# Jozef Zwierzycki, a prolific Polish geological mapping expert in Indonesia, 1914-1938.

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## I. INTRODUCTION AND SUMMARY

Jozef Zwierzycki was a Polish-German geologist with a very eventful life. This included a long and remarkably productive career with the Dienst van het Mijnwezen (Bureau of Mines/ Geological Survey of the Netherlands Indies) from 1914-1938, first as a field geologist and eventually as Head of the Geological Survey Department. This was followed by an eventful late career back in Poland during and after World War II.

Zwierzycki left a legacy of about 50 scientific publications and a series of maps on the geology of the Netherlands Indies. In addition to his publications, he also authored many unpublished reports on surveys on gold, tin, petroleum and coal deposits in various parts of Indonesia.

Jozef Zwierzycki was born on 12 March 1888 in Krobi (Kroben), which is now in western Poland, but until 1918 was under Prussian (German) control. He went to elementary school in Krobi and completed high school in Gnesen. From 1908 he studied natural sciences and geology in Leipzig, Munich and Berlin. He obtained a doctorate in geology in October 1913 from the Alexander von Humboldt University in Berlin, with a thesis on ammonites from the 1911-1913 Tendaguru Expedition to Tanganyika, East Africa. This was followed by study at the Bergakademie (Mining Academy) of Berlin, where he graduated as a mining engineer in early 1914.

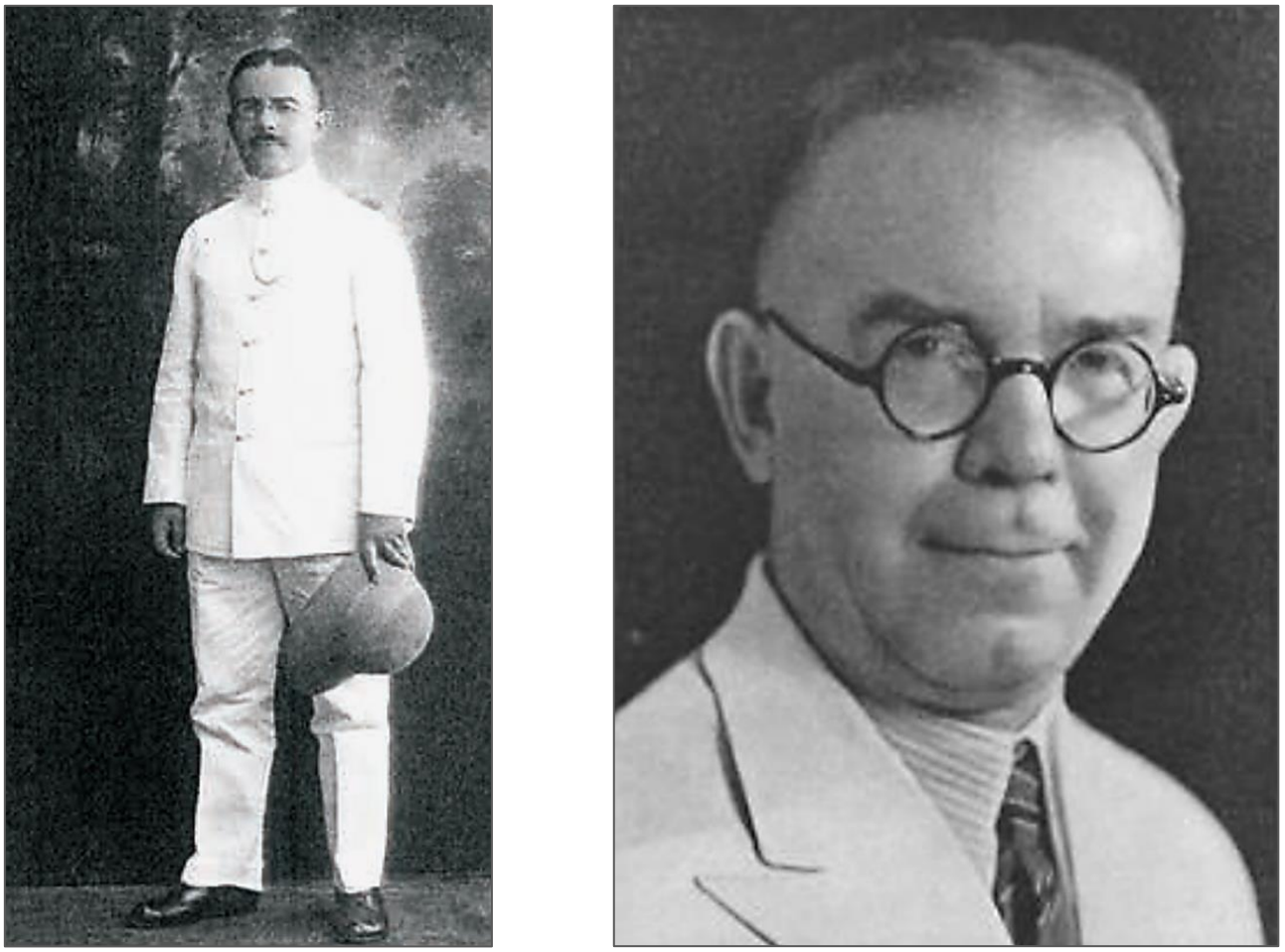


***Figure 1**: Left: Dr. Jozef Zwierzycki arriving in Batavia in the Netherlands Indies in 1914 (from Chrzastek et al. 2014). Right: J. Zwierzycki in the 1930s (from Persoonlijkheden in the Koninkrijk der Nederlanden, 1938).*

## II. BUREAU OF MINES OF THE NETHERLANDS INDIES, 1914-1938

In August 1914 Zwierzycki arrived in Java by steamship from Hamburg, to join the Dienst van het Mijnwezen in Nederlandsch Oost-Indie (Bureau of Mines) as 'Temporary Geologist'. With this move he narrowly avoided military service in World War I in Europe. At this time Mijnwezen was still located in Weltevreden (Batavia/Jakarta), but would move to Bandung in 1924. In 1922 he became a permanent employee of Mijnwezen, as one of the first non-Dutch nationals.

Between 1914 and 1933 Zwierzycki spent most of his time in Indonesia doing field-based work, successfully combining regional geologic mapping and interpretation, as well as more detailed resource evaluations. Partly due to his large volume of work much progress was made in the understanding of the geology of large parts of Sumatra, Java and New Guinea (Westerveld 1961).

### *Aceh, North Sumatra, 1914-1919*

During the first years, through 1919, J. Zwierzycki spent most of his time on mapping and prospecting in North Sumatra, while based in Langsa, Aceh. Much of this area was uncharted territory and not yet under government control. The North Sumatra fieldwork was documented in multiple reports in the Jaarboek van het Mijnwezen between 1915 and 1922.

### *North New Guinea mapping project, 1920-1922*

From September 1920- January 1922 Zwierzycki was based in and led the final phase of the geologic mapping project of North New Guinea, an extremely remote area (geology summarized in Manokwari Zwierzycki 1924). This project had been conducted by Mijnbouw from mid-1917-early 1922, in which several other geologists/ engineers had also participated for limited periods (Hogenraad Kemmerling, Hartmann, Loth, Taverne, Grandjean, etc.).

Interesting details on the large scale of the field operations and of the logistical difficulties (in particular problems with hiring and holding onto local Papuan laborers) were described in Zwierzycki (1922) and Kemmerling (1928). Many ethnographic objects collected by Zwierzycki from New Guinea were donated to museums in Poland in 1922 (Poznan, Warsaw).

In his final report (Zwierzycki 1924) it was concluded that, despite the presence of oil and gas seeps, no commercial petroleum accumulations should be expected, due to the structural complexity of the area surveyed. The detailed maps of surface anticlinal structures and seeps produced during this survey are probably still the best available, as the area does not appear to have been remapped since then.

During his first home leave back to Poland in 1922-1923, Zwierzycki renounced his German

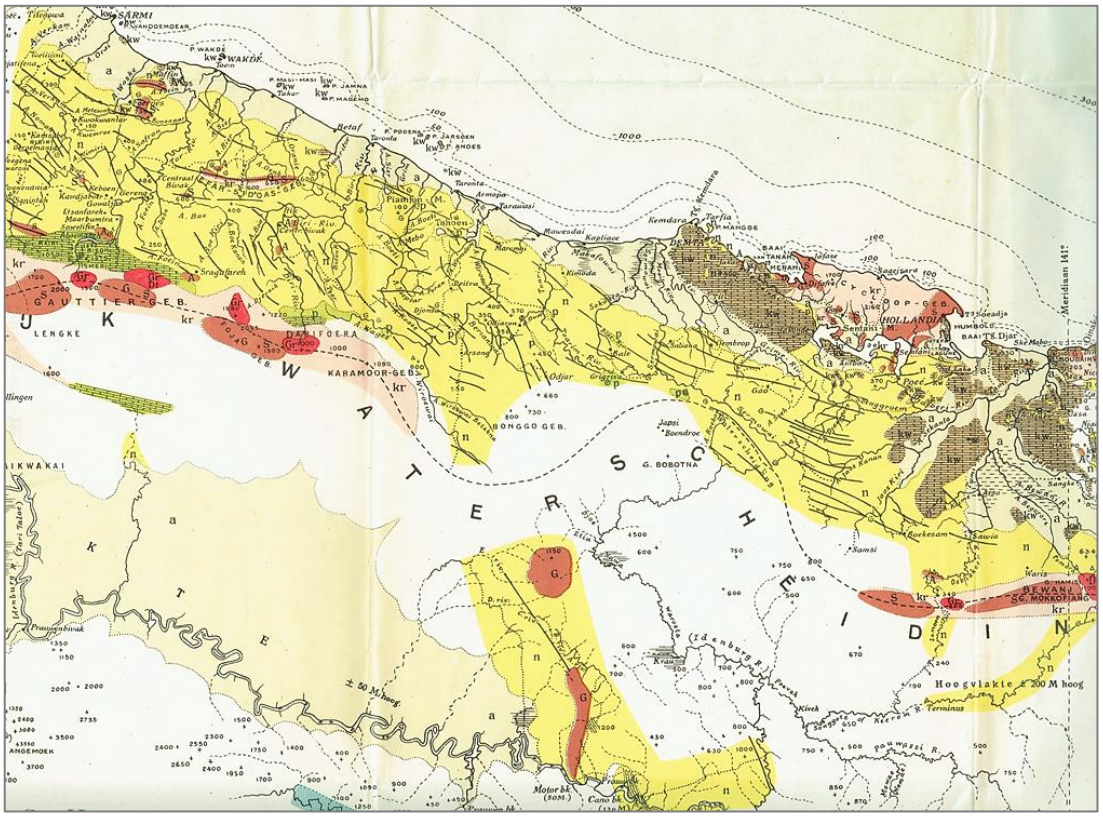



***Figure 2**: Part of the 1:1million scale compilation map of northern Netherlands New Guinea (NE West Papua) (Zwierzycki 1928).*

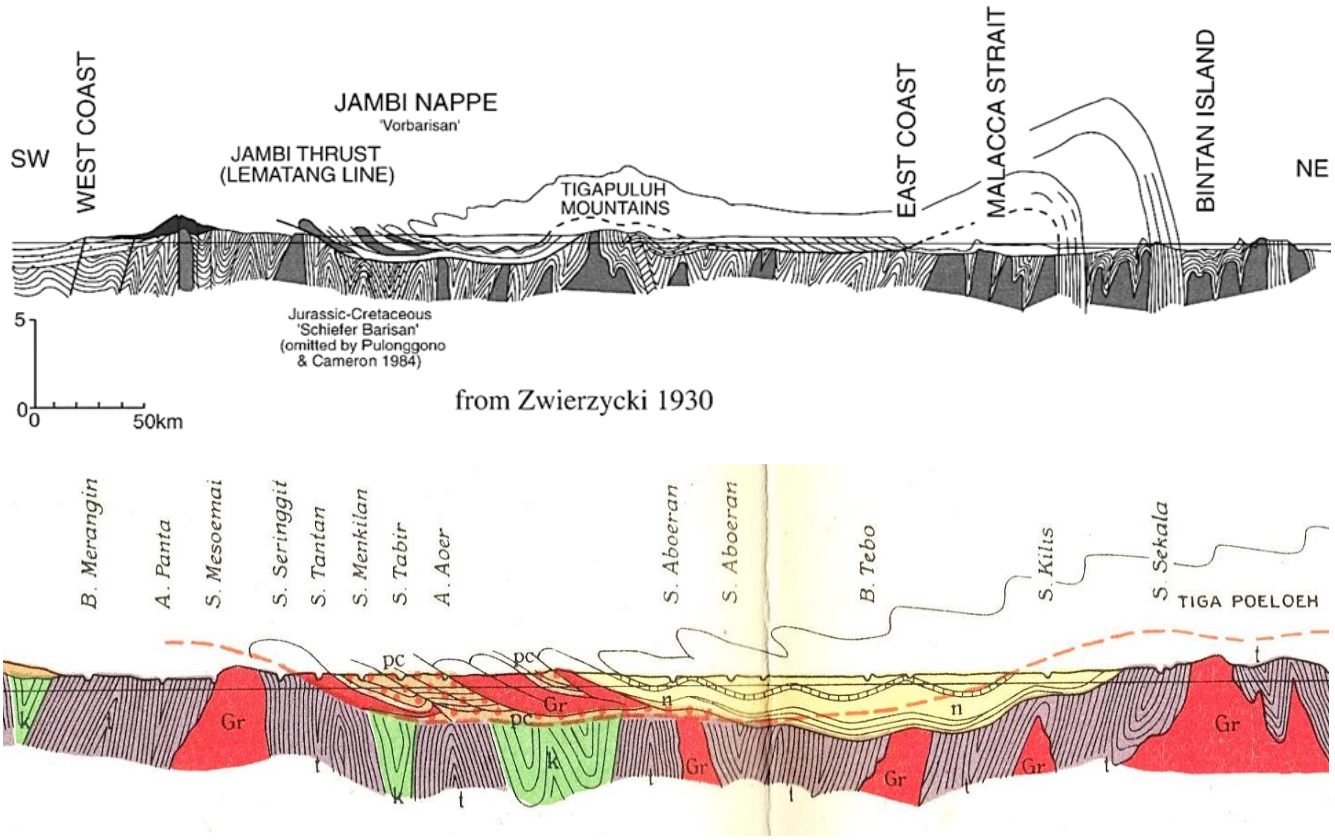



***Figure 3**: Top: The classic (underappreciated?) SW-NE cross-section across Sumatra to the Riau islands by Zwierzycki (1930) (redrawn in Barber et al. 2005). It shows allochthonous Jambi nappes overlying isoclinally folded Triassic- Cretaceous metasements, the Jambi Tertiary basin, Tigapuluh Mountains uplift, etc. Base: Part of Zwierzycki's original 1930 section (~3x vertical exaggeration).*

citizenship and became a Polish citizen. Another home leave was in 1928 (when he married in Poland), and a final one from March-November 1931.

### *East Sulawesi, 1924*

In 1924 Zwierzycki briefly was Leader of the MGO Oost Celebes (East Sulawesi Geological-Mining Survey), based in Makassar, but was transferred to Bandung at the end of 1924. He spent most of that year in Buton, evaluating the geology of the asphalt terrains of Buton island with A.C.D. Bothe (Zwierzycki 1925).

### *The 1925 Jambi Paleobotanical expedition*

In 1925 Zwierzycki was seconded as leader to the Paleobotanic Djambi expedition to the Merangin River area of West Sumatra. This academic expedition was funded by six academic and industrial organizations and was an initiative of paleobotanist Dr. Jongmans and Prof. L.M.R. Rutten in The Netherlands, with as main purpose the collection of additional plant fossils at localities first described by Tobler. He was accompanied by the young paleobotanist O. Posthumus and two topographic surveyors and a large group of contract laborers. Zwierzycki (1930/1935) detailed the geologic setting of the fossil-bearing beds, while the plant fossils of the now-famous Early Permian Jambi flora were described by Posthumus (1927) and Jongmans and Gothan (1935).

The expedition lasted from June- November 1925 and was rather eventful. Most of the contract laborers from Korintji deserted when they found out they could make more money working in nearby rubber plantations, so 30 contract laborers had to be sent from Batavia. A boating accident nearly killed the field party, and an infestation of aggressive, man-eating tigers in the area required additional armed guards (who killed three tigers). Despite all this, a large volume of Permo-Carboniferous plant and animal fossils was collected.

### *The nappe tectonic model of Sumatra*

Already in 1925 and 1930 Zwierzycki realized the significance of the presence of Early Permian low-latitude 'Cathaysian' floras and fusulinid foraminifera in thin limestone interbeds in an area that was believed to be a region with cool-Gondwanan affinities in Permian time. Zwierzycki (1930, 1935) saw this as support for the alpine-style nappe structure interpretation of Tobler (1917, 1922). The low-latitude Permian floras were interpreted to be from an allochthonous nappe, derived from a root zone in the East Malayan

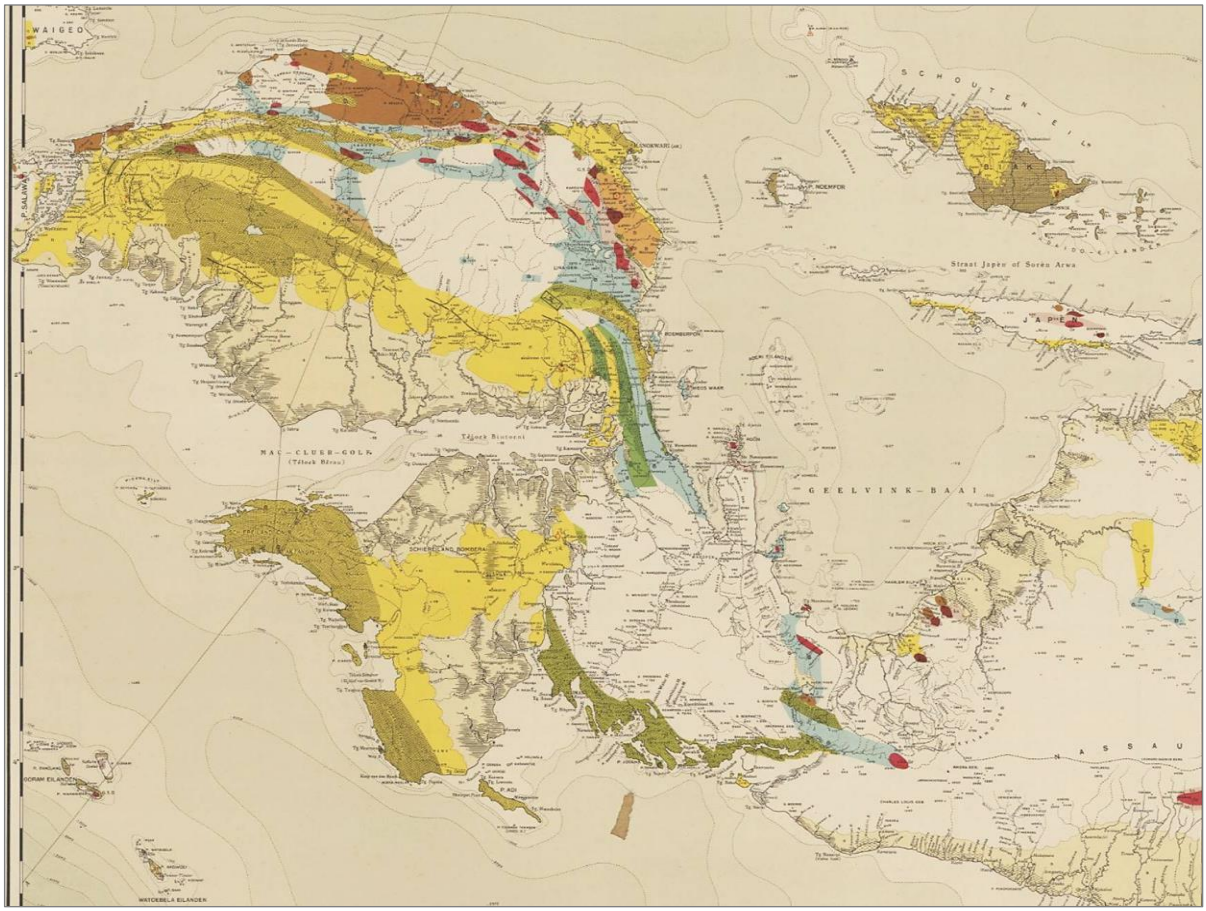



***Figure 4***. *Geologic overview map of the Netherlands Indies- sheet XIII- Birds Head (Zwierzycki 1932).*

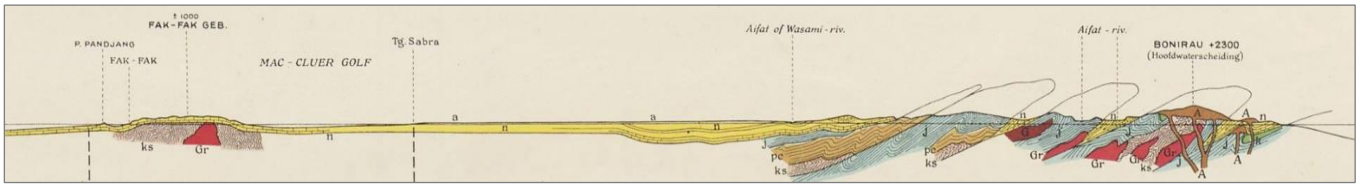



***Figure 5***. *SW-NE cross-section of Birds Head (Zwierzycki 1932).*

continental block (possibly near the Riau Islands NE of Sumatra; Figure 3). The Zwierzycki cross-section suggests >300 km of near-horizontal displacement.

The Tobler/Zwierzycki nappe tectonic model of Sumatra was accepted by Van Bemmelen (1949) but was reinterpreted by most later workers on tectonics of the Sumatra Pretertiary. From the 1960s, Katili, Pulunggono and Cameron, Hutchison, Barber and Crow, etc., instead promoted models of Sumatra being composed of a mosaic of microplates of different origins. However, in my opinion, the current tectonic explanations are not simple or without problems either, and it may be prudent to keep an open mind on the possibility of large mid-Cretaceous time thrusts in Sumatra as the cause of the remarkable juxtaposition of isoclinally folded, Triassic- Early Cretaceous marine metasediments and relatively little deformed, non-metamorphic, thick Permian sediments.

A more recent paleobotanic expedition to the Merangin River area of Jambi was organized by the Naturalis Museum of The Netherlands and the Geological Survey, Bandung, in 2004 (see papers by Van Waveren, Crow, Hasibuan and others). They collected many useful new details on Early Permian floras and rocks, but no fundamentally different views on the low-latitude nature of the Jambi flora since the Zwierzycki, Posthumus and Jongmans work.

### *Geological Overview maps of the Netherlands Indies, 1922- 1930.*

During his career with Mijnbouw Zwierzycki published six sheets of the 1: 1 million scale Geologische Overzichtskaart van Nederlands-Indie (Geologic overview map of the Netherlands Indies). The first two sheets in 1922 were in North Sumatra and Tapanuli, East Sumatra. Between 1927 and 1932 he authored four additional map sheets: Central Sumatra in 1930, North New Guinea and South New Guinea in 1928, and Birds

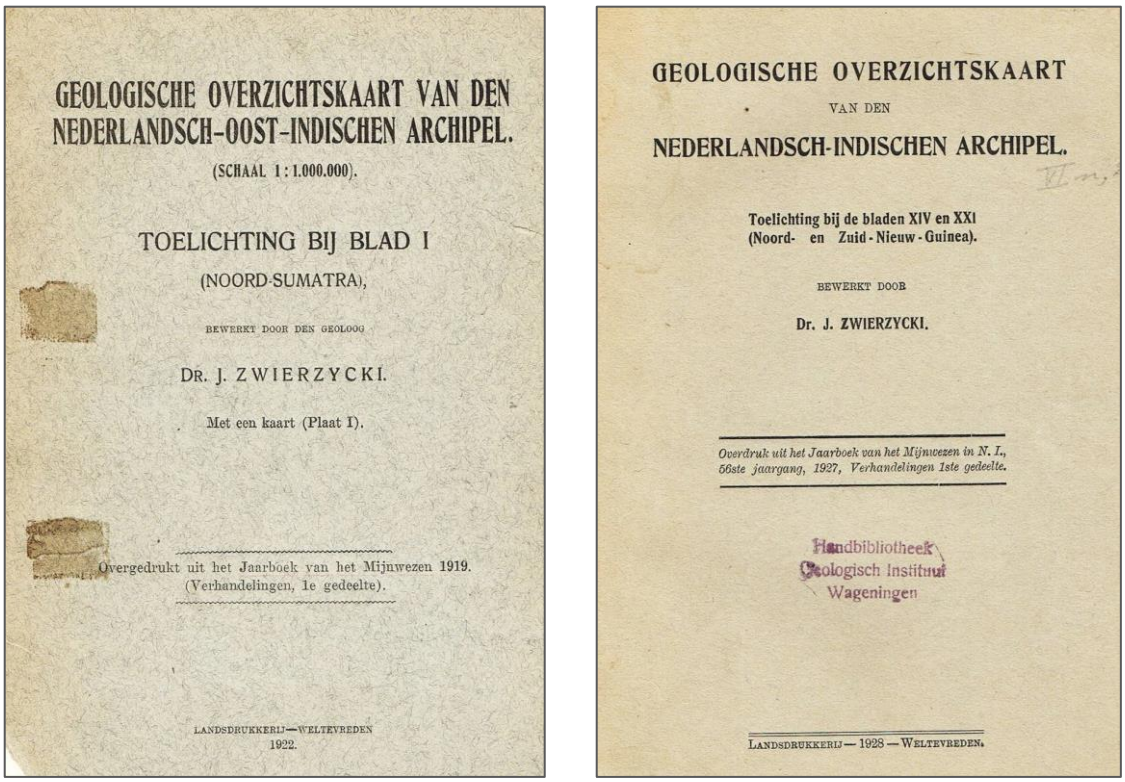



***Figure 6**: Covers of Explanatory notes of the 1:1 million scale geologic overview map of the Netherlands East Indies, sheets North Sumatra (1922) and North and South New Guinea (1928).*

Head of West Papua in 1932 (Figure 4). In 1930 Zwierzycki authored the Geotectonic map of the Netherlands East Indies (1:5 Million scale).

### *The Sumatra systematic mapping program, 1927-1932*

In January 1927 Zwierzycki became leader of the newly established Sumatra Kaarteering (Sumatra mapping project). The program was scheduled to

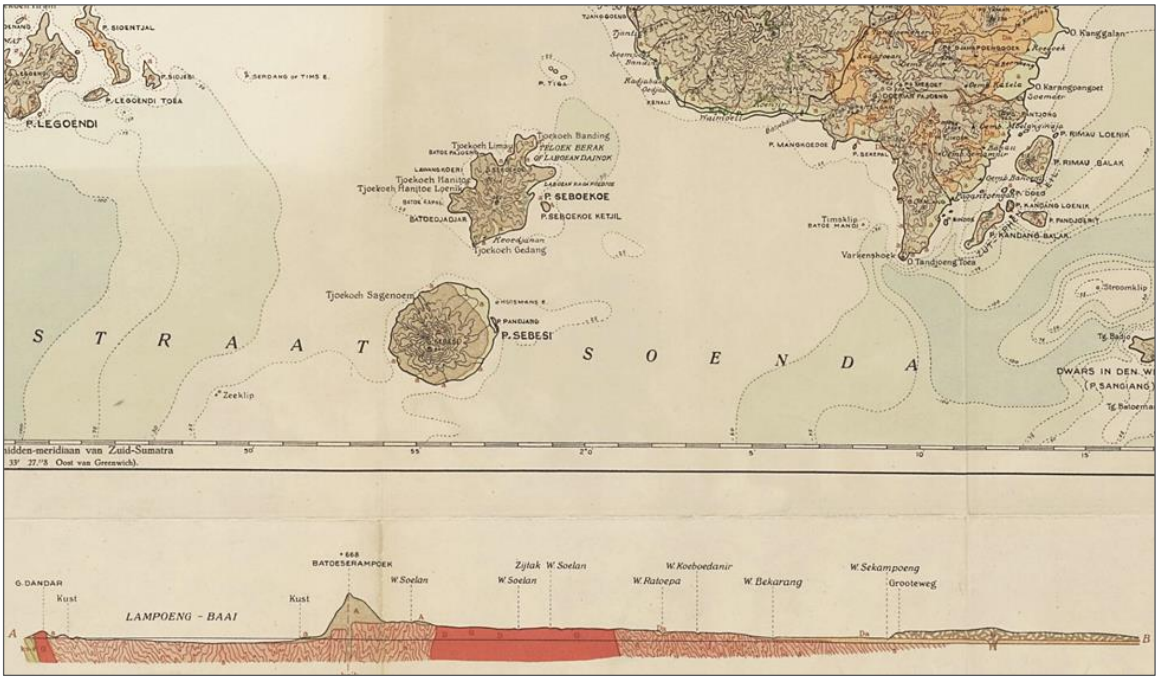



***Figure 7**: The southern part of the Telukbetung map sheet and a SW-NE cross section of the southernmost tip of Sumatra, showing folded Pretertiary metamorphics and granites, overlain by Pleistocene- Recent volcanics (incl. Sukadana flood basalts plateau in NE).*

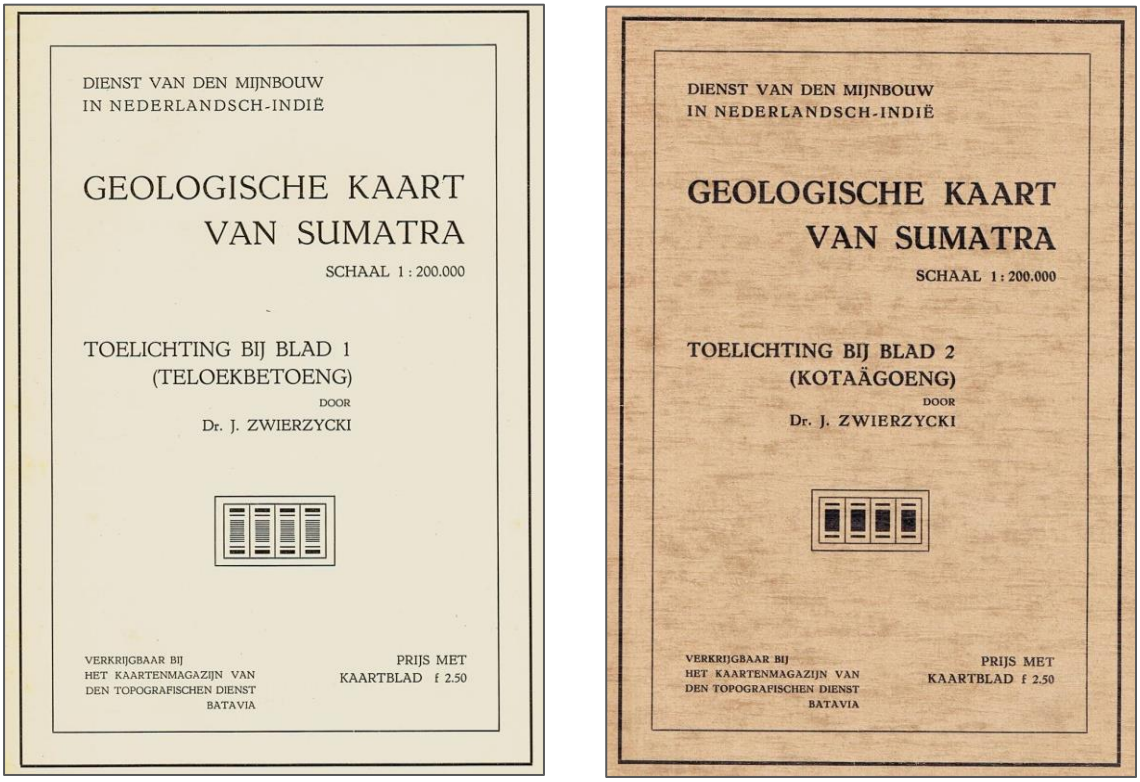



***Figure 8**: Covers of Explanatory notes and geologic maps of the first two South Sumatra map sheets (1931, 1932).*

last at least ten years but was cut short in 1932 due to budget shortfalls. The program included a team of geologists from seven countries that included geologists R.W. van Bemmelen, K.A.F.R. Musper and J. Westerveld and agrogeologist Szemian.

In addition to leading the project Zwierzycki completed the publication of two 1:200,000 scale map sheets of Sumatra in 1931-1932 (Telukbetung, Kota Agung). From March-November 1931 Zwierzycki was on home leave to Europe and was temporarily replaced by Ir. H. Krol.



***Figure.9**: Dr. J. Zwierzycki in the field (second from right), most likely at the Ngandong excavation in East Java in July 1934. On left Ir. Carel Ter Haar, second from left Ir. Johan Duyfjes, on right Dr. Ralph von Koenigswald (photo courtesy Geological Museum, Bandung).*

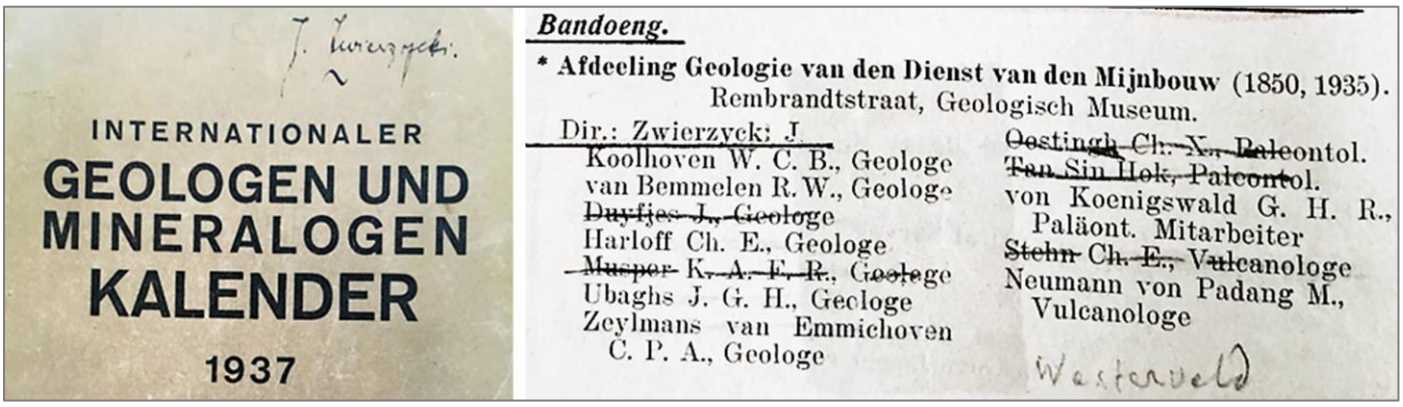



***Figure 10**: Part of a page from Zwierzycki's personal copy of the 'International Geologists and Mineralogists Listing 1937'. Names crossed out by him are Geological Survey geologists from Bandung that died during World War II, between 1943 and 1945 (Wroclaw University collection).*

### *The Java systematic mapping program, 1933- 1935*

After the Sumatra systematic mapping project was halted in 1932 due to budget cuts, 'Zwier' became Head of the Java Kaarteering (Java Mapping program) in September 1933. He took over from the retiring W.W.F. Oppenoorth, and supervised another team of highly educated and capable geologists that included R.W. van Bemmelen, K.A.F.R. Musper, J. Duyfjes, C. Ter Haar and W.C.B. Koolhoven (who would succeed Zwierzycki as Head of the Geological Survey Department in 1938). From 1930-1933 Zwierzycki taught geology part-time for engineers at the Polytechnic University (later ITB) in Bandung.

### *Head of the Geological Survey department, Bandung, 1935-1938*

In June 1935, after moving through the seniority ranks of the *Dienst van den Mijnbouw* for almost 20 years, Zwierzycki was promoted to Head of the *Afdeling Geologie* (Geological Survey department) of *Mijnbouw*. Unfortunately, as a result of the ongoing global economic crisis, he was forced to implement continued budget cuts, which had already started in 1932.

By the late 1930s *Mijnbouw* personnel had been reduced in half, compared to what it was in the late 1920s (Rutten 1938). In 1936 professional staff at *Mijnbouw* was down to 8 geologists, 2 volcanologists and 2 paleontologists. During Zwierzycki's tenure scientific publications in the previously prolific *Jaarboek van Het Mijnwezen in Nederlandsch Indie* series were reduced to almost zero.

During his years in charge of *Mijnwezen,* Zwierzycki and his staff (especially Dr. K.A.F.R. Musper) worked with the two main oil companies in the Neetherlands Indies on an assessment of petroleum occurrences and reserves. Unfortunately, their reports were never published, but some copies may still be in the archives of the Geological Survey in Bandung (e.g. Zwierzycki 1935).

### *Redjang Lebong mine final evaluation, West Sumatra 1936*

In 1936 Zwierzycki briefly returned to West Sumatra, at the request of the *Mijnbouwmaatschappij Redjang Lebong*, to conduct a geological study and evaluation of the well-known Lebong Donok gold-silver mine. After years of profitable gold production in the early 1900s this mine had been in decline. The report


**Mijnbouw-benoemingen.**

Bij den dienst van den Mijnbouw zijn benoemd tot hoofd van de afdeeling Geologie, Dr. J. Zwierzycki, thans hoofdingenieur, leider der Geologische Kaarteering, en tot hoofd van de afdeeling geologisch-technische onderzoekingen, Dr. ir. L. J. Ch. van Es, hoofd-ingenieur, leider der geologisch-technische onderzoekingen.

***Figure 11**: Newspaper clipping: J. Zwierzycki promoted from Head of Geological mapping to Head of the Geologic Department of the Bureau of Mines (Indische Mercuur 21 August 1935).*



29 November 1936 — DE TELEGRAAF — Vierde Blad.

OBLIGATIE-INDEX.

rsindexcijfer van De Telegraaf voor obligaties.

| | Totaal Index | Publ.r. lich. | Pand-briev. | Indu-strie | Spoor-wegen |
|---|---|---|---|---|---|
| 30 | 98.18 | 97.53 | 96.25 | 100.92 | 100.28 |
| 31 | 85.00 | 84.68 | 88.51 | 82.75 | 84.08 |
| 32 | 98.13 | 97.45 | 98.13 | 100.89 | 97.63 |
| 33 | 95.78 | 96.63 | 96.— | 101.25 | 87.19 |
| 34 | 98.14 | 98.96 | 100.34 | 101.48 | 89.13 |
| 35 | 94.05 | 95.62 | 91.28 | 100.96 | 85.63 |
| | 94.94 | 95.87 | 91.50 | 101.38 | 90.00 |
| | 99.45 | 98.45 | 99.89 | 103.04 | 98.27 |
| | 99.40 | 98.49 | 99.89 | 103.02 | 98.13 |
| | 99.32 | 98.44 | 99.89 | 102.67 | 98.17 |
| | 99.35 | 98.53 | 99.87 | 102.69 | 98.04 |
| | 99.33 | 98.63 | 99.89 | 102.54 | 97.66 |
| | 99.35 | 98.61 | 99.95 | 102.66 | 97.71 |
| | 99.39 | 98.66 | 99.95 | 102.73 | 97.75 |

RAPPORTEN i. z. „REDJANG LEBONG".

Eenigszins verdeelde conclusies.

UITPUTTINGSDATUM TE VERSCHUIVEN?

Dr. Zwierzycki acht geen enkele kans voor een belangrijke verlenging van den levensduur aanwezig.

Heeft men nog voldoende arm erts van 3 dwts en — niet te vergeten — kan men de kosten van het bedrijf nog omlaag brengen? Het eerste gedeelte van deze vraag moet ontkennend worden beantwoord. Er is geen erts van gemiddeld 3.0 dwts/t Au meer in de mijn aanwezig. Hieruit volgt, dat men op het tweede gedeelte van de vraag in het geheel niet hoeft in te gaan. Bovendien is het volgens mededeelingen van den bedrijfsleider absoluut onwaarschijnlijk, dat de bedrijfskosten voor de bestaande capaciteit van het bedrijf nog in eenig opzicht naar beneden zouden gebracht

***Figure 12**: Newspaper headline reporting on Zwierzycki's evaluation study of the Rejang Lebong mine, Sumatra, proclaiming that Zwierzycki sees no ways to extend the gold mining operations at Redjang Lebong, as all reserves are depleted (De Telegraaf, 29-11-1936).*

he wrote was published by the company and was long viewed as one of the best descriptions of epithermal gold-silver deposits in Indonesia (Zwierzycki 1936, Westerveld 1961). In the report Zwierzycki concluded that there were no analogs for Redjang Lebong in the literature, but that no additional silver-gold reserves could be expected beyond what had been being mined already.

## III. RETIREMENT FROM BANDUNG AND RETURN TO POLAND, 1938

In late 1937 Zwierzycki was offered the position as Head of the Petroleum and Salt Division of the Polish Geological Institute (Geological Survey) in Warsaw. He reached the retirement age of 50 in early 1938 and retired from Mijnbouw after 23 years of service. Despite all of his achievements, Zwierzycki was not universally liked among his staff in Bandung. Most probable because he had to make a number of unpopular decisions through the period of reduced budgets during the economic crisis of the 1930s, many of the staff reportedly happy with his departure as recorded in Tan Sin Hok private letter 23 May 1938 www.brieven-tan-schepers.nl ). However, in recognition of his contributions, Zwierzycki received the Officier in de Orde van Oranje Nassau medal from Dutch



DR. J. ZWIERZYCKI'S VERTREK.

Verlies voor Indië.

Onze correspondent te Bandoeng meldde reeds het vertrek van dr Zwierzycki naar Polen. Het *A. I. D.* gaf hierover nog de volgende bizonderheden:

Er is op het oogenblik in Polen op geologisch gebied zeer nuttig werk te doen. Dit werk ligt zoowel op het terrein der internationale oriëntatie als op dat van wetgeving en exploratie. In dr. Z. vindt de Poolsche regeering een autoriteit wat betreft kennis van internationale petroleumverhoudingen. Zij vindt in hem tevens een mijningenieur, die vele jaren lang practisch gewerkt heeft bij den exploratie-dienst, terwijl hij tevens een belangrijk aandeel heeft gehad in de studie van de wetgeving op het gebied van het mijnwezen.

Valt dus de Poolsche regeering van harte geluk te wenschen met de keuze welke zij deed, de Dienst van den Indischen Mijnbouw verliest in dr. Zwierzycki een moeilijk vervangbaar werker.

DONDERDAG 9 DECEMBER 1937.

DE INDISCHE COURANT

Dr. Z. studeerde geologie aan de Universiteiten te München, Leipzig en Berlijn. In laatstgenoemde plaats behaalde hij den graad van doctor in de geologie. Na zijn promotie ving hij zijn studie aan — aan de Berlijnsche Bergakademie — voor mijningenieur. Met deze studie kwam hij in de eerste helft van 1914 gereed. In dien tijd vond een uitbreiding plaats van het exploratie-personeel van den Indischen mijndienst. Daar in Holland niet voldoende krachten verkrijgbaar waren, wendde het departement van Koloniën zich tot buitenlandsche universiteiten. Op deze wijze kwam dr. Z. kort voor het uitbreken van den wereldoorlog in Indië, waar hij in totaal thans ruim 23 jaren heeft gewerkt.

Tien jaren lang werkte hij bij de exploratie en in dien tijd werd van zijn uithoudingsvermogen wel het alleruiterste gevergd. Velen van hen, die uit dien tijd dateeren hebben met hun leven den tol betaald, welken de rimboe vraagt van zoovelen, die zijn geheimen willen doorgronden.

***Figure 13**: News clip of Zwierzycki's return to Poland in 1937, here called 'a loss for the Indies' (De Indische Courant 9 Dec. 1937)*




***Figure 14**: Left: J. Zwierzycki biography in Polish, entitled 'Jozef Zwierzycki- the pride of four countries' (2014). Right: In May 1941 as prisoner of war in the German concentration camp Auschwitz in South Poland.*

Queen Wilhelmina at his retirement. Zwierzycki returned to Poland departed on the M.S. Sibajak on 23 February 1938.

Upon his return in Poland in 1938 Zwierzycki worked on projects in the Zechstein of the Sudeten zone near the Carpathian Mountains. At the beginning of World War II (for Poland in September 1939) he became Deputy Director of the Geological Institute in Warsaw.

### *World War II (1939-1945) and after*

The German invasion of Poland started an unhappy period in Zwierzycki's life. He and his family survived the bombings of Warsaw by the German Army on 25-27 October 1939 by hiding in the basement of the Geological Survey for two days.

In April 1941 he was arrested in Warsaw by the German Gestapo, charged with collaboration with the Polish resistance movement, possibly related to sabotaging oil installations in Poland prior to the German occupation. One month later he was imprisoned in the Auschwitz-Birkenau concentration camp, where he remained for 15 months until July 1942 (Figure 14 Right).

With the help of Dr. Alfred Bentz, Head of the Institute for Petroleum Geology in Berlin and apparently one of the 'good Germans' during World War II, Zwierzycki was transferred from Auschwitz to Berlin, to work as a political prisoner/ translator in the office of the Reichsamt fur Bodenforschung (German Geological Survey).

In July 1944 Zwierzycki managed to escape from a German convoy to Warsaw and spent the remainder of the war period in hiding in Krakow. In the meantime, he had lost all his personal documents and library when his Warsaw residence was destroyed during the war.

By May 1945, after a siege by advancing Russian troops, Festung Breslau ('Stronghold Breslau') was >80% destroyed. After the Potsdam Conference in summer 1945 the Silesia part of eastern Germany became territory of Poland and the city of Breslau was renamed Wroclaw. During the late 1940s- 1950s most of the former German-dominated population of Breslau/Wroclaw was evacuated to Germany and replaced with ethnic Polish nationals that were displaced from territories in Eastern Poland annexed by Russia (now Belorussia) in 1945.

## IV. RESURRECTING GEOLOGY EDUCATION, UNIVERSTY OF WROCLAW, 1945-1960

Immediately after the liberation by Russian forces of the towns of Krakow (January 1945) and

Breslau (May 1945) Zwierzycki worked on securing geological collections and rebuilding the geological education systems at the Jagiellonski University of Krakow and at the University of Breslau (renamed Wroclaw). In late 1945 geology courses resumed at the University of Wroclaw, taught by Zwierzycki and others, and in 1948 Zwierzycki became full professor of stratigraphy and geology. During his tenure in Wroclaw he was instrumental in the discovery of the strata-bound lead-zinc and copper deposits of the Lubin mine in the Late Permian Kupferschiefer of the Sudetes, SW Poland, in 1953.

Prof. Dr. J. Zwierzycki retired from Wroclaw University in August 1960, aged 72. He died after a lengthy disease in May 1961 in Wrocław, where he was buried in the St. Wawrzynca cemetery (Figure 15).

### *Commemorations and monuments in Poland*

Many years after his death in 1961 Zwierzycki still enjoys hero status in Poland. The elementary school he attended in his native town of Krobia school was re-named after him in 1982. In the city of Wroclaw (before 1945 known as the Silesian/Prussian/German city of Breslau) a boulevard along the North bank of the North Oder River was named after him in 1991 (Bulwar Profesora Jozefa Zwierzyckiego) and a granite monument was erected here in 2015. The best students at the Institute of Geological Sciences in Wroclaw are awarded with the Medale Profesora Józefa Zwierzyckiego (Zwierzycki Medal). In 2000 he was commemorated with a Polish postage stamp (Figure 16).




***Figure 15:*** *Jozef Zwierzycki grave in the St. Wawrzynca (St. Laurentius) cemetery in Wroclaw, Poland, in 2019*

An extinct Pleistocene saber-toothed cat from the Pleistocene black clays of Sangiran, Java, was named Epimachairodus zwierzyckii by Von Koenigswald (1934; now called Hemimachairodus zwierzyckii). At that time Zwierzycki was leader of the Java mapping program. Other fossils species named after him include an Early Permian plant




***Figure 16****: Left: The logo of the elementary school in Krobia, which was renamed after Jozef Zwierzycki.*

*Right: A commemorative postage stamp from Poland for J. Zwierzycki in 2000.*




***Figure 17**: The Prof. Jozef Zwierzycki granite monument along the Jozef Zwierzycki Boulevard in Wroclaw, Poland, in March 2019. It was erected in 2015.*

Sphenopteris zwierzyckii (Jongmans and Gothan 1935) and a Neogene mollusc Nucula zwierzyckii (Oostingh 1933).




***Figure 18**: The 'Boulevard of Jozef Zwierzycki' and Geological Institute of the University of Wroclaw, Poland, in 2019.*

***Key publications***

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