1924h "Wanderungen im unteren Lammertale." In: SPENGLER, E.: Geologischer Führer durch die Salzburger Alpen und das Salzkammergut. – Sammlung geol. Führer, herausgeg. v. KRENKEL, E., 26, 78–101, 4 pls. (pl. 4–7), 1 Textfig. (fig. 11), Verlag Gebr. Borntraeger, Berlin.

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