

Piotr Köhler

ORCID [0000-0001-8713-0817](https://orcid.org/0000-0001-8713-0817)

Institute of Botany, Faculty of Biology, Jagiellonian University (Kraków, Poland)






piotr.kohler@uj.edu.pl

Władysław Szafer as a palaeobotanist

Abstract

Władysław Szafer (1886–1970) was one of the notable Polish botanists of the first half of the 20th c., palaeobotany being one of his main fields of interest, cultivated for over 60 years. Initially, he studied Quaternary floras and later on he expanded his interests to the Tertiary (Neogene) floras at the end of the 1930s. He published at least 80 different books and papers on palaeobotany, many of which still having scientific, not only historical, value. His organizational, teaching and editing activities in the field of palaeobotany were also remarkable, and influenced strongly the science in Poland. He contributed to the fast development of this field of knowledge in Poland, both in terms of research and in terms of staff number. 50 years after his death, we summarize the results of Władysław Szafer's activity in palaeobotany.

Keywords: *Władysław Szafer, palaeobotanical research, history of botany, Poland, the interwar period, twentieth century*

PUBLICATION INFO		e-ISSN 2543-702X ISSN 2451-3202		 DIAMOND OPEN ACCESS
<p style="text-align: center;">CITATION</p> <p>Köhler, Piotr 2021: Władysław Szafer (1886–1970) as a palaeobotanist. <i>Studia Historiae Scientiarum</i> 20, ss. 191–212. DOI: 10.4467/2543702XSHS.21.007.14038.</p>				
RECEIVED: 25.01.2021 ACCEPTED: 30.06.2021 PUBLISHED ONLINE: 13.09.2021		ARCHIVE POLICY Green SHERPA / RoMEO Colour	LICENSE 	
WWW	https://ojs.ejournals.eu/SHS/ ; http://pau.krakow.pl/Studia-Historiae-Scientiarum/archiwum			

Władysław Szafer jako paleobotanik

Abstrakt

Władysław Szafer (1886–1970) był jednym z najwybitniejszych polskich botaników pierwszej połowy XX w. Jednym z jego głównych obszarów zainteresowań była paleobotanika. Uprawiał ją ponad 60 lat. Początkowo badał flory czwartorzędowe (plejstocen i holocen). Od końca lat trzydziestych XX w. poszerzył swe zainteresowania na flory trzeciorzędowe (neogeńskie). Opublikował co najmniej 80 różnego rodzaju prac związanych z paleobotaniką. Sporo z nich nadal ma wartość naukową, a nie tylko historyczną. Równie długotrwała, różnorodna i ważna, szczególnie dla nauki w Polsce, była jego działalność w zakresie paleobotaniki na polu organizacyjnym, dydaktycznym i redakcyjnym. Z pewnością dzięki swojej aktywności przyczynił się do szybkiego rozwoju paleobotaniki w Polsce, zarówno w aspekcie badań, jak i w zakresie kadry paleobotaników. Celem niniejszego artykułu jest podsumowanie rezultatów paleobotanicznej działalności Władysława Szafera z perspektywy 50 lat, które upłynęły od jego śmierci.

Słowa kluczowe: *Władysław Szafer, badania paleobotaniczne, historia botaniki, Polska, okres międzywojenny, XX wiek*

1. Introduction

Among the botanists active in Poland in the first half of the 20th c., Władysław Szafer (1886–1970) was one of the greatest scholars, both in terms of the number of publications and the breadth of his knowledge. His interests were very broad and he influenced the development of science in his time. In 2020, fifty years passed from his death: an opportunity to try and analyze his achievements, including those in palaeobotany. Although many shorter or longer biographical studies were published, there have been no analyses of his achievements in the particular fields of his activity from fifty years perspective. This article is an attempt to describe his palaeobotanical research and analyze its results.

1.1. Palaeobotany until the mid-20th century

The beginning of palaeobotany as a separate branch of science, within botany, dates back to 1820s.¹ Earlier, fossil plants were found and described. However, it was not until Ernst Friedrich von Schlotheim (1764–1832), a German palaeontologist, and his work *Petrefaktenkunde auf ihrem jetzigen Standpunkte* (1820), and Adolphe-Théodore Brongniart (1801–1876), a French botanist, and his *Histoire des Végétaux Fossiles* (1828–1837), as well as, Kaspar Sternberg (1761–1838), a Bohemian mineralogist and botanist, and his *Versuch einer geognostisch-botanischen Darstellung der Flora der Vorwelt* (1820–1838) that fossil plants were incorporated into the natural system of plants. As a result, these three naturalists became founders of scientific palaeobotany. The invention of the method of microsection by a Scot William Nicol (1770–1851) in 1830 made studying the internal structure of fossil plants possible. And it was not until August Corda (1809–1849), a Bohemian physician and mycologist, published his work *Beiträge zur Flora der Vorwelt* (1845) that a broader basis for the histology of fossil plants was made available.

In the 19th c. (until the 1920s), palaeobotany was mainly concerned with the Carboniferous floras. About 1850, due to the research by Franz Unger (1800–1870), an Austrian botanist and palaeontologist, and Oswald Heer (1809–1883), a Swiss geologist and naturalist, Tertiary floras sparked scholars' interest. Unger examined various Tertiary floras of the Austro-Hungarian Monarchy. Heer investigated floras and described the prints of Tertiary plants of Switzerland in the three-volume work *Flora tertiaria Helvetiae* (1855–1859). In the 1870s, William Crawford Williamson (1816–1895), an English palaeobotanist, began research on the internal structure of all important groups of Carboniferous floras. Bernhard Renault (1836–1904), a French palaeobotanist, studied the internal structure of the Cordaites, visible in flinted remains of plants. Dukinfield Henry Scott (1854–1934), a British botanist and palaeobotanist, showed that *Lagenostoma* seeds belong to *Lyginodendron*, thus demonstrating the existence of seed ferns. Apart from the Carboniferous floras, the Mesozoic floras were also studied at that time. In the early 20th c., Alfred Gabriel Nathorst (1850–1921), a Swedish

¹ A specialist in palaeobotany is usually well versed in the history of palaeobotany. Therefore, it is not necessary to present it in detail here. Besides, one can consult relevant studies, like Andrews 1980.

geologist and palaeobotanist, used the cuticle structure to classify fossil plants. On the basis of structure of the cuticle, it was then possible to determine the systematic position of many separately found organ remains: leaves, microsporangia and seeds. In the first half of the 20th c., the research on Carboniferous plants was continued. These studies concerned, i.a., the seed evolution. The studies of Mesozoic floras were related to the question of the origin of angiosperms. The origin of terrestrial plants and their oldest representatives was another research topic in palaeobotany of that time.²

In 1916, palaeopalynology appeared. At that time, Lennart von Post (1884–1951), a Swedish naturalist and geologist, presented the results of his research on Swedish peat bogs using the pollen analysis method. The method allows for the reconstruction of the composition of the vegetation, and, therefore, the characteristics of the climate prevailing in a given area during the deposition of the studied sample. Information obtained in this way is of great practical importance, especially in determining the stratigraphy and correlation of the sediments. In the interwar period, research was carried out using pollen analysis method, mainly related to changes in woody vegetation of the Pleistocene and Holocene, as well as their stratigraphy.

The fast development of this method took place after the World War II. As early as 1941, Johannes Iversen (1904–1971), a Danish palaeoecologist and plant ecologist, published a basic work for the interpretation of Young Holocene pollen diagrams, in which he determined pollen indicators of human activity for the first time.³ And in 1943, the Swedish researcher Gunnar Erdtman (1897–1973) published the first illustrated textbook of modern pollen analysis.⁴ Thus, Władysław Szafer's palaeobotanical activity coincided with the enormously dynamic advances in this field of knowledge.⁵

² Reymanówna 1971, pp. 140–141; 1986, pp. 112–113.

³ Iversen 1941.

⁴ Erdtman 1943.

⁵ Mamakowa 2003, p. 44.

1.2. Palaeobotany in Poland (in the Polish lands) before Władysław Szafer

The first information in Polish literature about fossilized trees and plant prints was published as early as 1721.⁶ Until the end of the 1880s, there were no Polish palaeobotanical studies, and the remains of plants were only occasionally studied by geologists, such as Ludwik Zejszner (1805–1871), who in the mid-19th c. examined the sulfur deposits in Swoszowice near Kraków. He sent the plant prints found there to the Austrian botanist Franz Unger (1800–1870) for consultation. The obtained data were published by Zejszner, among others, in his paper “Opis geologiczny pokładu siarki w Swoszowicach pod Krakowem” [Geological description of the sulfur layer in Swoszowice near Kraków].⁷

Until the end of the 1880s, there was a public belief that the Polish lands were poor in fossil flora. It was not until 1888 that the first Polish palaeobotanical work by Franciszek Tondera (1859–1926), a demonstrator at the Geological Cabinet (Department) of the Jagiellonian University, and then a secondary school teacher,⁸ was published.⁹ Marian Raciborski (1863–1917), assistant at the Department of Botany and the Botanical Garden of the Jagiellonian University, also published works, which contributed heavily to the development of Polish palaeobotany at that time. Most of them concerned Jurassic floras from the northern slope of the Świętokrzyskie Mountains, the Tatra Mountains, Kraków clays and from Karniowice. He also described the trunk of bennetite and fossilized trees from Kwaczała.¹⁰

Among other scholars, Antoni Józef Żmuda (1889–1916), an assistant at the Botanical Institute of the Jagiellonian University, carried out strictly palaeobotanical studies in Ludwinów near Kraków before the World War I.¹¹

⁶ Rzączyński 1721, pp. 3–5, 32–35.

⁷ Zejszner 1850.

⁸ Köhler 2002b.

⁹ Tondera 1888.

¹⁰ Reymanówna 1986, pp. 113–122.

¹¹ In 1911, Antoni J. Żmuda began researching the glacial flora discovered by geologist Wiktor Kuźniar in a brickyard in Ludwinów near Kraków. On this basis, he wrote a monograph: Żmuda 1914.

Polish geologists also conducted their research, and their works, containing information about fossil floras from several places in Poland, were published. They described places like the Świętokrzyska Upland,¹² Potylicz near Żółkiew (now Zhovkva in Ukraine),¹³ the Tatra Mountains and Podhale,¹⁴ coal deposits of the Kraków Basin¹⁵ (including a compilation of their fossil flora), and a very distant region – the Sikhote-Alin Mountains in Russia between the Japanese Sea and the Lower Amur.¹⁶

From the above review, it can be concluded that until the World War I there were few Polish palaeobotanical or geological studies of fossil flora.

2. Władysław Szafer's palaeobotanical research and its results

2.1. The origins of his interest in palaeobotany

The reasons why Władysław Szafer took interest in palaeobotany remain unclear. He himself does not write about them directly. Perhaps the only clue is his memory contained in *Wspomnienia przyrodnika* [Memoirs of a Naturalist]. He writes that Marian Raciborski encouraged his students to take up palaeobotany.¹⁷ Or perhaps Szafer was influenced by his fellow-geologists, Bolesław Kropaczek (1886–1914), during his studies in Vienna, or Jan Nowak (1880–1940), during his first years of assistantship at Lwów University (now Lviv in Ukraine). Towards the end of his life, Szafer wrote about his first palaeobotanical research in his *Moje prace* [My publications] as follows:

Just before my trip abroad, something unexpectedly happy happened to me, namely an accidental discovery of the

¹² Czarnocki, Samsonowicz 1913. Description of the fossil remains of 10 plant species.

¹³ Nowak 1907.

¹⁴ Kuźniar 1908, pp. 32–36; in the chapter “Fossils” – subsection “Plants”, there is a list of 5 species with descriptions. Kuźniar 1910, pp. 65–75; in the chapter “Descriptive part” – subsection “Plants”.

¹⁵ Rydzewski 1913.

¹⁶ Nowak 1912.

¹⁷ Szafer 1973, p. 85.

first in Poland (except Pomerania) fossil *Dryas* flora in Krystynopol near Sokal. This discovery, which I described in 1912, stimulated in me a new and lively interest in the study of the past of our flora, from which I have never gone away. And over time I was called a palaeobotanist, and wrongly so, because I had never worked exclusively in this field.¹⁸

However, there are no details in the above quotation. We still do not know what this ‘happened’ alludes to: was he personally in Krystynopol (now Chervonohrad in Ukraine) near Sokal on the Bug River in Volhynia? Did he dig himself? Or did someone else find it and just gave the samples to him?

Anyway, his interests in palaeobotany turned out to be very persistent. Throughout his life, Szafer conducted palaeobotanical research and published the results. Later on, this field even came to the fore in his scientific activities.

2.2. First works

Before the outbreak of the World War I, Szafer published a few palaeobotanical works. Two of them concerned the Old Diluvian (according to the present terminology: Early Pleistocene) flora discovered in Krystynopol on the Bug River. They discussed traces of periglacial tundra in the form of macroscopic plant remains.¹⁹ The topic of his second palaeobotanical work of this period was the macroscopic remains of trees and shrubs found in a shaft in Starunia (now in Ukraine), where the then famous woolly rhinoceros (*Coelodonta antiquitatis*) was found.²⁰ For Żmuda (1914), mentioned in the previous chapter, Szafer consulted the remains of the trees from Ludwinów.²¹

2.3. Research in the interwar period

After a break, caused by the war, Władysław Szafer quickly returned to palaeobotanical research. In the first half of 1922, at the meeting

¹⁸ Szafer 1967, p. 107.

¹⁹ Szafer 1911; 1912.

²⁰ Szafer 1914a.

²¹ Szafer 1914b.

of the Polish Geological Society, he presented the then state of his knowledge about the flora of the Polish Pleistocene.²² The basis of his paper was the above-mentioned studies of the floras of Ludwinów and Krystynopol.²³ In this paper, Szafer showed a passion for bold synthesis and generalization, based on a small amount of data. This feature would become visible in all his works, also palaeobotanical ones.

After the World War I, on Szafer's initiative, the pollen analysis by Lennart von Post was introduced to Polish palaeobotany. Soon after 1922, Szafer organized an informal team at the Botanical Institute at the Jagiellonian University in Kraków (consisting of his wife, Janina Jentys-Szaferowa (1895–1983),²⁴ students and volunteers).²⁵ The research of this team was financed mostly by the Polish Academy of Sciences and Letters.²⁶ The team worked in various sites using the pollen analysis method. The aim of this research was to reconstruct the post-glacial history of forests in Poland.²⁷ The object of the research was both Holocene and older, interglacial sediments. The research covered the Świętokrzyskie Mountains, the Tatra Mountains and Podhale, Babia Góra, the Sandomierz Forest, Polesie (Polissia now in Ukraine and Belarus), the Augustów Primeval Forest and areas located to the northeast near the Dżisna (now in Belarus).²⁸

Meanwhile, palaeobotanical studies using the pollen analysis method were carried out at the Jan Kazimierz University in Lwów. These studies, not supervised by Szafer directly, covered: Roztocze, the vicinity of Lwów, the Eastern Carpathian Foothills, the Eastern Carpathians, Podole (Podilia, now in Ukraine) and Polesie. Later, similar research began at the University of Poznań: in Greater Poland and Pomerania, in the Augustów Primeval Forest and in the Suwałki-Augustów Lakeland. What concerned central Poland, naturalists from the University of Warsaw studied the area of the spruce-free belt in central Poland, the Dobrzyń Region and the Suwałki Region.²⁹

²² Unpublished.

²³ Rühle 1972, p. 438.

²⁴ Köhler 2009b.

²⁵ Szafer 1973, pp. 191–193.

²⁶ Köhler 2002a, p. 271.

²⁷ Mamakowa 2003, pp. 42–43.

²⁸ Mamakowa 2003, p. 43.

²⁹ Mamakowa 2003, p. 43.

From the above research, most of which was concluded before 1935, Szafer obtained enough data to draw the first isopollen map of Poland. In 1935, he used the isopollen map method for the first time in interpreting the spread of trees.³⁰ Isopollens, or pollen isolines, are lines connecting points on the map with the same pollen values of a selected plant species (initially: trees) in pollen spectra. Isopollen maps reflect the statistical spread of a given plant species (initially: trees) over an area. This method was accepted in science and entered the textbooks of palynology,³¹ and it is still used today.³²

At the initiative of Szafer, research started also in Kraków using the pollen analysis method of Pleistocene deposits in Koszary on the Bug and in Szeląg near Poznań (this being the first percentage pollen diagram from the Eemian site). Using the results of this research, Szafer was able to deliver a paper *Dzisiejszy stan naszej wiedzy o florze i klimacie dyluwium w Polsce* [The present state of our knowledge about the flora and climate of the Diluvium in Poland] at the meeting of the Polish Geological Society in March 1928. The paper was then published under the title *Zarys stratygrafji polskiego dylunium na podstawie florystycznej* [An outline of the stratigraphy of the Polish Diluvium on a floristic basis].³³ In this publication, Szafer included the first Polish synthesis of the Quaternary stratigraphy on the palaeobotanical basis. Also, Szafer carried out a division of the Pleistocene in Poland on the floristic basis, accepted in the scientific community later on. Also, he proposed Polish names for particular glacial and interglacial periods. The scheme proposed by him and the nomenclature of three glacials (Cracovien, Varsovien I and Varsovien II) and two interglacials (Masovien I and Masovien II) [see Fig. 1] was used for almost a quarter of a century by most Polish and foreign researchers, despite some reservations. Thus, Szafer was a very notable scholar in the history of the Quaternary stratigraphy in Poland.³⁴

Beginning with the above-mentioned speech, Szafer continued to regularly inform geologists about the state of palaeobotanical research

³⁰ Szafer 1935.

³¹ Köhler 2009a; Zemanek 2000, p. 191.

³² Ralska-Jasiewiczowa *et al.* 2004.

³³ Szafer 1928.

³⁴ Rühle 1972, p. 438.

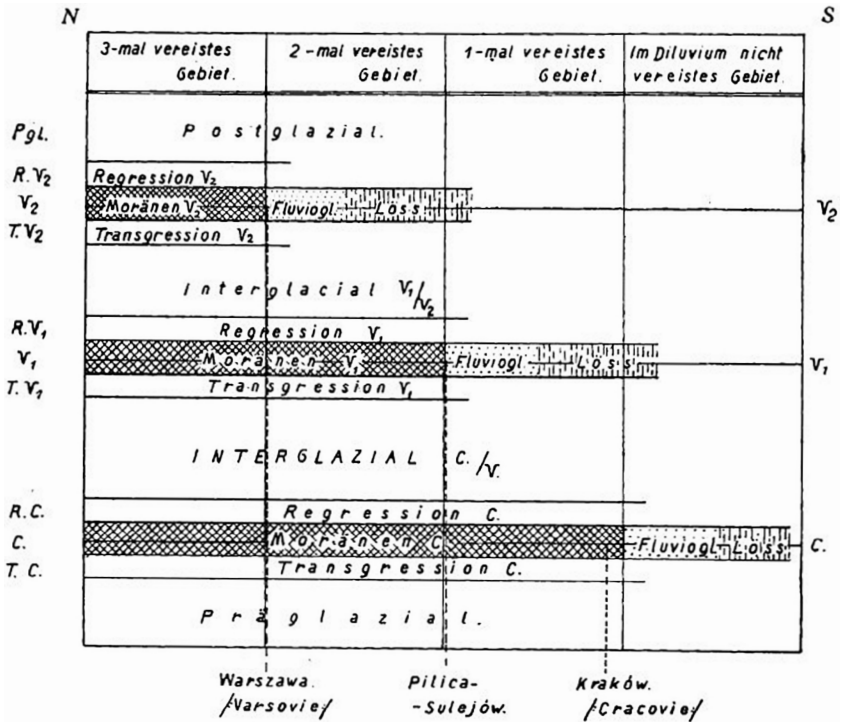


Fig. 1. The first schema proposal for the division of the Pleistocene in Poland on a floristic basis. Source: Szafer 1928, p. 28.

in the field of stratigraphy of the Holocene, Pleistocene and then Neogene.³⁵ From 1938 onwards, Szafer gain his interests in the issues of Tertiary (in the present nomenclature: Neogene) fossil floras. Yet, he published important monographs based on these studies only after the World War II.

2.4. The World War II

During the World War II, Szafer studied the flora of the Neogene Age, discovered before near Krościenko on the banks of the Dunajec river, when the circumstances allowed.

³⁵ Rühle 1972, p. 438.

2.5. Research after World War II

In March 1946, the 25th Congress of the Polish Geological Society was held on the issues of the Quaternary of Poland. At the Congress, Szafer delivered a report entitled *Stratygrafia plejstocenu Polski na podstawie florystycznej* [Stratigraphy of the Pleistocene of Poland on a floristic basis], which was soon published.³⁶ This work was another – and the first in nearly 20 years – synthesis of Quaternary stratigraphy based on a palaeobotanical analysis of plant remains, presented in numerous geological profiles. The article was widely discussed and caused a lot of feedback.³⁷

The Neogene flora near Krościenko on the Dunajec river, long and carefully studied by Szafer during World War II, turned out to be the one of the richest Pliocene flora in Europe. The result of this research was a two-part monograph: *Flora plioceńska z Krościenka n/Dunajcem. I. część ogólna*,³⁸ and *II. Część opisowa* [Pliocene Flora from Krościenko on the Dunajec. I. General part, and II. Descriptive part].³⁹ In this monograph, Szafer reconstructed the vegetation, its development and transformation from the Lower Pliocene to the Lower Pleistocene, and presented new data on the evolution of a number of species. The monograph was a model study of Neogene flora in Poland, including a number of important topics in the field of palaeoclimate and palaeogeography of plants in the Pliocene. Also, the monograph is one of the best documented palaeobotanical works by Szafer.⁴⁰

Soon after the end of World War II, Szafer began to promote palaeobotany: already in 1946 he published the book *Epoka lodowa* [The Ice Age].⁴¹ His aim was to raise the readers' interest in the Pleistocene. He also published one of the first Polish textbooks on palaeobotany, and this book had two editions.⁴²

The next two monographs by Szafer presented very valuable scientific achievements globally. The first one, published in 1954, was *Pliocieńska*

³⁶ Szafer 1952.

³⁷ Rühle 1972, p. 438.

³⁸ Szafer 1946b.

³⁹ Szafer 1947.

⁴⁰ Zastawniak, Köhler 2001, p. 20.

⁴¹ Szafer 1946; second edition: Szafer 1950.

⁴² Szafer, Kostyniuk 1952; 1962.

flora okolic Czorsztyna i jej stosunek do plejstocenu [Pliocene flora of Czorsztyn area and its connection to the Pleistocene].⁴³ In this book, he discussed the border between the Neogene and Pleistocene in the Carpathians, which was very rare at the time.⁴⁴ This allowed for establishing the first Polish attempt at the Pliocene and the Old Pleistocene stratigraphy in correlation with other areas of Europe.⁴⁵

The second of the above-mentioned monographs was the *Miocenńska flora ze Starych Glinic na Śląsku* [Miocene flora from Stare Gliwice in Silesia] 1961,⁴⁶ in which Szafer described new plant forms, as well as climatic changes and species migrations, from the Miocene to the Pleistocene. This monograph was of great importance for the Miocene stratigraphy. It was the last major palaeobotanical work by Szafer⁴⁷ and he made a very important statement in it:

It would be impossible to solve many palaeoclimatic problems, palaeogeographic ones especially, using geological and geophysical methods only. Therefore, it is of special importance to reconstruct pictures of ancient plant communities accurately, which constitutes the basis for further geological consideration, both theoretical and practical.⁴⁸

For all his work in the field of the Quaternary flora, Szafer was awarded with the highly valued Albrecht Penck Medal by the world botanists in 1962.⁴⁹ Among other awards, he was also bestowed a 1st degree state award for his lifetime research in botany and palaeobotany (1949).

3. Organizational, didactic and editorial activity

Władysław Szafer's activity as promoter, mentor and editor the field of palaeobotany was long-lasting and impacted science in Poland remarkably. In 1918–1960, he was (with a break during World War II)

⁴³ Szafer 1954.

⁴⁴ Rühle 1972, pp. 438–439.

⁴⁵ Rühle 1972, p. 439.

⁴⁶ Szafer 1961.

⁴⁷ Rühle 1972, p. 439.

⁴⁸ Rühle 1972, p. 439.

⁴⁹ Brzosowski 1971, p. 596.

a professor at the Jagiellonian University, where he taught palaeobotany and other courses. At the Botanical Institute, organized an informal research team for reconstruction of the post-glacial history of forests in Poland (see subsection 2.3 above). Szafer, in his memoirs *Wspomnienia przyrodnika*, written in the last year of his life, quoted from a paper:

Throughout [Szafer's] and his employees' scientific activity in the Institute, work continues on the fossil floras of the youngest geological epochs. Interest in the topic expands from here to the whole country, and through Professor Szafer's initiative this kind of research is conducted in Poland for the first time. The Institute is a center, where new research methods are developed; where employees of other universities come to learn about a new field of science in order to promote it in their communities.⁵⁰

This description shows well the importance of Szafer's work in the organization of palaeobotanical research in Poland that time: he inspired and started research not only at his own institute, but also at other universities. He shared his experience with visiting botanists interested in palaeobotanical issues. Thus, the new ideas could spread. In the interwar period, except Kraków, palaeobotanical research was carried out in Lwów, Warsaw and Poznań. According to Szafer, twelve assistants worked at the Botanical Institute of the Jagiellonian University, and four of them focused on palaeobotany.⁵¹ Supervised by Szafer, they worked on the history of plants (mainly trees) in Polish territory in the Quaternary. Additionally, they explored their own fields of interest. Aniela Kozłowska (1898–1981) pioneered in archaeobotanical studies of fossil cereals from the Neolithic period⁵² and discovered fossil flora of glacier tundra in the vicinity of Katowice.⁵³ Bronisław Jaroń (1905–1942) carried out pollen analysis of an interstadial in the village of Żydowszczyzna near Grodno (now Hrodna in Belarus).⁵⁴ Together

⁵⁰ Szafer 1973, p. 191.

⁵¹ Szafer 1973, p. 190.

⁵² Kozłowska 1920.

⁵³ Kozłowska 1933.

⁵⁴ Jaroń 1933.

with Szafer, he studied an interglacial site in Roztoki near Jasło.⁵⁵ Alongside Kozłowska, he was one of the first Polish archaeobotanists and the author of a book on plant remains found in Biskupin (Lusatian culture).⁵⁶ Jadwiga Dyakowska (1905–1992) studied history of a peat bog near Nowy Targ⁵⁷ and Pleistocene fossil floras (including those of Poniemuń near Grodno) using pollen analysis.⁵⁸ She published one of the first Polish archaeobotanical works.⁵⁹ The fourth Szafer's assistant was Stanisław Kulczyński (1895–1975). He took up palaeobotany only after he moved to the Jan Kazimierz University of Lwów. In 1932, he published a study on Old Diluvian flora from the vicinity of Przemysł.⁶⁰ His leading achievement was a two-volume study *Torfowiska Polesia* [Peat bogs of Polessia] (1939–1940), in which he produced empirically verifiable theoretical generalizations in the field of peat biosedimentation.⁶¹

In his memoirs, Szafer also mentioned forty eight “employees of the Institute of Botany of the Jagiellonian University” (presumably students working on their MA theses).⁶² Of these, as many as eleven published the results of their palaeobotanical studies. As it can be seen from the above, the palaeobotanical team organized by Szafer in the interwar period was very active and conducted research in various regions of Poland.

In 1929–1933, Szafer was a member of the Committee of Starunia of the Polish Academy of Sciences and Letters. The Committee was to organize research on the rhinoceros, as well as flora and fauna, found in Starunia and supposed to publish the results. Upon not launching any publication, the Committee was dissolved by the Management Board of the Academy at the request of Szafer.⁶³ Instead, the Management Board of the Academy established the Editorial Board Commission of the Starunia Publications, which operated between 1933–1952 and

⁵⁵ Szafer, Jaroń 1935.

⁵⁶ Jaroń 1938.

⁵⁷ Dyakowska 1929.

⁵⁸ Dyakowska 1936b.

⁵⁹ Dyakowska 1936a.

⁶⁰ Kulczyński 1932.

⁶¹ Kulczyński 1939–1940.

⁶² Szafer 1973, pp. 190–191.

⁶³ Köhler 2002a, p. 136.

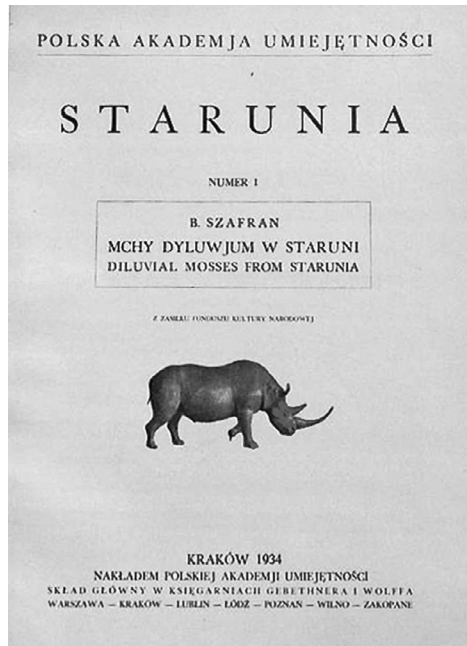


Fig. 2. Title page of *Starunia* 1934 no. 1.⁶⁴

Szafer was the member.⁶⁵ The Commission published the periodical *Starunia*, and twenty nine issues were published from 1934 to 1950.

From 1933 to around 1948, Szafer was a member of the Academic Committee of Silesian Publications. The Committee was funding the scientific research, including palaeobotanical research in Silesia and financed palaeobotanical research by Jan Zerndt (1894–1945), Bronisław Jaroń and Tadeusz Bocheński (1901–1958).⁶⁶ The Committee published two works by Zerndt⁶⁷ and one by Bocheński.⁶⁸

Szafer was involved in establishing the Commission for Pleistocene Research in Poland, which was not an easy task, and it was only in March 1939 that Szafer began to formally organize the Commission for Pleistocene Research (within the Academy of Sciences and Letters).

⁶⁴ Köhler 2004.

⁶⁵ Köhler 2002a, p. 130.

⁶⁶ Köhler 2002a, pp. 136–139.

⁶⁷ Zerndt 1934; 1937.

⁶⁸ Bocheński 1939.

He also designed its regulations. Unfortunately, the World War II and the German occupation in Poland brought the works to a halt.

After the war, he still pushed to establish this commission. He obtained support for the idea during a Pleistocene convention at the seat of the Academy in Kraków on 1–3 March, 1946. Other than this, no other data is available.⁶⁹

Szafer was the organizer, and then in 1953–1960, the head of the Palaeobotany Department⁷⁰ within the Institute⁷¹ of Botany of the Polish Academy of Sciences in Kraków. He also initiated the Palaeobotanical Section as part of the Polish Botanical Society: in 1955, at the Society Congress in Gdańsk, he proposed to establish this Section. At the first meeting, he was elected the chairman and kept this position until 1969.⁷² In 1957, he organized the Palaeobotany Department of the Jagiellonian University.⁷³ And in 1958, he started the palaeobotanical journal *Acta Palaeobotanica*, and was the editor from vol. 1 (1960) to vol. 11 (1970).⁷⁴

4. Final remarks

Fifty years after Władysław Szafer's death, one can try to assess his achievements and influence on the development of palaeobotany in Poland. For nearly 60 years, he was active in this field of science. With his organizational and teaching activities, he contributed to the fast development of palaeobotany in Poland, both in terms of research and staff. He certainly used all the circumstances of the interwar period (such as various Committees and Commissions of the Polish Academy of Sciences and Letters) and the quarter-century after the World War II (such as the establishment of the Palaeobotany Department at the Institute of Botany of the Polish Academy of Sciences) to ensure the successful development of palaeobotany in Poland.

Szafer's palaeobotanical contribution includes about 80 publications of different rank, from short notes to extensive monographs, and from

⁶⁹ Köhler 2002a, p. 132.

⁷⁰ Until 1956, the Laboratory [scientific research unit] of Palaeobotany.

⁷¹ Until 1956, the Department of Botany.

⁷² Bobrowska 1972.

⁷³ Köhler, Zemanek 1995, p. 15.

⁷⁴ Brzozowski 1971, p. 596.

science-promoting articles to the textbooks. What is his legacy today? Is it relevant for modern palaeobotany? Due to the fast advancement of science, some of these achievements are of historical value, especially the results published before the World War II. The methods of research changed. The accuracy of the pollen analysis changed.

Certainly, an analysis of the frequency of citation of Szafer's publications could show to what extent these publications still remain relevant.

Władysław Szafer witnessed the changes in methods of palaeobotany in the first half of the 20th century. Moreover, he was a pioneer of new methods, as in the case of isopollen maps. His palaeobotanical activity was just a part of his work, which included four extensive sections of botany: floristics with plant taxonomy, phytogeography with phytosociology, palaeobotany and the history of botany, and nature conservation. Thus, Szafer was able to explain the present state of vegetation by solving the mysteries of the past.

Bibliography

- Andrews, Henry Nathaniel 1980: *The fossil hunters. In Search of Ancient Plants*. Ithaca and London: Cornell University Press. ISBN-10 080141248X, ISBN-13 978-0801412486.
- AZ [Alicja, Zemanek] 2015: Szafer Władysław (23 VII 1886, Sosnowiec – 16 XI 1970, Kraków). [In:] B. Orłowski (sci. ed.). *Polski wkład w przyrodoznawstwo i technikę. Słownik polskich i związanych z Polską odkrywców, wynalazców oraz pionierów nauk matematyczno-przyrodniczych i techniki*. T. 4, S–Ż. ISBN 9788375455700, ISBN 9788375455724, ISBN 9788376298283, ISBN 9788376298320, ISBN 9788386062287, ISBN 9788386062973. Warszawa: Instytut Historii Nauki im. L. i A. Birkenmajerów PAN, Instytut Pamięci Narodowej, pp. 206–209.
- Bobrowska, Jadwiga 1972: Sekcja Paleobotaniczna (1955–1970). [In:] H. Barycz, L. Karpowiczowa editors. *50 lat Polskiego Towarzystwa Botanicznego*. Wrocław: Zakład narodowy im. Ossolińskich. (ser.: “Monografie z Dziejów Nauki i Techniki”, vol. 77), pp. 135–136.
- Bocheński, Tadeusz Antoni 1939: On the Structure of Sigillarian Cones and the Mode of their Association with their Stems. (Budowa sygilarowych szyszek sporofilowych i sposób ich umieszczenia na pniu). *Wydawnictwa Śląskie – Prace Geologiczne* 7, pp. 1–28.
- Brzozowski, Stanisław 1971: Władysław Szafer 1886–1970. *Kwartalnik Historii Nauki i Techniki* 16(3), pp. 595–602.

- Czarnocki, Jan; Samsonowicz, Jan 1913: Przyczynek do poznania cechsztynu w granicach wyżyny Świętokrzyskiej. (Sprawozdanie tymczasowe). *Rozprawy Wydziału Matematyczno-Przyrodniczego Akademii Umiejętności. Dział B. Nauki Biologiczne* 53 (ser. 3, vol. 13), pp. 273–290.
- Dyakowska, Jadwiga 1929: Historia torfowiska na Czerwonem pod Nowym Targiem w świetle analizy pyłkowej. Analyse pollinique et histoire de la tourbière “na Czerwonem” près Nowy Targ en Pologne. *Sprawozdanie Komisji Fizjograficznej [Polskiej Akademii Umiejętności]* 63, pp. 129–150.
- Dyakowska, Jadwiga 1936a: Analiza pyłkowa torfu z przedhistorycznej maty, znalezionej w Łączyńskiej Hucie w pow. Kartuskim. *Wiadomości Archeologiczne* 14, pp. 92–95.
- Dyakowska, Jadwiga 1936b: Interglacial w Poniemuniu pod Grodnem. Interglacial in Poniemuń near Grodno. *Starunia* 14, pp. 1–11.
- Erdtman, Gunnar 1943: *An Introduction to Pollen Analysis. (A new series of plant science books, vol. 12)*. Waltham, Mass.: Chronica Botany Company. 2nd edn (1992) edited by Siwert Nilsson and Joseph Pragłowski. Copenhagen: Munksgaard, p. 239.
- Iversen, Johannes 1941: Landnam i Danmarks Stenalder: En pollenanalytisk Undersøgelse over det første Landbrugs Indvirkning paa Vegetationsudviklingen (Dansk tekst 7–59, Engl. text 60–65). *Danmarks Geologiske Undersøgelse II.række* 66, pp. 1–68. (reprinted 1964).
- Jaroń, Bronisław 1933: Analiza pyłkowa interglacjalna z Żydowszczyzny koło Grodna. *Rocznik Polskiego Towarzystwa Geologicznego* 9, pp. 147–183.
- Jaroń, Bronisław 1938: Szczątki roślinne z wczesnego okresu żelaznego w Biskupinie (Wielkopolska). [In:] J. Kostrzewski editor. *Gród prastawiański w Biskupinie w powiecie żnińskim*. Poznań: Drukarnia Uniwersytetu Poznańskiego, pp. 104–132.
- Köhler, Piotr 2002a: *Botanika w Towarzystwie Naukowym Krakowskim, Akademii Umiejętności i Polskiej Akademii Umiejętności. Botany at the Academic Society of Cracow, Academy of Sciences and Letters and the Polish Academy of Sciences and Letters (1815–1952)*. Kraków: Polska Akademia Umiejętności, ser.: Studia i materiały do dziejów Polskiej Akademii Umiejętności. vol. 2. ISBN 83-88857-19-3.
- Köhler, Piotr 2002b: Leksykon Botaników Polskich. Dictionary of Polish Botanists. 44. Franciszek Töndera. *Wiadomości Botaniczne* 46(3/4), pp. 100–103.
- Köhler, Piotr 2004: *Bibliografia botaniki w Towarzystwie Naukowym Krakowskim, Akademii Umiejętności i Polskiej Akademii Umiejętności (1818–1952–2000). Bibliography of botany at the Academic Society of Cracow, Academy of Sciences and Letters and the Polish Academy of Sciences and Letters (1818–1952–2000)*. Kraków: Instytut Botaniki im. W. Szafera PAN. ISBN 83-89648-14-8.

- Köhler, Piotr 2009a: Szafer Władysław Józef, krypt. W.S. (1886–1970). *Polski Słownik Biograficzny* vol. 46, pp. 401–407.
- Köhler, Piotr 2009b: Szaferowa (Jentys-Szaferowa) z Jentysów Janina Maria (1895–1983). *Polski Słownik Biograficzny* vol. 46, pp. 407–409.
- Köhler, Piotr; Zemanek, Alicja 1995: *Instytut Botaniki Uniwersytetu Jagiellońskiego. Informator*. Kraków: Instytut Botaniki UJ. ISBN 83-233-0868-3.
- Kozłowska, Aniela 1920: O zbożach kopalnych z okresu neolitu w Polsce. *Rozprawy Wydziału Matematyczno-Przyrodniczego Polskiej Akademii Umiejętności, Dział B. Nauki Biologiczne* 60 (ser. 3, vol. 20), pp. 1–20.
- Kozłowska, Aniela 1933: Ukształtowanie utworów dyluwjalnych i flora driasowa z okolic Milowic i Makoszów. [In:] *Z badań and dyluwjum Śląska*. Katowice: Wydawnictwa Muzeum Śląskiego w Katowicach, Dział III no. 6, p. 3–45.
- Kulczyński, Stanisław 1932: Die altdiluvialen Dryasfloren der Gegend von Przemyśl. *Acta Societatis Botanicorum Poloniae* 9(1–2), pp. 237–299. Cyfrowe Repozytorium PTB. Available online (13.06.2021): <https://pbsociety.org.pl/journals/index.php/asbp/article/view/7527>.
- Kulczyński, Stanisław 1939: *Torfowiska Polesia. Die Moore des Polesie-gebietes*. Kraków: Nakładem autora, Drukarnia Uniwersytetu Jagiellońskiego. Vol. I, pp. I–X, 1–394. 1940: *Torfowiska Polesia. Die Moore des Polesie-gebietes*. Kraków: Nakładem autora, Drukarnia Uniwersytetu Jagiellońskiego. Vol. II, pp. I–VIII, 395–777.
- Kuźniar, Wiktor 1908: Eocen tatrzański. *Sprawozdanie Komisji fizyograficznej [Akademii Umiejętności]* 42 part III, pp. 25–57.
- Kuźniar, Wiktor 1910: Eocen Tatr i Podhala. I. *Sprawozdanie Komisji fizyograficznej [Akademii Umiejętności]* 44 part IV, pp. 26–76.
- Mamakowa, Kazimiera 2003: Zarys historii badań paleobotanicznych czwartorzędu w Polsce. [In:] E. Zastawniak, editor. *Paleobotanika na przełomie wieków*. Ser.: “Botanical Guidebooks” vol. 26. ISBN 83-89648-01-6, ISSN 1642-5005, pp. 41–64.
- Nowak, Jan 1907: Kopalna flora senońska z Potylicza. *Rozprawy Wydziału Matematyczno-Przyrodniczego Akademii Umiejętności, Dział B. Nauki Biologiczne* 47 (ser. 3, vol. 7), pp. 1–27.
- Nowak, Jan 1912: Naukowe wyniki wyprawy do Sichota–Alin. Cz. IV. O mioceńskich szczątkach roślinnych z Sichota–Alin. Wissenschaftliche Ergebnisse der Expedition nach dem Sichota–Alin. IV. Über miozäne Pflanzenreste aus dem Sichota–Alin. *Bulletin International de l’Académie des Sciences de Cracovie, Classe des Sciences Mathématiques et Naturelles, Série A: Sciences Mathématiques. Anzeiger der Akademie der Wissenschaften in Krakau, Mathematisch-Naturwissenschaftliche Klasse, Reihe A: Mathematische Wissenschaften* 1912(6), pp. 632–634.

- Ralska-Jasiewiczowa, Magdalena; Latalowa, Małgorzata; Wasylikowa, Krystyna; Tobolski, Kazimierz; Madeyska, Ewa; Wright, Herbert E. Jr.; Turner, Charles editors. 2004: *Late Glacial and Holocene history of vegetation in Poland based on isopollen maps*. Kraków: W. Szafer Institute of Botany, Polish Academy of Sciences. ISBN 8389648237.
- Reymanówna, Maria 1971: Paleobotanika. [In:] S. Skowron, W. Ostrowski, A. Tejchma, editors. *Biologia XX wieku*. Vol. 1. Warszawa: Wiedza Powszechna, pp. 137–155.
- Reymanówna, Maria 1986: Marian Raciborski – ojciec polskiej paleobotaniki. Marian Raciborski – the father of Polish Palaeobotany. [In:] J. Kornaś editor. *Marian Raciborski. Studia nad życiem i działalnością naukową. De Mariani Raciborski vita et scriptis*. Uniwersytet Jagielloński – Varia 210. ISBN 83-01-07342-X, pp. 111–134.
- Rühle, Edward 1972: Władysław Szafer (1886–1970). *Rocznik Polskiego Towarzystwa Geologicznego* 42(4), pp. 437–442
- Rydzewski, Bronisław 1913: O wieku warstw węglowych Zagłębia Krakowskiego. Sur l'âge des couches houillères du bassin carbonifère de Cracovie. *Bulletin International de l'Académie des Sciences de Cracovie, Classe des Sciences Mathématiques et Naturelles, Série B: Sciences Naturelles. Anzeiger der Akademie der Wissenschaften in Krakau, Mathematisch-Naturwissenschaftliche Klasse, Reihe B: Biologische Wissenschaften* 1913(7), pp. 538–565.
- Rzeczyński, Gabriel 1721: *Historia naturalis curiosa Regni Poloniae, Magniducatu Lituaniae [...]*. Sandomiriae: Typis Collegii Soc. Jesu.
- Szafer, Władysław 1911: Tymczasowa wiadomość o znalezieniu flory starodyluwialnej na Wołyniu. [Über eine alt-diluviale Flora in Krystynopol in Wolhynien]. *Kosmos* 36(3/6), pp. 337–338.
- Szafer, Władysław 1912: O florze dryasowej z pod Krystynopola. Eine Dryas-Flora bei Krystynopol in Galizien. *Bulletin International de l'Académie des Sciences de Cracovie, Classe des Sciences Mathématiques et Naturelles, Série B: Sciences Naturelles. Anzeiger der Akademie der Wissenschaften in Krakau, Mathematisch-Naturwissenschaftliche Klasse, Reihe B: Biologische Wissenschaften* 1912(8), pp. 1103–1123.
- Szafer, Władysław 1914a: Anatomiczny rozbiór drzew i krzewów mamutowego szybu w Staruni [Anatomical analysis of trees and bushes of the mammoth shaft in Starunia]. [In:] *Wykopaliska Staruńskie. Dzieło zbiorowe*. Kraków: nakładem Muzeum im. Dzieduszyckich, vol. 15, pp. 34–36.
- Szafer, Władysław 1914b: Anatomische Bestimmung der diluvialen Holzreste von Ludwinów. [In:] A. J. Żmuda Fossile, Flora des Krakauer Diluviums. *Bulletin International de l'Académie des Sciences de Cracovie, Classe des Sciences Mathématiques*

et Naturelles, Série B: Sciences Naturelles. Anzeiger der Akademie der Wissenschaften in Krakau, Mathematisch-Naturwissenschaftliche Klasse, Reihe B: Biologische Wissenschaften 1914(2), pp. 209–352.

- Szafer, Władysław 1928: Zarys stratygrafji polskiego dyluwjum na podstawie florystycznej. Entwurf einer Stratigraphie des polnischen Diluviums auf floristischer Grundlage [An outline of the stratigraphy of the Polish Diluvium on a floristic basis]. *Rocznik Polskiego Towarzystwa Geologicznego* 5, pp. 21–33.
- Szafer, Władysław 1935: The Significance of Isopollen Lines for the Investigation of the Geographical Distribution of Trees in the post-glacial Period. *Bulletin International de l'Académie Polonaise des Sciences et des Lettres, Classe des Sciences Mathématiques et Naturelles, Série B: Sciences Naturelles (I)* 1935 no. 8–10, pp. 235–239.
- Szafer, Władysław 1946a: *Epoka lodowa* [The Ice Age]. Warszawa: Państwowe Zakłady Wydawnictw Szkolnych.
- Szafer, Władysław 1946b: Flora pliocenńska z Krościenka n/Dunajcem. I. Część ogólna. *Polska Akademia Umiejętności. Rozprawy Wydziału Matematyczno-Przyrodniczego. Dział B* 72 (ser. 3, vol. 32)(1), pp. 1–162.
- Szafer, Władysław 1947: Flora pliocenńska z Krościenka n/Dunajcem. II. Część opisowa. *Polska Akademia Umiejętności. Rozprawy Wydziału Matematyczno-Przyrodniczego. Dział B* 72 (ser. 3, vol. 32)(2), pp. 1–213.
- Szafer, Władysław 1950: *Epoka lodowa* [The Ice Age]. 2nd edition. Warszawa: Państwowe Zakłady Wydawnictw Szkolnych.
- Szafer, Władysław 1952: Stratygrafia plejstocenu Polski na podstawie florystycznej [Stratigraphy of the Pleistocene of Poland on a floristic basis]. *Annales Societatis Geologorum Poloniae* 22(1), pp. 1–99.
- Szafer, Władysław 1954: Pliocenńska flora okolic Czorsztyna i jej stosunek do plejstocenu [Pliocene flora of Czorsztyń area and its relationship to the Pleistocene]. *Instytut Geologiczny. Prace* vol. 11.
- Szafer, Władysław 1961: Miocenńska flora ze Starych Gliwic na Śląsku [Miocene flora from Stare Gliwice in Silesia]. *Instytut Geologiczny. Prace* vol. 33.
- Szafer, Władysław 1967: Moje publikacje (1908–1965). *Studia i materiały z Dziejów Nauki Polskiej, ser. B Historia Nauk Biologicznych i Medycznych* 13, pp. 103–144.
- Szafer, Władysław 1973: *Wspomnienia przyrodnika*. Wrocław – Warszawa – Kraków – Gdańsk: Zakład Narodowy im. Ossolińskich.
- Szafer, Władysław; Jaroń, Bronisław 1935: Pleistocenickie jezioro pod Jasłem. Pleistocene Lake near Jasło in Poland. *Starunia* 8, pp. 1–20.
- Szafer, Władysław; Kostyniuk, Mikołaj 1952: *Zarys paleobotaniki*. Warszawa: Państwowe Wydawnictwo Naukowe.

Piotr Köhler
Władysław Szafer as a palaeobotanist

- Szafer, Władysław; Kostyniuk, Mikołaj 1962: *Zarys paleobotaniki*. 2nd edition. Warszawa: Państwowe Wydawnictwo Naukowe.
- Tondera, Franciszek 1888: Rzut oka na florę kopalną formacji węglowej w W[ielkiem] Ks[jewództwie] Krakowskim. *Kosmos* (Lwów) 13, pp. 143–150.
- Zastawniak, Ewa; Köhler, Piotr 2001: *Polskie badania paleobotaniczne trzeciorzędu. Polish palaeobotanical research of the Tertiary*. Ser.: “Botanical Guidebooks” vol. 25. ISBN 83-854444-81-5, ISSN 1642-5006.
- Zejszner, Ludwik 1850: Opis geologiczny pokładu siarki w Swoszowicach pod Krakowem. *Rocznik Towarzystwa Naukowego Krakowskiego* 20 (ser. II, vol. 5) 1, pp. 38–51.
- Zemanek, Alicja 2000: Władysław Szafer (1886–1970) botanik, fitogeograf, paleobotanik, współtwórca ochrony przyrody. [In:] A. Zemanek editor. *Uniwersytet Jagielloński. Złota Księga Wydziału Biologii i Nauk o Ziemi. Część I: Biografie uczonych*. Kraków: Uniwersytet Jagielloński. ISBN 83-7188-322-8, pp. 185–197.
- Zemanek, Alicja 2015: Nie poszedł na zapowiedziany wykład... [He did not attend the announced lecture...] *Alma Mater* special issue 179, pp. 40–45.
- Zemanek, Alicja 2016: Władysław Szafer (1886–1970) – klasyk polskiej botaniki – Władysław Szafer (1886–1970) – the classic of Polish botany. *Wiadomości Botaniczne* 60(1/2), pp. 1–18.
- Zerndt, Jan 1934: Les mégaspores du Bassin Houiller Polonais. [Les couches anticlinales]. Ière partie. *Comité des Publications Silesiennes – Travaux Géologiques* 1, pp. 1–56.
- Zerndt, Jan 1937: Les mégaspores du Bassin Houiller Polonais. IIère partie. [Le groupe marginal]. *Comité des Publications Silesiennes – Travaux Géologiques* 3, pp. 1–78.
- Żmuda, Antoni J. 1914: Roślinność kopalna dyluwium krakowskiego. Fossile Flora des Krakauer Diluviums. *Bulletin International de l'Académie des Sciences de Cracovie, Classe des Sciences Mathématiques et Naturelles, Série B: Sciences Naturelles. Anzeiger der Akademie der Wissenschaften in Krakau, Mathematisch-Naturwissenschaftliche Klasse, Reihe B: Biologische Wissenschaften* 1914(2), pp. 209–352.