Boletín de la Academia Nacional de la Ingeniería y el Hábitat. ISSN 1317-6781
Caracas, Nº 67 Abril-Junio 2025: 31 – 57

Recibido: febrero 2025
Aprobado: junio 2025

CORNELIE MARGUERITE BRAMINE CAUDRI (1904-1991): THE CARIBBEAN'S MICROPALEONTOLOGIST

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ABSTRACT

Cornelie Marguerite Bramine Caudri was a Dutch micropaleontologist born 120 years ago on December 28, 1904 in The Hague, Netherlands. She studied biology at the University of Leiden and later specialized in larger foraminifera, under the supervision of Dr. Berend G. Escher (1885-1967) and Dr. I. M. Van der Vlerk (1892-1974). She was an assistant of Dr. Heinrich Gerth (1884-1971) for two years at the University of Amsterdam, studying microfossils from the Dutch East Indies (Indonesia). Dr. Caudri worked as a micropaleontologist for the oil industry starting in 1939 when she began working at the Pointe-à-Pierre Laboratory in Trinidad, a world reference center in the field of micropaleontology. Later, from 1945 onwards, she worked for Tropical Oil in Bogota, Colombia, and then in 1950 she started working for the Texas Petroleum Company in Venezuela for a period of 11 years until her retirement in 1961. During her 22 years of uninterrupted work in the Caribbean, she left an important micropaleontological legacy in the field of larger foraminifera through her research and publications. She spent her retirement years in La Tour de Peilz, Canton of Vaud, Switzerland, dedicated to publishing all extensive work developed in the area of Caribbean micropaleontology during her active years in the oil industry, with the support of Dr. Hans Kugler (1893-1986) and the Natural History Museum of Basel. Dr. Caudri showed interest in the arts in general from a very early age. She made excellent pencil drawings and painted sublime Venezuelan landscapes near Caracas, which she left to her relatives. Dr. Bramine Caudri died in Oosterbeek, the Netherlands at the age of 86, on February 2, 1991.

RESUMEN

Cornelie Marguerite Bramine Caudri (1904 – 1991): La Micropaleontóloga del Caribe.

Cornelie Marguerite Bramine Caudri fue una micropaleontóloga neerlandesa nacida hace 120 años, un 28 de diciembre de 1904 en La Haya, Países Bajos. Estudió biología en la Universidad de Leiden y posteriormente se especializó en el campo de los foraminíferos grandes, siendo sus tutores el Dr. Berend G. Escher (1885-1967) y el Dr. I. M. Van der Vlerk (1892-1974). Fue asistente por dos años en la Universidad de Amsterdam del Dr. Heinrich Gerth (1884-1971), estudiando los microfósiles de las Indias Orientales Holandesas (Indonesia). La Dra. Caudri se desempeñó como micropaleontóloga de la industria petrolera a partir del año 1939, fecha en la que inicia su trabajo en el Laboratorio de Pointe-à-Pierre en Trinidad, centro de referencia mundial en el campo de la micropaleontología. Posteriormente a partir de 1945 trabaja para Tropical Oil en Bogotá, Colombia y desde 1950 comienza a laborar para la Texas Petroleum Company en Venezuela por espacio de 11 años hasta la fecha de su jubilación en el año 1961. Durante sus 22 años de trabajo ininterrumpido en el Caribe dejó un importante legado micropaleontológico en el campo de los foraminíferos grandes a través de sus investigaciones y publicaciones. Sus años de retiro los pasó en La Tour de Pailz, Cantón de Vaud, Suiza, dedicada a publicar toda su extensa obra desarrollada en el área de la micropaleontología caribeña durante sus años activos dentro de la industria petrolera, con el apoyo del Dr. Hans Kugler (1893-1986) y del Museo de Historia Natural de Basilea. La Dra. Caudri desde muy temprana edad manifestó interés por las artes en general, elaborando excelentes dibujos a lápiz y pintando sublimes paisajes venezolanos cercanos a Caracas, que legó a sus familiares. La Dra. Bramine Caudri muere en la localidad de Oosterbeek, Países Bajos a la edad de 86 años, el día 2 de febrero de 1991.

Keywords: Pioneer, foraminifera, biostratigraphy, artist, Caribbean
Palabras clave: Pionera, foraminíferos, bioestratigrafía, artista, Caribe

INTRODUCTION

Cornelie Marguerite Bramine Caudri was a Dutch micropaleontologist who was born 120 years ago, on December 28, 1904, in The Hague, Netherlands, to her father, Dr. Willem Daniel Caudri (1873-1950), who was a lawyer at the Ministry of Justice, and her mother, Marie Olga Gauchat (1876-1933), originally from Bern, Switzerland. She was the

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second in a family of four siblings made up Johan Ferdinand Maurits (1903-1949), Louis Willem Daniel ("Dani") (1909-1998) and Hanna Agathe Olga (1915-2001) (Figures 1 & 2). In that first stage of life (Figure 3), she attended schools in The Hague, her place of residence (Figure 4).



Figure 1. Family photograph from 1911 showing C. M. Bramine Caudri (standing in the center of the image), with her parents Dr. Willem Daniel Caudri (right) and Marie Olga Gauchat (left), and her two brothers Johan Ferdinand Maurits (seated) and Louis Willem Daniel (standing in front of Bramine).



Figure 2. Photo of Caudri-Gauchat family. Probably taken at the 25th wedding anniversary of her parents, ca. 1927. In front, from left to right are the eldest son, Johan Ferdinand Maurits (Maus), the youngest daughter Hanna Agathe Olga (Hans), Olga Caudri-Gauchat (mother), Willem Caudri (father), Cornelie Marguerite Bramine (Bram) and Louis Willem Daniel (Dani).



Figure 3. Photos of Bramine Caudri in different stages of her adolescence. Left image source: VAN GORSEL (2022)



Figure 4. Family residence of Bramine Caudri at Dunklerstraat No 61 (house located in the center of the image and identified by the flagpole), The Hague, the Netherlands in 1925

Micropaleontology is the discipline that studies past life and the evolution of the biosphere from small fossils, for which special sampling, preparation, and observation techniques with the microscope are used. Micropaleontology, being a paleontological discipline, provides a series of very interesting data, mainly evolutionary, paleoecological, and biostratigraphic. Traditionally, it has been the utilitarian aspect of microfossils that has largely developed biostratigraphic applications to solve geological problems in the oil industry, since microfossils present numerous advantages due to their small size, great abundance, and wide distribution (MOLINA 2002).

A fundamental fact for the birth of micropaleontology was the invention of the microscope by the Dutch merchant Antonie Van Leeuwenhoek (1632-1723) in the mid-17th century, which allowed Robert Hooke (1635-1703), in his work *Micrographia* of 1665, to describe and illustrate a microforaminifera, which would later be named *Ammonia beccarii* by Carl Von Linnaeus (1707-1778). Most prominent in the study of microorganisms was the Frenchman Alcide d'Orbigny (1802-1857), who is now generally considered the main founder of micropaleontology. The study of microfossils with the thin section technique of the rocks that contain them

was carried out for the first time by Henry Clifton Sorby (1826-1909) in 1849 (MOLINA 2002).

The first to apply micropaleontological research to oil prospecting was Josef Grzybowski (1869-1922) in 1897, who studied various borehole samples in Poland, establishing various zones and horizons, thus demonstrating that the analysis of microfauna could be very valuable for the oil industry. Micropaleontology was born in Europe, but it was in America where it had a more spectacular development, due to the application of microfossils to the dating and correlation of oil drillings. The most important of the pioneers in the USA was Joseph Agustine Cushman (1881-1949), who can be considered the first specialist properly called a micropaleontologist (MOLINA 2002).

In this sense, with the intensification of oil prospecting in the USA after the First World War, micropaleontology developed in such a way that oil companies hired specialists and created their own laboratories. In 1920, the Humble and Río Bravo oil company formed the first applied micropaleontology laboratory, led by three researchers. Despite the strong gender discrimination that was widespread in the oil industry at that time, several female pioneers played an important role in the investigations that revolutionized micropaleontology in the USA, including Esther Richards (1895-1972), Alva Ellisor (1892-1964), and Hedwig T. Kniker (1891-1985) (CASTAÑO y APESTEGUÍA 2023). The universities dedicated themselves to training specialists, initially within Paleontology courses, and since 1923 as a separate discipline. In this way, numerous specialists were trained, some dedicated to teaching and research at universities, but the majority were hired by oil companies, carrying out an activity applied in the service of geology.

Something similar happened in the rest of the industrialized countries after 1925: taxonomic aspects were developed, other groups of microfossils were studied in addition to foraminifera, and the research was applied to the resolution of geological problems. Development worldwide was slower and later than in the USA, but a series of researchers emerged, among whom the role of Dr. C. M. Bramine Caudri stands out as a specialist in larger foraminifera in this part of the American continent.

ACADEMIC CAREER AND BEGINNINGS IN THE WORLD OF MICROPALEONTOLOGY

Bramine Caudri studied Biology at the University of Leiden, the Netherlands, and then specialized in Micropaleontology. Early in her career, she published several monographs on larger Tertiary foraminifera from the Dutch East Indies (Indonesia). Around 1930, Caudri (Figure 5) became an assistant to Professor Dr. Heinrich Gerth [3] (1884-1971) (Figure 6), who had just moved from Bandung to the University of Amsterdam. There she began work on larger foraminifera in samples collected by Dr. Gerth in 1929, mainly in *Cycloclypeus*-rich Middle Miocene assemblages from the West and East Java region (Figure 7) (CAUDRI 1932, VAN GORSEL 2022).



Figure 5. Bramine Caudri, ca. 1930, around the time in which she ventured into the world of micropaleontology

[3] Dr. Heinrich Gert, was born in Frankfurt am Main, Germany, on June 16, 1884. He completed his higher education at several of the most prestigious universities in this country, such as Heidelberg, München, Berlin, Freiburg, and Bonn. In 1908 he obtained the degree of Doctor of Natural Sciences at the latter university. In 1910 he was hired for 3 years as a geologist in the Mines Division of Buenos Aires, Argentina. In 1920 he was appointed curator at the Museum of Geology and Mineralogy in Leiden, the Netherlands. In 1928 he was commissioned as a paleontologist in the Dutch Indies by the Dutch government. He spent much of his academic career in the Netherlands. In 1930 he was appointed professor of Paleontology and Stratigraphy at the University of Amsterdam, a position he held until 1945. In 1938 he was invited by the Venezuelan government to participate in the Geological Congress held in San Cristobal, Tachira State, where he traveled and studied the Andean mountain ranges of Venezuela and Colombia. Between 1948 and 1960, he served as professor at the University of Bonn. He had a list of 99 scientific publications written mostly as the sole author in German, English, and Spanish, covering a large number of geological and paleontological topics. Many of his publications are dedicated to the study of different groups of marine invertebrates such as corals, echinoids, sponges, foraminifera, crinoids and ammonites, without losing sight of their biostratigraphic implications and their paleobiological value. His travels through South America allowed him to continue, from Germany, his admirable four-volume work "*Geologie Sudamerikas*" (1932-1955), which continues to be one of the most consulted syntheses of South American geology. He was one of the illustrious, outstanding pioneers of South American geology. Dr. Gerth died on August 2, 1971, in Bonn, Germany (ZAVATTIERI y GIAMBIAGI 2008).



Figure 6. Dr. Heinrich Gerth, professor whom Bramine Caudri assisted at the University of Amsterdam.
Source: RAMOS (2021)

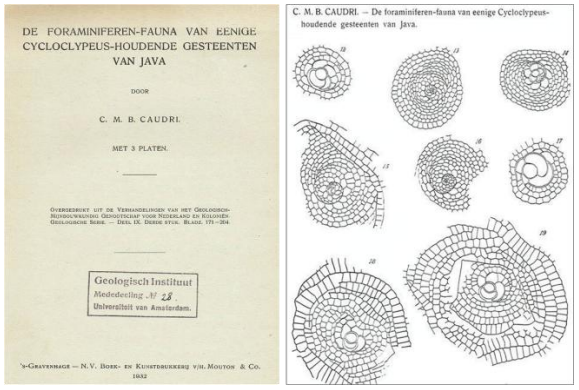


Figure 7. Cover and images of the work of Caudri (1932), referring to the Description of the genus *Cycloclypeus*, a larger foraminifera from the Miocene of Java (microspheric and megalospheric generations) (CAUDRI 1932).
Source: VAN GORSEL (2022).

Subsequently, Bramine Caudri obtained her PhD on July 12, 1934 at the University of Leiden, the Netherlands. The thesis was titled "*Tertiary Deposits of Soemba*" (Figure 8), and made under the tutorship of Prof. Dr. Berend George Escher[4] (1885-1967) and the supervision of Dr. Isaäk Martinus Van der Vlerk[5] (1892-1974) (Figure 9). This thesis was based on samples collected between 1924 and 1925 by a team from the *Dienst van den Mijnbouw* (Geological Survey), led by Georges Laure Louis Kemmerling (1888-1932). Due to Kemmerling's untimely death, the fieldwork results of the Mijnbouw project in Soemba remain largely undocumented and unpublished, except for summaries of unpublished reports in Bramine Caudri's thesis (VAN GORSEL 2022).

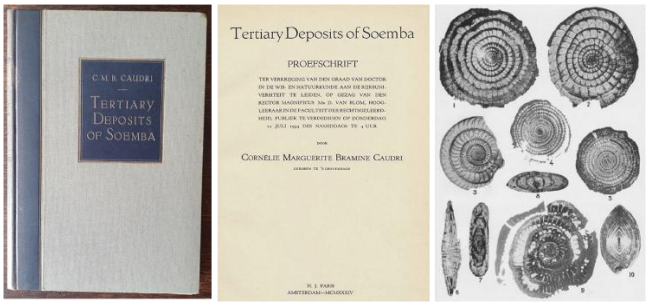


Figure 8. Front cover and title page (left and center images) of the PhD Thesis by Dr. Bramine Caudri, which was presented at the University of Leiden in July 1934, where she describes larger foraminifera of the Tertiary Deposits of Soemba, Indonesia, such as the *Assilina* and *Camerina* (*Numulites*) (Plate I, right image)

The stratigraphy and geological history of the island are briefly described in the introduction, but the main part of the work deals with detailed descriptions of the species. A key finding in Caudri's doctoral work was that the Tertiary limestones of Soemba represent two main sets, of Eocene and Miocene age, separated by an unconformity:

[4] Dr. Berend G. Escher was born on April 4, 1885, in Gorinchem, the Netherlands. He spent his youth in Switzerland. He studied geology at the *Eidgenössische Technische Hochschule* (Technical University) in Zurich, where he was a student of Albert Heim. In 1911 he finished his studies and returned to the Netherlands, where he was first assistant to M. E. F. T. Dubois at the University of Amsterdam and then curator of the geological collections at the University of Delft. In 1916 he was hired by Royal Dutch Shell in the Dutch East Indies. Escher became a professor at the University of Leiden in 1922; at the same time, he became director of the geological museum of this institution. His research area was mainly volcanology, crystallography, and mineralogy. He was a pioneer of experimental geology in solving geological questions, for which he developed a laboratory in Leiden. Of importance were his contributions in the discussions with F. A. Vening Meinesz, Ph. H. Kuenen, and J. H. F. Umbgrove on the zones of negative gravitational anomalies, which explained that convection took place in the mantle. When the University of Leiden opened its doors after World War II, he became a magnificent rector. He died at the age of 82 in 1967 in Arnhem, the Netherlands (https://en.wikipedia.org/wiki/Berend_George_Escher)

[5] Dr. I. M. Van der Vlerk was a Dutch geologist and paleontologist born in Utrecht on January 31, 1892. He was an expert in the stratigraphy of the Dutch East Indies and in the Pleistocene of the Netherlands. He went to Groningen in 1914 to study geology with J. Bonnema. After his bachelor's degree, he continued his studies at the University of Basel, Switzerland, where under the influence of the geologist August Tobler, he became interested in the new method of dating using fossil foraminifera. In 1922 he obtained his PhD with a dissertation on the stratigraphy of Sumbawa in the Dutch East Indies, classifying it according to local divisions made by him. He worked mainly on the Tertiary stratigraphic subdivision of this region based on foraminifera. In 1928, Van der Vlerk returned to the Netherlands to become curator of the National Museum of Natural History in Leiden. He also began teaching at the University of Leiden. Starting in 1958, Van der Vlerk stopped teaching to focus all his attention on the organization of the museum. He formulated new criteria for the classification of foraminifera and, after his retirement, continued working on this research until his death in Leiden in 1974 (DEN TEX 1974).

1) Relatively steeply dipping Eocene limestones with *Assilina*, *Nummulites*, *Discocyclina*, *Fasciolites* (= *Alveolina*), and *Pellatispira*; (Ta and Tb letter zones).

2) Unconformably superimposed are Early Miocene limestones with *Lepidocyclina*, *Miogypsina*, etc. (Te-Tf zones). Rocks from the larger foraminiferal zone Td (late Early Oligocene) are extremely rare or absent and suggest a folding event of Late Oligocene or Early Miocene age. A list of localities with details of the faunal content provides quick information on the determination of the ages made by Caudri. The locations can be easily found on the maps provided in that work (VAN GORSEL 2022).

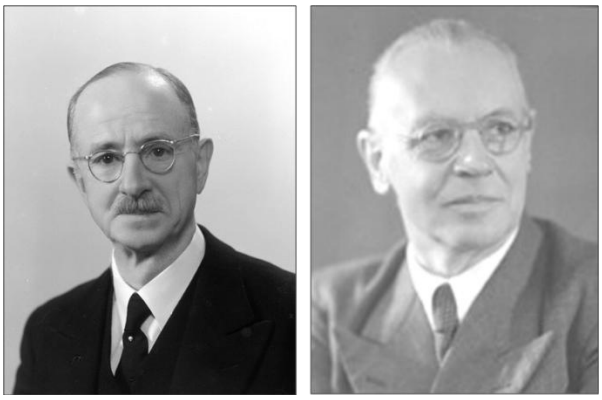


Figure 9. Dr. Berend Escher (left image) and Dr. I. M. Van der Vlerk (right image), tutor and supervisor respectively of Caudri's PhD Thesis at University of Leiden. Sources:

https://picryl.com/media/portrait-of-professor-bg-escher-ahm-f-5935-25-cropped-37c563 and DEN TEX (1974)

During the years following her PhD Thesis (1935-1938), Caudri continued her research work on larger foraminifera from the Dutch East Indies at the University of Amsterdam and at the National Museum of Natural History in Leiden using samples collected by Professor H. Gerth (VAN GORSEL 2022). At the same time, she wrote an article in 1937 on the foraminifera of the Niesen flysch, based on the study of rock samples from Ochsenweid and Lochberg, Switzerland (Figure 10), which were collected by her cousin Dr. Johan Ferdinand Maurits De Raaf [6] (1902-1982) (Figure 11), who sent them to Leiden to accurately determine the ages of that sedimentary sequence based on the content of its foraminifera (SODER 1991).



Figure 10. Thin section of a *flysh* sample from Ochsenweid, Switzerland, analyzed by Bramine Caudri where she identified the species: (a) *Nummulites*; (b) *Discocycline*; (c) *Bryozoan* and (d) *Archaeolithothamnium* algae (dark spots in the image). 11x magnification (Plate 30). Source: CAUDRI (1937)



Figure 11. Dr. J. F. M. de Raaf, Dutch sedimentologist and cousin of Dr. Bramine Caudri, was the one who collected the samples in the Niesen flysch in Switzerland, which were later analyzed and dated by Caudri in Leiden in 1937. Source: https://profs.library.uu.nl/index.php/profrec/getprofdata/1675

Her last work on larger foraminifera from the Dutch East Indies was a systematic description of *Lepidocyclina* species from the Oligocene-Miocene (Te-Tf zones) of Java and Madura (Figure 12), from samples collected by Gerth between 1928 and 1930. (CAUDRI 1939). In this work, she distinguished 33

[6] Dr. J. F. M. de Raaf was a Dutch geologist born on January 28, 1902 in Rotterdam. He was the son of Dr. Kornelis de Raaf, professor of Dutch language in Rotterdam, and Marie Caudri. He began his geology studies at the Higher Technical School of Delft and completed them at the University of Lausanne, Switzerland, with Prof. Maurice Lugeon (1870-1953), graduating from there in 1930. He joined the oil company *Bataafsche Petroleum Maatschappij* (BPM) shortly after and worked for many years in Romania. Towards the end of the Second World War, he worked in Shell's London office, and after the war ended he settled in The Hague. His field of specialization was Sedimentology. He was a professor of this specialty at the University of Utrecht, the Netherlands, between 1964 and 1972. He died in 's-Hertogenbosch on March 14, 1982 (https://profs.library.uu.nl/index.php/profrec/ getprofdata/1675) (CAUDRI 1987).

species and varieties. It was one of the last "traditional" classifications of *Lepidocyclina*. It was found that many of these "species" are probably environmentally controlled varieties, with numerous transitional forms, and that quantitative characterization of the evolutionary stages of the embryo is a more useful way to group *Lepidocyclina* (VAN GORSEL 2022).

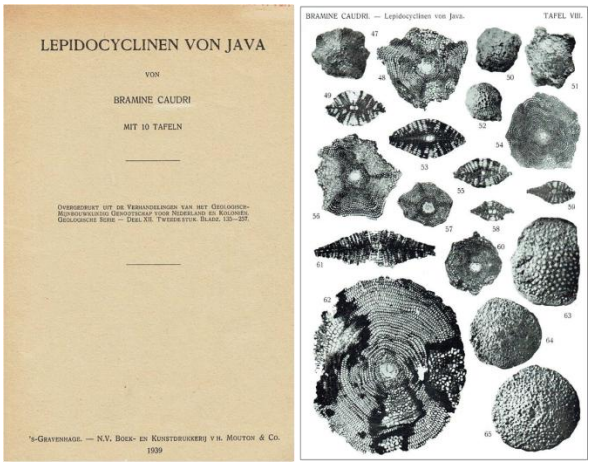


Figure 12. (Left) Cover of the paper by Caudri (1939) concerning the *Lepidocyclinen* of Java, Indonesia in the left image. (Right) Plate 8 with the Middle-Late Miocene species *Lepidocyclina talahabensis*, *Lepidocyclina japonica*, *Lepidocyclina martini* and *Lepidocyclina rutteni*. Source: VAN GORSEL (2022).

BEGINNINGS IN THE CARIBBEAN OIL INDUSTRY AND TIME IN TRINIDAD

Starting in 1939, Dr. Bramine Caudri began a long period as a micropaleontologist in the oil industry (Figure 13), first by joining Trinidad Leaseholds Ltd. (TLL) (a company later acquired by Texaco in 1956), under the leadership of Dr. Hans Gottfried Kugler [7] (1893-1986) (Figure 14), with whom she ended up having a long-term professional relationship. In Trinidad she worked for 6 years until 1945. Dr. Kugler formed a team of professionals who later became world-renowned in the area of Micropaleontology, who together carried out important work for geological sciences in the Caribbean area and gained international recognition in the field of foraminiferal zonations. Systematic and biostratigraphic applications began to stimulate the study of foraminifera in many parts of the world.

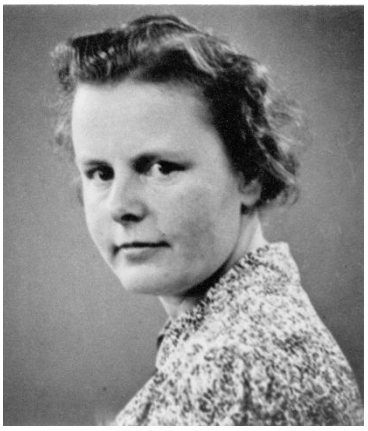


Figure 13. Official portrait of Dr. Bramine Caudri, 1939, made before leaving for Trinidad

The necessary studies in this matter were carried out in a laboratory created by Dr. Kugler in 1929 in Pointe-à-Pierre, Trinidad (Figure 15), when he was a consultant to TLL. This small micropaleontological laboratory was a world reference and enjoyed a reputation as a research center, where many young people came directly from prestigious world universities to work as geologists and paleontologists. Some of them spent many years there, while others spent less time in Trinidad and then moved on to other oil regions of the world or to academic institutions of prominence (SAUNDERS 1974).

The team of professionals formed by Dr. Kugler in Pointe-à-Pierre, in the time of Dr. Bramine Caudri, involved Dr. Hans Hermann Renz (1910-2003) (Head of the Laboratory) and Dr. Robert Masterman Stainforth (1915-2002) (Figure 16), who worked alongside Dr. Bramine Caudri in the field of foraminiferal zonations, analyzing countless outcrop and subsurface samples from both Trinidad and Venezuela. Other world-class micropaleontologists passed through Pointe-à-Pierre after the departure of Bramine Caudri from Trinidad in 1945 including Dr. Paul Brönnimann (1913-1993), Dr. Hans Bolli (1917-2007), Dr. Jean-Pierre Beckmann (1927-2002) and Dr. Walter Blow (1924-1972) amongst others.

Dr. Bramine Caudri was the only woman who was part of that group of famous and brilliants micropaleontologists who served in TLL, at a time when the oil industry was absolutely dominated by men, which further emphasizes Caudri's important knowledge, and contributions. She played a prominent role in the field of micropaleontology of larger foraminifera, and always was interested in their beautiful forms and its importance for the oil industry.

[7] Dr. Hans G. Kugler was a geologist born on August 22, 1893 in Baden, Canton of Argau, Switzerland. He studied geology at the University of Basel under his tutor Dr. August Tobler (1872-1929), with whom he worked in Trinidad in 1913. Dr. Kugler stood out mainly in stratigraphy for the oil industry, becoming interested in the field of micropaleontology. About 60 taxa are named in his honor. He was the architect of the creation of the Pointe-à-Pierre Laboratory, a world reference in the field of micropaleontology. He worked in Venezuela with the North Venezuelan Petroleum Corporation (NVPC) from c.1926 to c.1933, leading exploration teams in the Falcon region, which led to the development of the Cumarebo and Mene de Acosta oil fields. From c.1933 until 1952, he was in Trinidad, dealing with operations in both Venezuela and Trinidad. One of Dr. Kugler's main concerns was to improve dating methods by turning to foraminifera. He is considered the Father of Trinidad Geology. Dr. Hans Kugler died in Basel on December 6, 1986, at the age of 93 (BARITTO 2023).



Figure 14. Dr. Hans Kugler on July 23, 1960 at 66 years of age, supervisor of Bramine Caudri in Trinidad. Source: KNAPPERTSBUSCH (2007)

The most important concern of Dr. Kugler was the promotion of geological and paleontological sciences. He asserted that basic research could be done in his company and that the work, unlike other oil companies, did not have to be based solely on economic aspects. The possibility of publishing the results almost immediately naturally had a stimulating effect on the work carried out by the researchers. Without Dr. Kugler's constant interest and encouragement, the biostratigraphic application would not have been published at such an early date with data on foraminifera from Trinidad and Venezuela. Possibly they would not have appeared at all, due to the confidential nature that oil companies have always maintained. Without the influence of the publications emanating from the Pointe-à-Pierre investigations on the subsequent worldwide study of foraminifera, stratigraphy could well have advanced at a much slower pace (BOLLI 1974). Many of the studies on foraminifera first appeared as private reports from oil companies, which had considerable economic value. TLL's liberal policy allowed for the early release of this information for publication, and all of that was largely due to the management and influence of Dr. Hans Kugler at the risk of financial loss, a move that was essential to the global development of micropaleontology and petroleum geology (JUNG 1987).



Figure 15. Paleontology Building of the Pointe-à-Pierre Geological Laboratory in 1946, Trinidad (left image), where Dr. Bramine Caudri worked between the years 1939-1945 and technicians making picks for micropaleontological studies that would later be identified by specialists (right image). Source: BOLLI (1974)

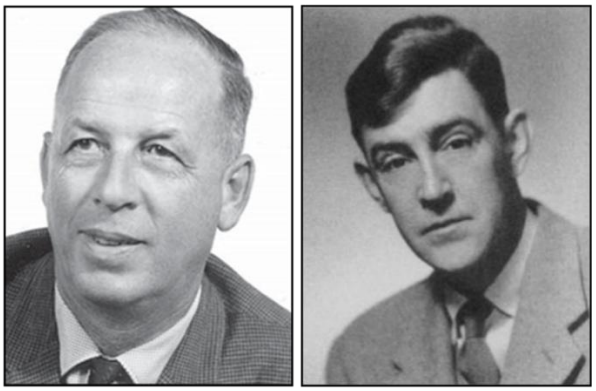


Figure 16. Dr. Hans Hermann Renz (left) and Dr. Robert Masterman Stainforth (right), who were co-workers of Dr. Bramine Caudri in Pointe-à-Pierre, Trinidad. Sources: PARDO (2004) and STAINFORTH (1962)

In 1942, Dr. Bramine Caudri made an excellent illustration of small foraminifera for a publication by Dr. J. A. Cushman and Dr. Hans Hermann Renz, who was in charge of the Paleontological Laboratory of Pointe-à-Pierre in Trinidad for a period of 10 years (1937-1947) until he went to the Mene Grande Company in Venezuela. The work was called "*Eocene, Midway, Foraminifera from Soldado Rock, Trinidad*", published in volume 18 of the *Journal Contributions from the Cushman Laboratory for the Foraminiferal Research*. The drawings of the small foraminifera in their entirety were made in pencil by Dr. Caudri, giving them great realism and technical detail when making the prints of these fossil organisms, which demonstrated the very high quality of her drawing and painting skills (Figure 17).

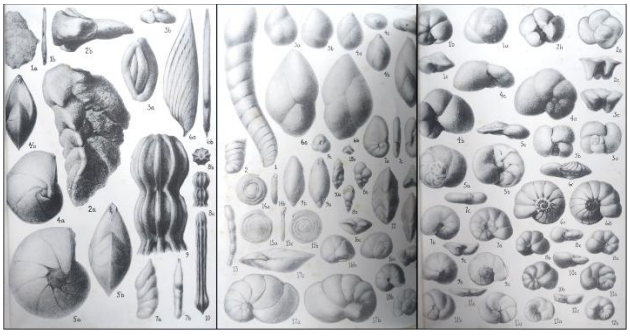


Figure 17. Illustrations of small Eocene foraminifera, made in pencil by Dr. Bramine Caudri for the paper of Dr. Cushman and Dr. Renz on Soldado Rock, Trinidad. Source: CUSHMAN & RENZ (1942)

During her time in Trinidad, Dr. Bramine Caudri published her first work on Venezuela in the *American Bulletin of Paleontology* in 1944, a paper entitled "*The Larger Foraminifera of San Juan de Los Morros, Guarico State, Venezuela*." In early 1941, Dr. Santiago E. Aguerrevere (1899-1984), a geologist with the Venezuelan Ministry of Development, presented a small collection of rock samples from San Juan de los Morros in the Guarico state, containing larger foraminifera to Dr. Hans Kugler in Pointe-à-Pierre, who in turn assigned the task to Dr. Bramine Caudri for micropaleontological inspection. After the

preliminary results proved to be of general interest, it was decided that they should be prepared for publication. The material available to Bramine Caudri consisted of 11 samples of hard limestones with foraminifera, of which many thin sections were prepared and preserved in the collections of the geological laboratory of Trinidad Leaseholds Ltd. in Trinidad, while duplicates of the samples were preserved in the Technical Service of Mining and Geology in Caracas.

Dr. Aguerrevere, in a letter dated February 11, 1941, provided information on the stratigraphic position of the samples and indicated details about the local stratigraphy, especially pointing out the location of sample G.91 (Figure 18), which was the first sample received for the investigation, and it was related to the important macrofauna found in that locality; there being no fundamental lithological or paleontological difference between G.91 and the other samples of the study. Similarly, Dr. Thomas Francis Grimsdale (1905-1963), a prominent figure in the field of foraminifera, at that time with Shell Trinidad, provided Dr. Caudri with type specimens for comparison, specialized literature, and technical discussions on the matter (CAUDRI 1944).

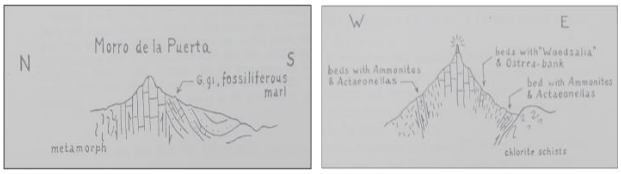


Figure 18. Geological cross-sections of Los Morros of San Juan, Guarico state, where one of the limestone samples collected by Dr. Aguerrevere is reflected (sample G.91, left image) and which was later analyzed by Dr. Bramine Caudri. The stratigraphic and structural relationships are shown. Source: CAUDRI (1944)

Dr. Caudri found that the fauna in the samples of the limestones of San Juan de los Morros was of Paleocene age. She described seven species of larger foraminifera, two of which were new species: *Hexagonocyclina meandrica* and *Discocyclina aguerreverei*, the latter called in honor of the Venezuelan geologist Dr. Santiago Aguerrevere (Figure 19). She also proposed two new generic names: *Hexagonocyclina* and *Ronikothalia*. Additionally, Dr. Caudri discussed the nomenclature of the American "*Miscellanies*" and conclusions with a general discussion on the relative age of the Soldado Formation in Trinidad and the vertical distribution of larger foraminifera from the Upper Cretaceous and Lower Tertiary in this region of the Caribbean.

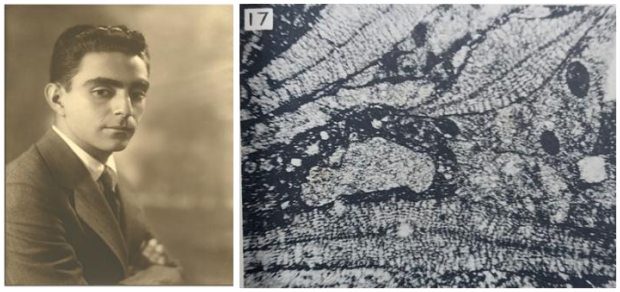


Figure 19. Dr. Santiago E. Aguerrevere, ca. 1924 (left image), and thin section (sample G.125e) of a limestone from Los Morros of San Juan, where the new species *Discocyclina aguerreverei* appears (fossil in the lower and upper left part of the thin section, 30x), named in honor of the Venezuelan geologist by Dr. Caudri (right image). Sources: https://www.geni.com/people/Santiago-Emigdio-Aguerrevere-Vera/5501864851450047397 and CAUDRI (1944)

TIME IN COLOMBIA

After her prolific period with Trinidad Leaseholds Ltd. in Pointe-à-Pierre, Dr. Bramine Caudri worked for Tropical Oil Co. in Bogota, Colombia, from 1945 to 1949. During this time she shared work in this company with Dr. Charles D. Redmond (1906-1978) who was the Head of the Laboratory, Dr. Viktor Petters (1909-1992) (Figure 20), Mr. Frank V. Stevenson, Mr. Keith Yenne, and in 1949 she will coincide again with Dr. R. M. Stainforth, who will be there for 1 year. In 1945, in co-authorship with members of the Standard Oil Company and the Creole Petroleum Corporation of Venezuela, among whom A. T. Proudfit, R. H. Sherman, L. P. Maier and Walter K Link are mentioned, she produced an unpublished report entitled "*Observations on orbitolina from locality 19149, Tomon Formation, State of Trujillo, Venezuela*". In it, she points out that in the locality studied, the collection of orbitolines has provided abundant material and seems to represent a natural population, which includes on the one hand, tiny immature forms of no more than 0.3 mm in diameter and on the other hand, larger specimens, up to 0.8 mm in diameter, with irregular, wavy and thickened edges and a general more developed appearance.

The Tomon Formation, now invalidated in the Stratigraphic Code of Venezuela, had been applied with a variable range of series, group and/or formations to the lower part of the Cretaceous sequence of the Andes, an interval in which the Rio Negro, Apon and Aguardiente formations are currently recognized (CIEN 1997).

During her time in Colombia, Dr. Caudri published two technical papers in the *Journal of Paleontology*, the first of them in 1948 called "*Age of the Guaduas Formation in Colombia: Note on the stratigraphic distribution of Lepidorbitoides*" It stands out that the genus *Lepidorbitoides* had been considered diagnostic of the Cretaceous. However, she indicates that it has been found in

several localities around the Caribbean in deposits of Tertiary age. In her paper, she briefly analyzes this data and its reliability to draw conclusions about the vertical distribution of genus.

In that work she proposes a new genus, *Bontourina*, to replace the invalidated name *Hexagonocyclina* previously proposed for one of the companion forms, and chooses a new species: *Bontourina inflata* Caudri, n.sp. (Figure 21), as well as briefly discusses the question of the age of the Guaduas Formation in Colombia, proposing the name Guaduas limestone for the reef-type limestone lenses, according to field data received from geologists of Tropical Oil Company to the east of the cities of Honda and Ambalema in the Upper Magdalena River, Colombia, and from which fossiliferous samples were collected that according to her analyzes dated as Maastrichtian (Upper Cretaceous), according to the larger foraminifera studied (CAUDRI 1948).



Figure 20. Dr. Charles D. Redmond (left) and Dr. Viktor Petters (right), Dr. Caudri's co-workers during her stay at the Tropical Oil Co, Colombia. Sources: REDMOND (1962) and PETTERS (1962)

Dr. H. H. Renz entrusted her in previous years when they worked in Trinidad, given her artistic qualities, to make the illustrations for an extensive classic work on the biostratigraphy of the Tertiary in the Caribbean region, a publication that would be published in 1948 under the title "*Stratigraphy and Fauna of the Agua Salada Group, Falcon State, Venezuela*", in Memoir 32 of the *Geological Society of America*. The drawings that appear in this extensive manuscript about the foraminifera of this region will be made by the pen and ink of Dr. Caudri, a pictorial work that denotes the dedication, time, and meticulousness captured under the microscope to represent each one of these microfossils in great detail (Figure 22).

In October 1949, Dr. Bramine Caudri visited the Department of Micropaleontology of the American Museum of Natural History in New York, USA, an institution that was an international crossroads for micropaleontologists from all over the world. Researchers visited to get a better idea of the resources and facilities available to them, to review manuscripts, or to carry out research that required the use of their libraries, indexes, or paleontological collections. In short, to contribute and be nourished by new ideas in the fields of their research.

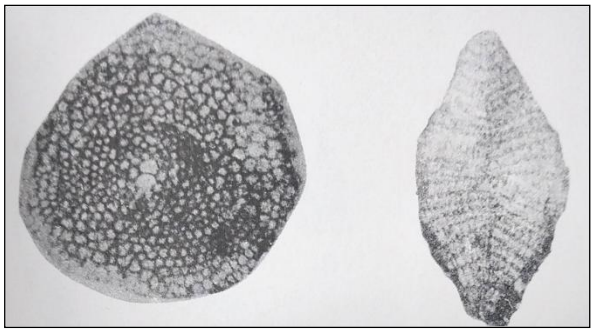


Figure 21. New species of foraminifera proposed by Dr. Bramine Caudri, *Bontourina inflata* Caudri, n.sp.
Source: ELLIS & MESSINA (1940)

On that occasion in the USA, she spent time with other important micropaleontologists, among whom Dr. Paul Brönnimann (1913-1993) from Trinidad Leaseholds Ltd. (Figure 23) stands out, who arrived at TLL a year after the departure of Caudri from TLL. Dr. Henry de Cizancourt (1891-1956) of the Compagnie Française des Pétroles of Paris, Dr. Nestor John Sander (1914- 2012) of the Arabian-American Oil Company, and Dr. G. J. R. Terpstra (1921-1998) of Shell of Venezuela also stand out.

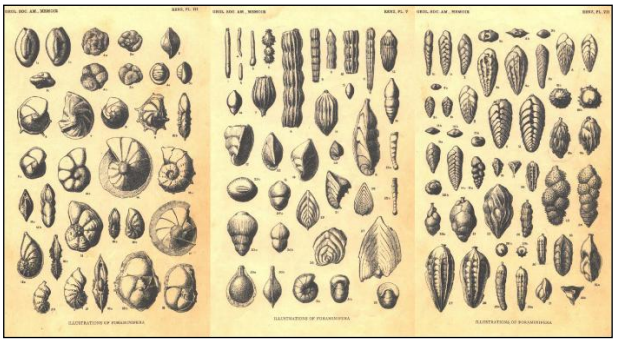


Figure 22. Illustrations of some of the plates of foraminiferal faunas from the Agua Salada Group, Falcon state, Venezuela, made in pen and ink by Dr. Bramine Caudri for the paper of Dr. H. H. Renz. Source: RENZ (1948)

By 1950, Dr. Caudri was already working for the Texas Petroleum Company and remained in Bogota for a few more months. In this same year she published again in the *Journal of Paleontology* a corrective note on the age of the Guaduas Formation that was titled "*The age of the Guaduas Formation in Colombia: a correction*". In this publication, she indicates that subsequent field work led to the conclusion that the limestone discussed in her paper of 1948 should not be included in the Guaduas Formation and proposed the new name Cimarronal limestone, to replace the erroneous name Guaduas limestone; the latter was more correct with the upper part of the Guadalupe Formation. The overlying Guaduas Formation could, in the opinion of Texas Petroleum geologists, include some Cretaceous age (post-Maastrichtian?), but most of it was definitely of Tertiary age.



Figure 23. Dr. Paul Brönnimann, a Swiss micropaleontologist who made important contributions in the Caribbean. He shared time with Dr. Caudri in 1949, at the American Museum of Natural History, USA. Source: BRÖNNIMANN (1957)

TIME IN VENEZUELA

During her stay in America, it will be in Venezuela where Dr. Bramine Caudri (Figure 24) will remain for the longest. She arrived in Caracas on November 4, 1950, transferred from Bogota by the Texas Petroleum Company, and she was hired by this company as Senior Paleontologist from the same date of her arrival (Figure 25) (DOCUMENTARY APPENDIX 1). However, as a contradictory element in her Venezuelan identity document issued in 1960 (Figure 26), ten years after her arrival in the country, the immigration authorities did not reflect her true profession but rather "domestic" jobs, which is considered as one more reason for gender discrimination towards the professionalization of women in the society of those times. She worked as Senior Paleontologist in Venezuela for 11 years until 1961.



Figure 24. Dr. Bramine Caudri, photo taken probably few years before her arrival in Venezuela



Figure 25. Photograph of Dr. Caudri with her brother Dr. Louis Willem Daniel "Dani" on a trip to Rome, Italy, ca. 1950, few months before her arrival in Venezuela. Her brother will later be sent to Damascus, Syria (1950-1952) by the UN-FAO

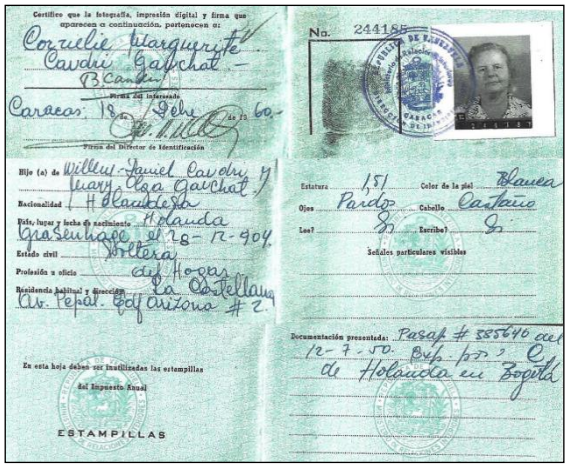


Figure 26. Venezuelan identity card of Dr. Caudri as foreign resident (Nº 244.185), issued on December 18, 1960 in her final period in Venezuela. This card shows her residence address in Caracas in addition to other personal and biometric data.

Between December 12 and 29, 1950, the Texas Company moved its previous paleontological laboratory created in January 1949 by Michael W. Zaikowsky and Dr. Max Schenker, located between 43 Jesuitas and Tienda Honda, to the Karam Building inaugurated that same year, located at the corner of Ibarras to Pelota on Urdaneta Avenue in the center of Caracas (Figure 27), so it was Dr. Caudri's turn to open the company's new facilities just a month after her arrival in Caracas (DUSENBURY 1950). It was her turn to direct this laboratory towards the end of the 1950s (SZENK 1961).

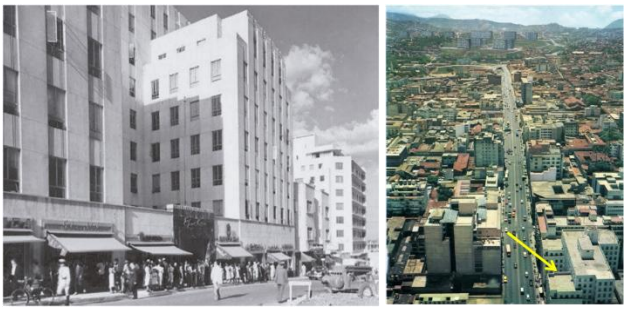


Figure 27. Photographs of the Karam Building front and aerial view (yellow arrow) on Av. Urdaneta in Caracas, a building inaugurated in 1950 housing the offices and Paleontological Laboratory of the Texas Petroleum Company. Operations started that same year, and Dr. Caudri directed the laboratory towards the end of the 1950's. Sources: https://www.ccscity450.com/obra/edificio-karam/ & https://www.facebook.com/groups/1554213468087520/

During her stay in Venezuela she carried out various micropaleontological works concerning the routine operational monitoring of samples collected in different wells drilled by the Texas Petroleum Co. Her work contributed to the understanding of the stratigraphy in western Venezuela, mainly in the Tiguaje and Mamon oil fields in the Falcon state (Figure 28), as well as other drillings in Anzoategui and Zulia states. She also carried out studies of samples collected in various surface geology surveys in Falcon, Barinas and Portuguesa states. Likewise, she dedicated time to correlating the stratigraphy of Anzoategui with that of Guarico. Dr. Caudri began working in the country on larger foraminifera from the Tertiary of Trinidad, the results of which were incorporated into a treatise on the geology of Trinidad that was written by Dr. Hans Kugler, based on geological studies previously carried out when they worked together for Trinidad Leaseholds Ltd. (DUSENBURY 1953, BRÖNNIMANN 1954).

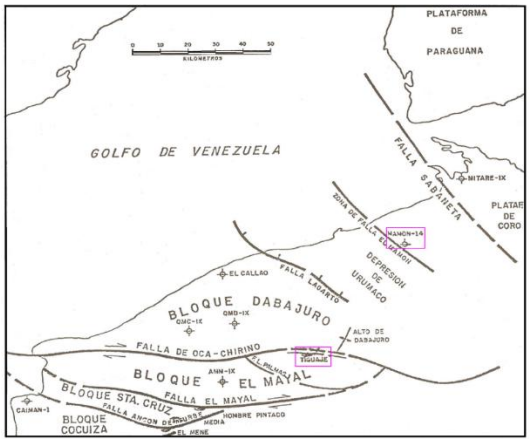


Figure 28. Map of western Falcon with the location of the Tiguaje and Mamon oil fields (purple boxes), belonging to the Texas Petroleum Co, where Dr. Caudri carried out her micropaleontological studies. Source: MARAVEN (1982)

In 1953, Dr. R. M. Stainforth arrived in Caracas from Peru to work for 6 months with the Creole Petroleum Corporation on the microfaunas of the Miocene and Oligocene and on the facies relationships of the Eastern Basin of Venezuela. On this occasion he was presented to the city's micropaleontologists at a lunch offered by Creole on February 9 at the famous Potomac Hotel, in San Bernardino, Caracas. This was an opportunity he had to share and debate with his former colleagues and friends, including Dr. Bramine Caudri, Dr. H. H. Renz and Dr. Pedro J. Bermudez (1905-1979) (MACSOTAY 2020), as well as other professionals (Figure 29) (DUSENBURY 1953, STAINFORTH 1953).



Figure 29. Potomac Hotel, located in San Bernandino, Caracas, location of the meeting between famous Caribbean micropaleontologists on February 9, 1953, where Dr. Caudri was present along with other former co-workers from Trinidad and Dr. Pedro J. Bermudez (right image). Sources: http://laguiadecaracas.net/58927/hotel-potomac-un-icono-extinto-de-caracas/ & https://www.ugr.es/~mlamolda/galeria/biografia/bermudez.html

Michael W. Zaikowsky was transferred from Caracas to Southern California. Dr. Caudri was joined by micropaleontologist Samuel Brown to assist her in the laboratory on December 11, 1953, after he had worked several months as a well geologist in eastern Venezuela (BURSCH 1954). Later, Miss Lina Mercedes Balseiro joined the professional staff of this paleontological laboratory in 1955, where she dedicated herself to the detailed correlation of wells in eastern Venezuela and to the study of foraminifera (SZENK 1961, STAINFORTH 1962). Bramine Caudri produced a total of 17 unpublished technical reports for the Texas Petroleum Company in Venezuela. These unpublished reports generated during their work in the country are listed below in chronological order:

[1953] *Paleontology of Tiguaje 3, Falcon State, Venezuela*. EP-12072. This is the first well that Caudri works in this area.

[1953] *Paleontology of Mamon-1, Falcon State, Venezuela*. EP-11950.

[1953] *Paleontology of the drilled and core section of Mata 3 well, Anzoategui State, Venezuela*. INF-000216, 53.

[1954] *Paleontology of Mamon No. 3, Falcon State, Venezuela*. Additional author: Brown, S.J. EP-10102.

[1954] *Paleontology of Tiguaje 1-2, Falcon State, Venezuela*. EP-12065.

[1954] *Preliminary Notes on Altosano-1, Falcon State, Venezuela*. EP-12064.

[1955] *Paleontology of Altosano-1, Falcon State, Venezuela*. EPC-10112.

[1955] *Paleontology of the Surface Samples Collected by Dr. M. Forrer and Mr. R. E. Smith in Falcon during 1954*. Additional authors: Forrer, M. and Smith, R.E. EPC-12079.

[1955] *Paleontological study of field samples collected by Charles Ducloz in the Barinas Basin, Venezuela during the years 1952-1953*. Additional author: Ducloz, Charles. INF-000314, 55. During his survey of the eastern foothills of the Andes in the Barinas and Portuguesa states, Dr. Charles Ducloz collected a total of 386 samples, although not all of them were of value for paleontological work. Several of these were taken only for lithological documentation.

[1956] *Palentology of Cason-1*. Additional authors: Balseiro, L. M., Perko, A. R. INF-000237, 56. The Cason-1 well was drilled by the Mene Grande Oil Company in 1954 to a total depth of 9,500 feet. Cutting samples were collected from 2,000 feet and above at 15-foot intervals. No cores were taken. For correlation purposes, only samples from 3,005 feet to full depth were examined in detail.

[1956] *Paleontology of Tiguaje 1-15 and 1-15a, Falcon State. Venezuela*. EP-11278.

[1957] *Paleontology of the Upper Tuara-2. EPC-12305*. The following report contains the description of the upper samples, as some difficulties were encountered in the interpretation of the paleontological break of this section she continued below 3,000 feet and made a quick check through the entire Miocene down to beyond the pick of the top of the Oligocene.

[1957] *A synopsis of the paleontology and Schlumberger data from some of the Tiguaje wells*. Additional authors: Young, H. A. EPC-9941. In terms of paleontological interpretations, this report is a precursor to a more comprehensive review, now in preparation, of all Falcon wells in which paleontological work has been performed since 1951.

[1957] *Preliminary paleontological report of the surface samples collected in Barinas by Mr. P. E. Gamboa during 1957*. EPC-2795.

[1958] *Comments on the Eocene section in the Mara wells*. EPC-11038.

[1958] *The Microfauna of the Eocene of Western Venezuela*. EP-12082. The attached table represents a synopsis of all the information on Eocene microfauna that has been gathered to date from material of wells and surface sections in Western Venezuela, east of Lake Maracaibo.

[1959] *Paleontology of Type Material of the Eocene Misoa-Trujillo and Pauji Formations in the Maracaibo Basin*. EPC-11682.

Likewise, she published two works in 1961 in the *Bulletin of the Venezuelan Association of Geology, Mining and Petroleum*, the first of them in volume 4, bulletin Nº 7 in co-authorship with geologist K. R. Quarfoth from Texas Petroleum Company titled "*Relationship of the Roblecito and La Pascua formations of eastern Venezuela with those of Paují and equivalents of the Barinas basin*". The Barinas Basin to the west and Guarico Basin to the east of Venezuela have been considered separated by the El Baul arc since Pre-Tertiary times. This work presents the contrary thesis that the La Pascua-Roblecito sequence within the Guarico Basin, dated to the Lower Oligocene, is actually from the Eocene and was previously in depositional continuity with known Eocene formations to the west in the Barinas Basin, corresponding to the Pauji-Misoa formations, as part of the same transgressive sea (Figure 30). However, the concept of east-west communication was very important and appears to have gained general acceptance since this paper was read at the AVGMP annual meeting in 1961 (STAINFORTH 1962).

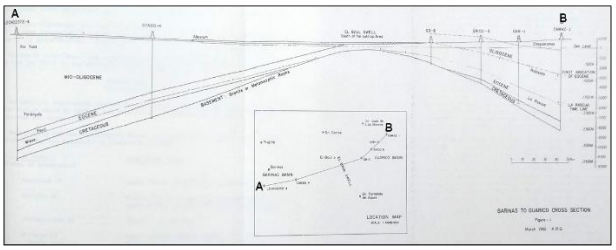


Figure 30. Structural cross-section in East-West direction (A-B), where the elevation of the basement of El Baul Arc can be seen in the central part of the image and the stratigraphic relationships existing between the La Pascua-Roblecito units in the east (Guarico Basin) and Pauji-Misoa to the west (Barinas Basin). Source: QUARFOTH & CAUDRI (1961)

The second work that Caudri publishes in volume 4, bulletin Nº 9 is called "*Some observations on the ferruginous interval in the Eocene section of Humocaro Bajo, Lara*". In this study she gives lists of larger foraminifera from specific localities, leading to a modification of the ages determined by Dr. Otto Renz (1906-1992) and supporting his initial suggestion of a sedimentary hiatus in the Early Eocene in this part from western Venezuela. It seems that, at least in Humocaro Bajo, the ferruginous interval is not from the Middle Eocene but from the Lower Eocene. This would speak in favor of a second alternative put forward by Renz, corresponding with reduced deposition during that time rather than a substantial hiatus in sedimentation between the Paleocene and Middle Eocene. Dr. Caudri had the impression that this "formation" of reduced, weathered and perhaps unevenly eroded deposits did not develop uniformly over greater distances. In the Baralt District and in the Carache River, the Middle Eocene is well represented, while in places like Humocaro Bajo it seems to be absent (CAUDRI 1961).

TIME IN SWITZERLAND

Dr. Bramine Caudri retired in Venezuela in 1961. She worked as a micropaleontologist in the oil industry for 22 years and later retired to live in the town La Tour de Peilz, Canton of Vaud, on Lake Geneva, Switzerland (Figure 31). In a short informative note written by Dr. R. M. Stainforth for the journal *Micropaleontology* in 1962, he noted the following:

> "*Dr. C. M. B. Caudri has retired after a long and useful career in this region. She and this correspondent were colleagues twenty years ago in Trinidad, and again in Bogota some time later. We will miss her stimulating presence and we all wish her the best as she settles in Switzerland. After leaving Venezuela, she spent a few months in*

Pointe-à-Pierre to complete an upcoming publication on the larger foraminifera of Trinidad."

She had important family ties to Switzerland, given that her mother was a citizen of this country, and given her long professional collaboration with Dr. Hans Kugler, a native of Basel, who had been her former boss in Trinidad. Dr. Kugler was an active member and curator of the Natural History Museum of Basel, an institution of outstanding relevance in the field of Caribbean micropaleontology, thanks in part to the noted interest of him, who knowing the importance of preserving material and information geology of this region, sent numerous samples and geological research materials to be archived and studied in various museums around the world, among which the United States National Museum (Washington, D.C), American Museum of Natural History (New York), Museum of Natural History in London and especially the Museum of Natural History in Basel, Switzerland, which preserves an outstanding geological heritage thanks to all these contributions by Kugler and his colleagues (SCHAUB 1974, JUNG 1987). These collections have irreplaceable value for science because they serve as evidence of field observations that have been published in specialized geological literature. Numerous sites and stratigraphic units that were used as type localities in the first description of rock formations or microfossils, are no longer accessible today. These collections in Basel offer the only opportunity to compare finds from other locations with those from the type localities (Figure 32) (KNAPPERTSBUSCH 2007).



Figure 31. View of La Tour de Peilz, Switzerland, the place where Dr. Bramine Caudri lived in retirement, behind the Nestle headquarters, a building that can be seen in the foreground in the left of the photo. Image taken from Lake Geneva by the author in 2011

She was a member of the Geological Society of Switzerland from 1937 onwards, and the Swiss Association of Petroleum Geologist and Engineering starting 1961. During this stage of her life in Switzerland, Dr. Caudri did not stop working and disseminating relevant information about her research on the larger foraminifera of the Caribbean, either through individual publications or in co-authorship with Dr. Kugler. Her time in Switzerland was one of prolific intellectual production, leaving her mark on the world of Caribbean Micropaleontology (Figure 33). Most of her technical articles were published in prestigious Swiss journals specialized in the field of Geology such as *Ecoglae Geologicae Helvetiae* and *Verhandlungen der Naturforschenden Gesellschaft in Basel*. The information presented took her more than three decades to be compiled and studied, in part due to her selfless dedication when she was working for various Caribbean oil companies. In most cases this information was initially reflected in private technical reports that were of a confidential nature to these oil operators from Trinidad, Colombia and Venezuela.

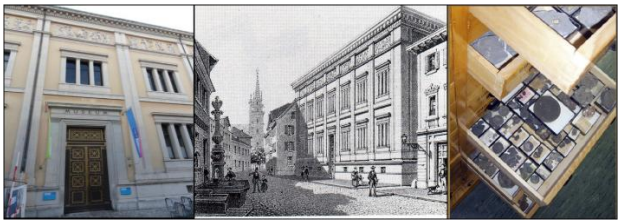


Figure 32. Photograph of the entrance to the Natural History Museum in Basel, Switzerland, taken by the author in 2011 (left). Lithograph from the museum in 1854 made by L. Graf (center). Cores, rocks and fossil samples from Venezuela stored in the museum (right). Sources: https://en.wikipedia.org/wiki/Museums_in_Basel#/media/ and KNAPPERTSBUSCH (2007).



Figure 33. Dr. Caudri during her stage of retirement. In this photo she is wearing her grandmother's dress for a family reunion

In 1972, Dr. Caudri published "*Systematics of the American Discocyclinas*" in volume 65, bulletin Nº 1 of the journal *Ecoglae Geologicae Helvetiae*. In this research, she follows and further develops Brönnimann's subdivision (1945) into two mainly different groups that are recognized as two unrelated families: *Discocyclinidae s.s.* and *Orbitoclypeidae* (Figure 34), rather than Vaughan and Cole's conception of the genera and subgenera of *Discocyclinidae*. A generic rank is assigned to all so-called

subgenres. Caudri indicates in this work that *Discocyclina s.s.* appears to be restricted to the eastern hemisphere while the American forms probably all belonged to *Orbitoclypeidae* and she proposed a new generic name for them: *Neodiscocyclina*. Creates another new genus, *Slenocyclina*, to separate the group of "*Proporocyclina*" *advena* from *Proporocyclina s.s.* The family *Discocyclinidae* in its restricted sense contains the genera: *Discocyclina*, *Actinocyclina*, *Proporocyclina*, *Alhecocyclina* and *Asterophragmina* (Figure 35). The genus *Orbitoclypeidae*: *Orbitoclypeus*, *Neodiscocyclina*, *Slenocyclina*, *Pseudophragmina* and *Asterocyclina*. The genus *Hexagonocyclina* provisionally places it in this last group, but its relationship is still unclear.

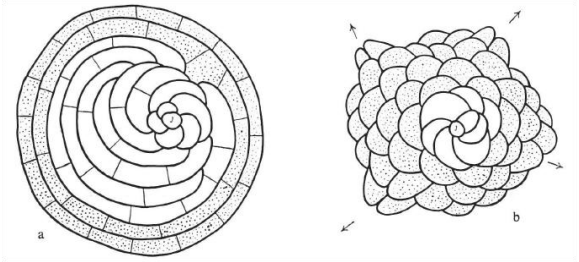


Figure 34. Schematic comparison of a): *Discocyclina papyracea* (Boubée)(family *Discocyclinidae*), and b): *Asterocyclina stellaris* (Brunner)(family *Orbitoclypeidae*). White chambers: nepionic stage; grey chambers: beginning of neanic stage. After BRÖNNIMANN (1945). Source: CAUDRI (1972a)

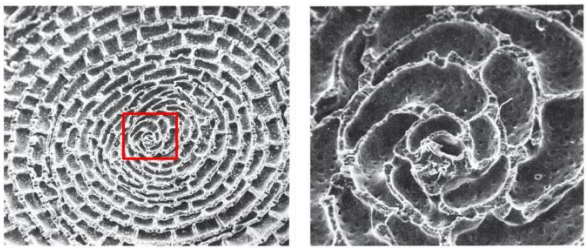


Figure 35. *Discocyclina archiaci* Schlumberger. On the left equatorial plane showing the first stages of spiral growth that present secondary subdivisions of the chambers and the first annular chambers, 250x. On the right, enlarged detail of the red box at 1000x. The proloculus is not completely open since the fracture does not exactly follow the equatorial plane. Source: CAUDRI (1972a)

In 1972, Dr. Caudri similarly presented a second article in the journal *Ecoglae Geologicae Helvetiae* entitled "*The Larger Foraminifera of the Scotland District of Barbados*", in the same volume and bulletin as the previous work. The island of Barbados, in the West Indies, is covered for the most part by Pleistocene coralline limestones, but in a large erosion window in its NE corner, the so-called Scotland District, the underlying Eocene and a little of the Oligocene-Miocene are widely exposed.

Based on a critical review of the literature published on the subject due to confusing and even frankly misleading results on the character of the foraminiferal fauna and given its importance for the stratigraphy and correlations in the Caribbean region, she decides to study in detail and clarify the errors that had been introduced and arrive at a better understanding of the data that was on hand at the time, combining this with a renewed study of samples collected by her in 1941 during a field excursion carried out together with Dr. Alfred Senn[8] (1899-1949), who through the long years of his residence on the island and his tireless efforts came to know this area like few others (Figure 36). With the intention of obtaining the best possible scientific results, Dr Senn after a previous detailed geological study of this area in 1940 subsequently divided his paleontological collection among different specialists in various fields for a more exhaustive analysis of the area, sending samples to J. W. Wells in Columbus, Ohio (corals), T. W. Vaughan in Washington, D.C. (orbitoids), Marie de Cizancourt in Paris (Nummulites and Operculinas), and a very limited amount of unclassified duplicate material to Bramine Caudri at the Pointe-à-Pierre Laboratory, for comparison with the local faunas of Trinidad.

Although T. W. Vaughan and Marie de Cinzancourt were aware of the fact that they had incomplete material, they did not contact each other and presented their readers with partial and distorted results of the fossil content of Barbados samples. To get a complete analysis of District Scotland's larger foraminiferal fauna, Dr Caudri had to combine all three lists; in addition to including new material collected by her and modernizing the names used in previous publications, so that they coincide with the other literature on the subject. Caudri's observations were included in private company reports in 1941 and after obtaining permission for publication in 1948, she only offered a preliminary list of fossils concerning a different topic, without further comment, until this publication of 1972, where she clarified the entire geological and paleontological panorama by making the pertinent corrections.

[8] Dr. Alfred Senn was born in Basel, Switzerland, on July 1, 1899. After preliminary studies at the universities of Neuchatel and Paris, he studied geology at the University of Basel, where he earned his doctorate with a thesis on the geology of the area between Mendrisio and Varese in the Southern Alps. He showed a predilection for stratigraphic problems and the application of modern paleontological methods in their solution. He worked as a geologist for North Venezuelan Petroleum from 1927 to 1932, where he had a good opportunity to apply his biostratigraphic training. Together with other colleagues, he studied the complex geological pattern and managed to subdivide and correlate the sediments of central and eastern Falcon. His efforts were decisive in establishing, for the first time in Venezuela, the zoning of the Tertiary sediments in the Falcon state, based on foraminifera. Between 1933 and 1936, he carried out similar work in Algeria and Morocco on behalf of the Compagnie Françoise des Pétroles. In 1937, Dr. Senn returned to the Caribbean region and, due to World War II, remained there until 1946 carrying out a detailed geological study of the Island of Barbados for the British Union Oil Company. He died at an early age on January 29, 1949, in Samaden, Engadin, Switzerland (VONDERSCHMITT 1950).

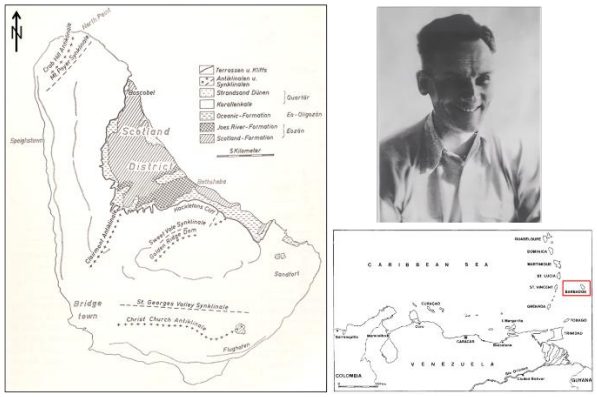


Figure 36. Geological map of Barbados Island, where the Scotland District stands out to the NE along with the different Tertiary stratigraphic units that emerge on the island, and on right photograph of Dr. Alfred Senn, who worked on the geology of Barbados for almost 10 years and he accompanied Dr. Caudri in collecting samples for her micropaleontological studies in 1941. Sources: WEYL (1966) and VONDERSCHMITT (1950).

She concludes that the Upper Scotland Formation of Barbados is the Lower Middle Eocene age, based on the following foraminifera: *Discocyclina s.s.*, *Asterocyclina*, *Nummulites*, *Operculina* and *Amphistegina* cf. *lopeztrigoi*, but its fauna is highly contaminated with reworked material from the Paleocene. On the other hand, the Lower Scotland Formation, in which only occasionally some small *Nummulites* or a good number of small *Discocyclinas* were found, was placed in the Lower Eocene for reasons of stratigraphic positioning. *Ranikolhalia*, "*Discocyclina*" (*Neodiscocyclina*) *grimsdalei* and associated species, and *Actinosiphon* do not continue into the Middle Eocene: they have a restricted vertical range in the Paleocene and Lower Eocene, and their presence in the strata of the Upper Scotland Formation is due to secondary deposition.

In 1974, Caudri published another of her classic Caribbean works on larger foraminifera, corresponding to Venezuela, which she called "*The Large Foraminifera of Punta Mosquito, Margarita Island, Venezuela*", published in volume 84 of the Bulletin *Verhandlungen der Naturforschenden Gesellschaft in Basel*. In this study, Caudri describes the larger foraminifera from three samples of the Punta Mosquito Formation (Figure 37) supplied by micropaleontologist Dr. Pedro J. Bermudez in 1967, who had studied this area in previous years, and she discusses the age of this formation, the youngest member of the Punta Carnero Group on Margarita Island, a stratigraphic unit that had been the subject of controversy for several years, considered by some authors to be Late Eocene (Dr. Paul Brönnimann) and by others as Middle Eocene age, including by Dr. Bermudez and Dr. J. Butterlin from the Ecole Normale Supérieure de Saint-Cloud in Paris, which led Dr. Caudri to investigate the foraminifera and the age of this formation (Figure 38).

In the analysis of the three samples, Caudri deduces that although they come from the same locality, the samples in the collection were not the same, two of them are similar according to their faunal associations and a third sample came from a completely different deposit. In the field, sample collectors had already noticed a kind of differentiation in the Punta Mosquito Formation, mentioning two different levels that could be clearly distinguished from each other both lithologically and biostratigraphically. One sample was described as a calcareous shale and the others as highly fossiliferous marly limestone. The conclusion is that one of the samples is older than the other two, but that they are all from the Middle Eocene, and the material is contaminated with remains of detritus from Upper Eocene formation that appears to have been completely eroded on the island, due to a few forms in the fauna, such as *Helicostegina soldadensis*, *Lepidocyclina spatiosa* and *Asterocyclina asterisca* that are characteristic of the Upper Eocene.

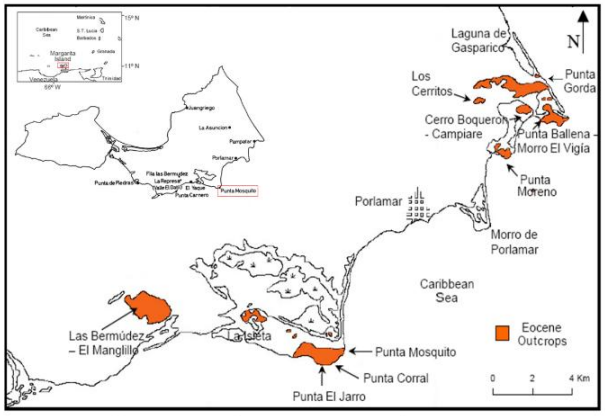


Figure 37. Map with the location of Punta Mosquito on Margarita Island, Venezuela, where were collected by Dr. Pedro J. Bermudez the geological samples containing larger foraminifera, and dated by Dr. Bramine Caudri as Middle Eocene.

Source: Modified from CAMPOS & GUZMAN (2002)

These few isolated individuals, hidden in the immense mass of Middle Eocene specimens, may be the eloquent witnesses of the contamination of an unprotected outcrop with washed debris from a completely bare younger formation. In this research, in addition to studying the larger foraminifera, Dr. Monique Tourmakine from the Federal Institute of Technology in Zurich analyzed the planktonic foraminifera of the 3 samples, determining in two of them the presence of the index species *Orbulinoides beckmanni*, which establishes the age without a doubt as Middle Eocene (Caudri, 1974). In the Punta Mosquito Formation, Dr. Bramine Caudri defined two new genera of larger foraminifera as: *Margaritella* and *Epiannularia*, as well as the new species: *Amphistegina pregrimsdalei*, *Asterocyclina preasterica*, *Margaritella ospinae* (genotype) and *Epiannularia pollonaisae* (genotype) (Figure 39).



Figure 38. Geologist Alex Lorenz working in front of outcrops of limestones and shales of Middle Eocene of Punta Mosquito in 1949 (left image) and sheared orbitoidal limestone belonging to this formation, near to the "Santiago Mariño" Airport from Margarita Island, Venezuela. Sources: CASAS & URBANI (2024) and right image courtesy of M.Sc. Tulio Peraza

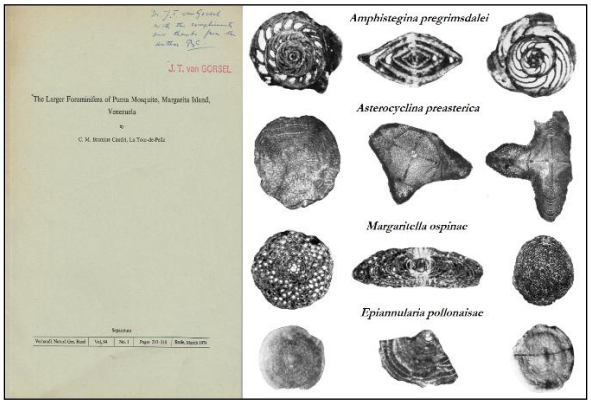


Figure 39. Cover of the paper on the *Larger Foraminifera of Punta Mosquito, Margarita Island, Venezuela*, with dedication from Dr. Bramine Caudri to Dr. J. T. van Gorsel in the upper right part (left photo) and images of the new genera and species defined in this work as: *Amphistegina pregrimsdalei*, *Asterocyclina preasterica*, *Margaritella ospinae* and *Epiannularia pollonaisae* (right image).
Cover courtesy of Dr. J. T. Van Gorsel.

In 1975 she again published two papers in the journal *Ecoglae Geologicae Helvetiae*, the first of them co-authored with Dr. Hans Kugler called "*Geology and Paleontology of Soldado Rock, Trinidad (West Indies)*", where aspects of Geology and Biostratigraphy are discussed, and a second individual paper, referring to the larger foraminifera of this small islet, located in front of the southwest point in Boca de Serpiente, between Trinidad and Venezuela (Figure 40), about 10 kilometers west of the Bay of Columbus on the Cedros Peninsula.

The Soldado Rock islet is nothing more than a mixture of Paleocene and Eocene olistostromes in Miocene turbidites, where up to twelve different rock units have been recognized from south to north. This steep islet has two peaks with an area of about 6,500 m^2 (Figure 41). Both peaks, the highest of which is 36 meters above sea level, are formed by limestone and between them is a saddle made of silt and marl of lesser hardness. Already in 1939, Dr. Hans Kugler had participated in the negotiations of border agreements on the property of Soldado Rock (Trinidad) and Patos Island (Venezuela) in the Gulf of Paria and the location of the maritime border between Trinidad and Venezuela.



Figure 40. Geographic location of the islet of Soldado Rock (purple circle) and the town of Pointe-à-Pierre in Trinidad, where Dr. Bramine Caudri lived and worked (green circle) during her time in this country. Source: KUGLER & CAUDRI (1975)

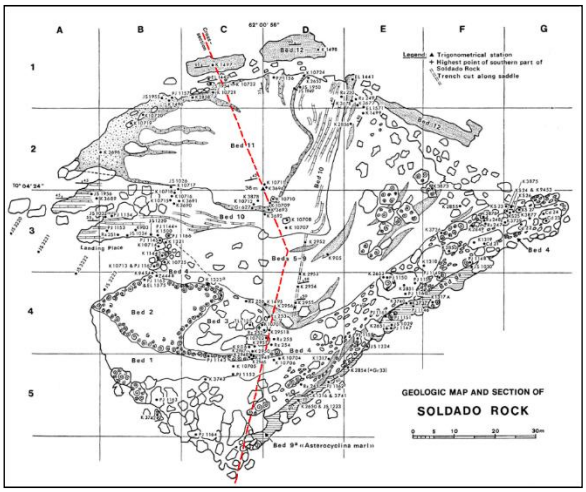


Figure 41. Geological map and section of the Soldado Rock islet in Trinidad, where the areal distribution of the different layers and samples studied with biostratigraphic and paleontological objectives can be seen. Source: KUGLER & CAUDRI (1975)

From the point of view of paleontology and its applications to regional stratigraphy, Soldado Rock is one of the most important localities in the Caribbean region. This small erratic piece of rock in the middle of the sea between Trinidad and Venezuela provided the type material for a good number of species and varieties of mollusks, echinoids, brachiopods and foraminifera, most of them (at least of the foraminifera) useful markers for correlation over long distances. Soldado Rock is the type locality for 11 small foraminifera, 20 larger foraminifera, 54 mollusks, 2 brachiopods, 3 echinoids and 5 ostracods. The molluscan fauna of the southern summit of the two-pointed islet earned it the title of Paleocene-type locality for this region (Soldado Formation), while the higher northern summit turned out to be the only known remnant of a formation marking the boundary between the Lower and Middle Eocene (Boca de Serpiente Formation, Early Middle

Eocene), which has been destroyed by erosion and has never been found in situ, a geological formation to which Dr. Caudri gave special attention to the fauna and general nature of this stratigraphic unit, since it is part of a remnant landslide mass (*flysch*) and it remains one of the greatest enigmas in the Caribbean region (Figure 42).

In the paleontological part of the study, Dr. Caudri described forty-nine species and varieties of larger foraminifera from the Paleocene, Early Middle Eocene and Upper Eocene, ten of them new to science: *Operculinoides trinitalensis var. granulata*, *Operculinoides spiralis*, *Neodiscocyclina mauryae*, *Asterocyclina soldadensis*, *Amphistegina undecima*, *Amphistegina paueiseptala*, *Amphistegina grimsdalei*, *Lepidocyclina peruviana var. nana*, *Lepidocyclina pustulosa var. compacta* and *Lepidocyclina spatiosa*. She applied a new generic name, *Helicosteginopsis*, to *Helicostegina soldadensis* Grimsdale given its stratigraphic importance and proposed a revision of the phylogenetic relationships between this species and *Helicostegina*, *Helicolepidina*, *Polylepidina*, among others. The recognition of significant reworking in the upper part of the Soldado Rock stratigraphic section changed long-held ideas about the vertical range of several of the species described in previous studies (CAUDRI 1975).

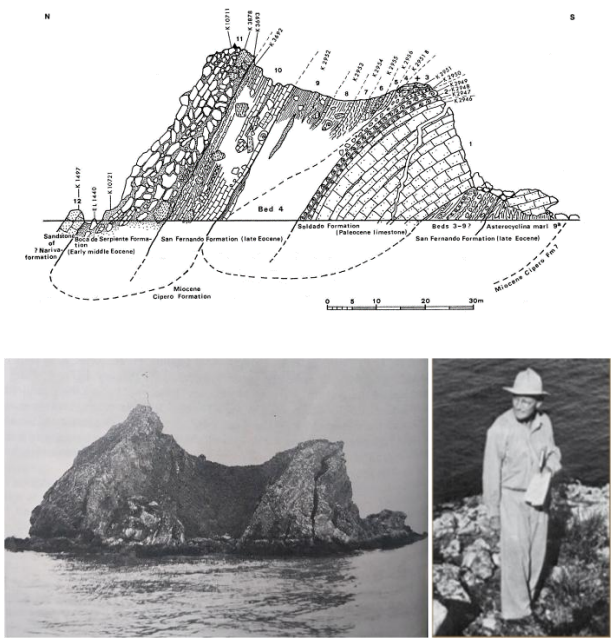


Figure 42. Geological cross-section N-S of the Soldado Rock islet, Trinidad, located in the upper figure, where the stratigraphic relationships of the different formations and the layers studied can be seen. Likewise, a photo can be seen in the lower part taken in May 1946 with a view from the west, during a stage of field gelogy carried out by Dr. Hans Kugler (in the lower right photo), co-author of the study. Sources: KUGLER & CAUDRI (1975) and KNAPPERTSBUSCH (2007).

The work, begun over thirty years before its publication in 1975, was repeatedly delayed and interrupted by all sorts of adverse events, according to Dr. Caudri, including moves to five different countries (Trinidad, Barbados, Colombia, Venezuela and Switzerland). Dr. Caudri's original intention was to include in a single comprehensive paper all the material she had analyzed from Trinidad, both from the main island and the small islet.

However, it was later decided that a single monograph on Soldado Rock, combining its paleontological and stratigraphic aspects, would be preferable, and the publication of data on Trinidad Island would be postponed to a later date. A solid basis for understanding the paleontological criteria and local problems at Soldier Rock was laid early on by Dr T. F. Grimsdale (Figure 43), with whom Caudri shared a free exchange of thin sections, technical knowledge, photographs and ideas, as he had worked on the micropaleontology of larger foraminifera on this islet in previous years when working for Shell in Trinidad.

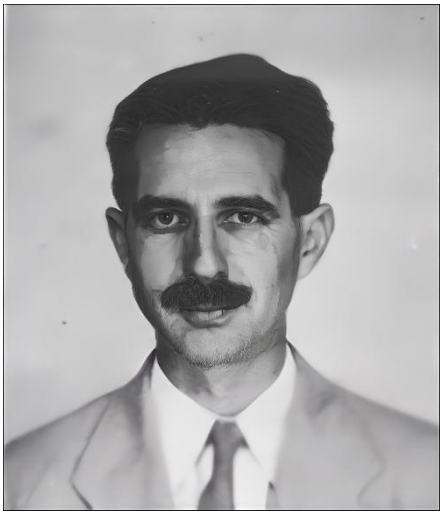


Figure 43. Dr. Thomas Francis Grimsdale, a British micropaleontologist specializing in foraminifera, with whom Dr. Caudri shared and discussed information regarding Soldado Rock in Trinidad. Source: GRIMSDALE (1948)

In 1984, D. Haman and R. W. Huddleston proposed the genus *Caudriella* as a replacement name, according to Article 53 of The International Commission on Zoological Nomenclature (ICZN) for *Margaritella*, a genus that had been introduced by Caudri in 1974 with the type species *Margaritella ospinae*, a larger foraminifera obtained from the upper level of the Punta Mosquito Formation of Middle Eocene on Margarita Island, Venezuela. Since this generic name was occupied twice, by *Margaritella* Meek and Hayden, 1860 (trochid mollusks from the Jurassic and Cretaceous of Nebraska), and the gastropod genus *Margaritella* Thiele, in Troschel (1891:259), later corrected (Thiele, in Troschel 1893:406), this replacement of *Margaritella* was proposed. The new name *Caudriella* was established in honor of C. M. Bramine Caudri in recognition of all her micropaleontological studies (Figure 44). This change was authorized by Dr. Caudri to correct the generic homonym (HAMAN & HUDDLESTON 1984).

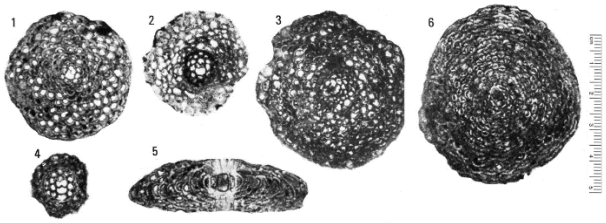


Figure 44. Larger foraminifera redefined as *Caudriella ospinae*, in honor of Dr. Bramine Caudri for her contributions to micropaleontology. 1-4, 6: horizontal section 36x; 5: vertical section 36x; 3: holotype. Source: CAUDRI (1974)

Caudri's study of the larger foraminifera of Trinidad was based on considerable faunal material, and advanced stratigraphic information to date the sediments from the Cretaceous to the Miocene. She described 24 localities containing larger foraminifera and paid special attention to the San Fernando area (Figure 45), which is of particular interest because of abundance of this type of foraminifera and its detailed stratigraphic record, as well as to the Late Eocene transgression in this area which took place in two phases, and the transgressive interval (Marabella marl) between the Late Eocene and Oligocene. That interval could not be recognized by using planktonic foraminifera, but it stands out clearly by its larger foraminifera. She investigated 120 taxa with their age ranges through distribution diagrams and described the following taxa as new: *Operculina bonioarensis*, *O. bontourensis var. ornala*, *Operculinoides ocalaniis var. decoratus*, *O. suleri*, *Heterostegina indicala*, *Lepidocyclina* (*Polylepidina*) *nitida*, *L. yurnagiinensis var. infiala*, *L. sanferntmdensis var. depressala*, *L. asterocolumnata*, *Eoconuloides senni var. conicus*, *Helicolepidinoides intermedius* and *Amphistegina farallonensis* (Figure 46).

Bramine Caudri completed her final manuscript on the larger foraminifera of Trinidad in 1985, a work consisting of 501 typewritten pages, 30 plates, 7 figures and distribution charts. Together with the illustrated specimens, her manuscript was archived for later publication at the Natural History Museum in Basel, an institution that always gave her full support in her research. Due to the size of this material, particularly the systematic part, it was difficult to finance its publication at that time. This work was published posthumously 11 years later in 1996 in the journal *Ecoglae Geologicae Helvetiae* and it was edited by Dr. Hans M. Bolli (1917-2007) in collaboration with Dr. Jean-Pierre Beckmann (1927-2002) (Figure 47). They decided to condense its size without losing relevant data, including illustrations and charts.

Basically, the reductions affected the systematic part. Although the newly proposed taxa remained fully documented, synonym lists, detailed descriptions, and discussions of previously published forms were reduced. In numerous cases, the reductions affected taxa that had already been treated by Caudri in her publication of Soldado Rock in 1975. Caudri's contribution substantially complemented the documentation on the systematics and stratigraphic distribution of the larger foraminifera from the main island of Trinidad and from the nearby Soldado Rock islet.

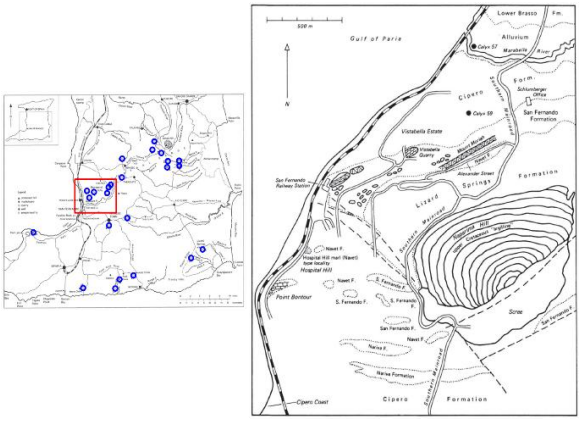


Figure 45. Map of Trinidad (left) showing the 24 larger foraminifera localities (blue circles) studied by Dr. Bramine Caudri and a geological map of San Fernando on the right, enlarged from the red box, highlighting the main stratigraphic units of this area. Source: CAUDRI (1996).

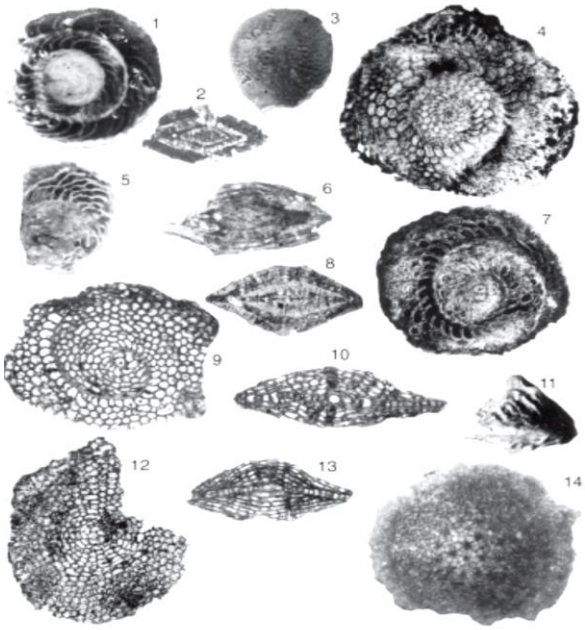


Figure 46. Photographs of some larger foraminifera fossils defined as new species and varieties in Trinidad by Dr. Caudri, among which the following stand out: 1-2: *Amphistegina farallonensis*; 3-8: *Helicolepidinoides intermedius*; 9-10: *Helicolepidina polygyralis* Barker; 11: *Eoconuloides senni var. conicus*; 12-13: *Lepidocyclina* (*Polylepidina*) *nitida*; 14: *Lepidocyclina asterocolumnata*.
Source: CAUDRI (1996)

In 1990, Dr. Caudri published again in *Eclogae Geologicae Helvetiae* her last paper called "*A note on the type material of the genus Ranikothalia* (*Foraminifera*)", in which she proposed separating the peculiar "*Nummulites cordelees*" of the Paleocene described by de CIZANCOURT (1948), with an exaggerated development of the marginal cord, from the general genus *Nummulites* under the name *Ranikothalia*. Since then, a

controversy arose among several specialists about the need for this new genus. Some authors, for purely morphological and statistical reasons, refused to separate it from *Nummulites*, *Operculinoïdes*, *Operculina* or even *Miscellanea*, as the case may be, while others accepted it by recognizing these specific forms as a very close group, limited in geological time. Between certain latitudes, the distribution of *Ranikothalia* is practically worldwide, but it is still an open question as to how many species the genus comprises. The variability in both external form and internal characteristics is so great, that the population of any given locality can easily be divided into ten different species or grouped together by statistical methods.

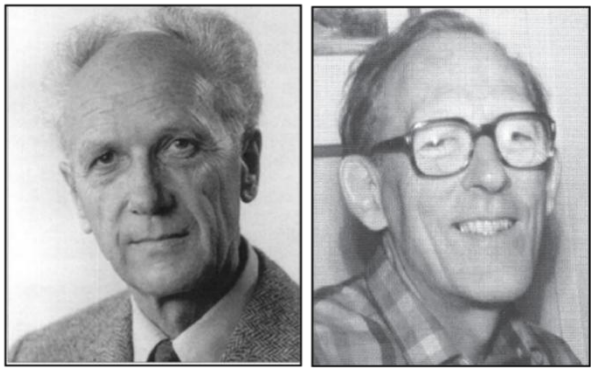


Figure 47. Dr. Hans Bolli (left) and Dr. Jean-Pierre Beckmann (right), Swiss micropaleontologists, who edited Dr. Caudri's work on Trinidad larger foraminifera in 1996, which was archived by her at the Natural History Museum in Basel.
Sources: LUTERBACHER (2007) and BOLLI (2002)

The specimens of *Ranikothalia* were obtained by Caudri from Venezuela in 1944, in the hard limestones of San Juan de Los Morros, in the Guarico state, which were well preserved and in situ, which demonstrated the presence of this form also in the Paleocene of the Caribbean region. These forms have subsequently been observed in many places in the western hemisphere and described and represented with various local names (*Nummulites bermudezi*, *soldadensis*, *antillea*, *tobleri*, etc.). Caudri was in favour of calling the Caribbean species *Ranikothalia catenula*, even listing its three morphological varieties "*antillea*", "*tobleri*" and "*soldadensis*" as she did in her Soldier Rock paper in 1975. The type species of this new genus defined by Caudri, is the same *Nummulites nuttalli* from the original Ranikot sites at Thal in Sind, western Pakistan (Figure 48).

The publications on larger foraminifera in the Caribbean carried out by Dr. Caudri, which have been mentioned in this research, were sent to other micropaleontologists in the region who were working in this important field, for example Dr. Pedro J. Bermúdez, who kept part of these papers by Dr. Caudri in his prolific personal library, now owned by the Micropaleontology Center of INTEVEP, S.A., where her papers were accompanied by a small dedications to him (Figure 49).

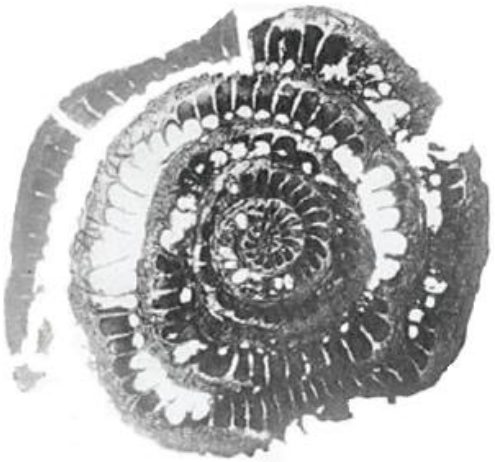


Figure 48. Fossil of *Ranikothalia nuttalli* reference. Horizontal section 6x. From the uppermost part of the Ranikot beds at Jherruck, Sind, western Pakistan, where the generic name came from. Source: CAUDRI (1934)

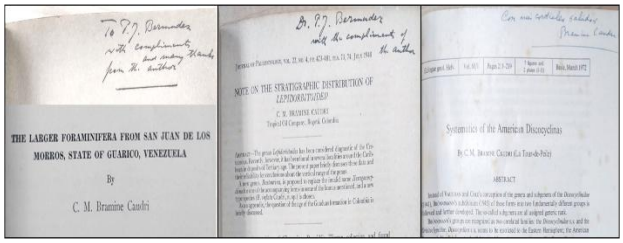


Figure 49. Covers of some of Dr. Caudri's papers sent and dedicated in the upper right corner to Dr. Pedro J. Bermudez in Venezuela. Images courtesy of "Dr. Pedro J. Bermudez" Micropaleontology Center of INTEVEP, S.A.

Studies of larger foraminifera have been of great importance not only to determine, together with other specialties of micropaleontology, the age ranges of rocks, but also because this type of fossils allow for fairly precise paleoenvironmental reconstructions within sedimentary basins. The larger foraminifera are found in abundance in the shelf regions of most shallow tropical and subtropical marine environments, especially in carbonate-rich environments.

In fact, this appears to have been the case since the first larger foraminifera emerged. Thus, here lies the enormous importance of the studies carried out by Dr. Caudri throughout her lifetime. She made a notable contribution to micropaleontology in the knowledge of this type of fossil organisms and their usefulness to Caribbean geology.

BRAMINE CAUDRI, THE ARTIST

From a very early age, Bramine Caudri had a great talent for artistic activities in general. She had no direct descendants, but her closest surviving relatives in the Netherlands, USA, Germany, and Ecuador, preserved part of this personal artistic legacy of "Aunt Bram" or "Tante Bram", as she was affectionately called by them. Among these early works, different freehand paper cutouts stand out. The first consists of figures about persons and animals (Figure 50), and she made

cuttings for her parent's silver wedding depicting the couple tending to a newborn baby (Figure 51, left) and a Dutch groom climbing a mountain to his Swiss bride (Figure 51, right). After that, she made a brooch with a female figure that we interpret as alluding to a druidess or enchanter busy with a magic ritual denoted by the cauldron in front expelling smoke, which was seemingly a popular theme in those times. Caudri produced this last work when she was approximately 14 years old (Figure 52, left).



Figure 50. Paper cutouts about persons and animals made by Bramine Caudri in the early stage

Other work on paper is a round cutout with elaborate and fine details, which she made without a preliminary drawing, and produced in 1921 when she was approximately 17 years old. This artwork is worth analyzing for all the Christian iconography reflected in the image (Figure 52, right). First, the cut-out depicts an octagon (eight-pointed), which represents the connection between Heaven and Earth, a very characteristic geometric figure used in baptismal fonts in churches. In the central image of the cut-out is Lamb of God and two trees at both ends that are found in the Garden of Eden and that symbolize one "*the tree of discernment of good and evil*" and the other the "*tree of life*".

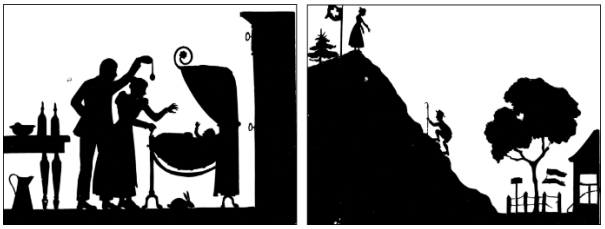


Figure 51. Cuttings made by Bramine Caudri in the latter stage for her parent's silver wedding: with a newborn baby (left image), with the Dutch groom climbing a mountain to his Swiss bride (right image).



Figure 52. [Left] Brooch with paper cutout and footnote written by Caudri that reads as follows: "*cut by Bram Caudri, the paleontologist, at ± 14 years of age*". [Right] Paper cutout alluding to Christian iconography, made by hand without a preliminary drawing by Caudri in 1921, 10.2 cm in diameter

On the periphery of the artwork, located exactly at the four cardinal points, is the Holy Spirit represented by the dove (top), the Chrismon or anagram formed by the superposition of the first two letters of the name of Christ in Greek, chi (X) and rho (P) (bottom), the alpha and omega (A- Ω) which are the first and last letter of the Greek alphabet traditionally used as a phrase of the Beginning and the End (right), and the Fishes used by the first Christians, to identify themselves as "*fishers of men*" (left). Additionally, on the periphery at 45º from the cardinal points, the 4 evangelists are also represented, clockwise there are Mark (Winged Lion), John (Eagle), Luke (Bull) and Matthew (Angel).

Then, with the passage of time, Caudri began to show innate abilities for drawing (Figure 53) and painting, skills that of course, would be later developed in her professional stage by faithfully representing her cherished fossils as highlighted in previous chapters. In 1929, during her university years when she was 25 years old she created her first pictorial work preserved by relatives, consisting of a watercolor on cardboard with a motif that titled: *Still Life of Bible and Cup*, the latter perhaps in allusion to an empty sacred chalice (Figure 54). These two elements together could indicate another type of Christian iconography that suggests that the word of God without someone to interpret it and give it meaning is nothing more than dead words (in reference to the closed Bible with its back to the viewer).

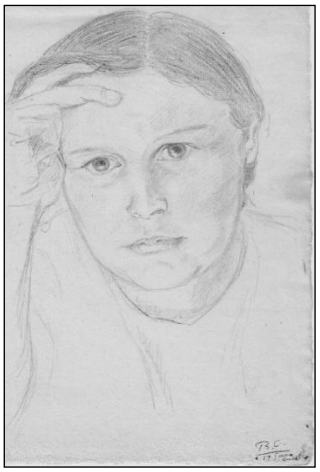


Figure 53. Self-portrait made by Bramine Caudri when she was 17 years old



Figure 54. Watercolor on cardboard made in 1929 by Caudri, in which she represents a *Still Life of a Bible and a Cup*. Dimensions 22 cm x 16 cm

In 1941, while working as a micropaleontologist in Trinidad, she drew what is perhaps her most notable artwork in pencil, referring to a *Madonna and Child* (Figure 55). About this artwork, Bramine Caudri herself wrote a letter dated October 5, 1982, in La Tour de Peilz, Switzerland, which she sent to her niece Claire Portheine in the Netherlands, explaining all the aspects that inspired and motivated the creation of this eminent artistic work. In the letter, which was translated from Dutch to English by relatives, she narrates that sitting next to the bedside of a dear friend who was very ill with malaria, but fortunately recovered later, the following:

> "*You may have studied Art History but I bet that you have never encountered a Madonna like this: namely one who expresses her fear to release her beloved child into the terrifying mess of the human world.*
>
> *Highly unorthodox, because in fact she must have found the courage to accept this sacrifice from the beginning as unavoidable and sacred, but how difficult. I think she must have had such moments of weakness.*
>
> *This Madonna is inspired by a microfossil, a Globigerina, that I had drawn shortly before as an illustration for a publication by someone else. It measures less than a millimeter and looks like this: (little sketch)*
>
> *It suggested to me the form of the protective arm around the child. These things can happen suddenly to you"*
>
> *Tante Bram*

The letter indicates high sensitivity and deep connection with religion that Dr. Bramine Caudri had, since from the natural world she captured, from a very small fossil observed under a microscope for a publication (we assume for Dr. H. H. Renz), a vision of religious nature came to her, and she was able to show it in such a human and realistic way through this excellent painting, thus connecting art through these three worlds: nature, spiritual, and human. According to her relatives, she was a very lively entertaining lady, full of funny stories and very welcoming during the time at her house in Switzerland.

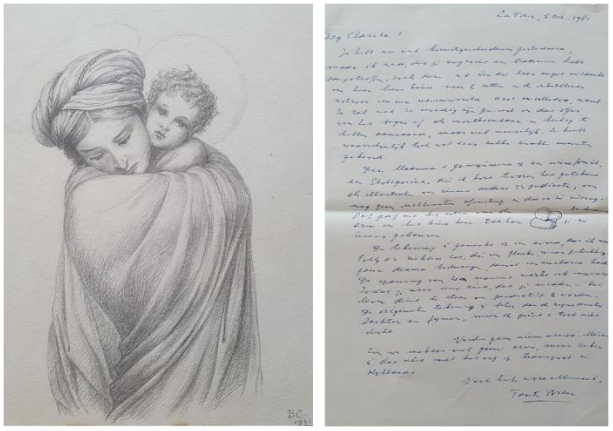


Figure 55. *Madonna and Child*, pencil drawing by Caudri made in 1941, dimensions 26 cm x 18 cm. On the right is the letter dated October 5, 1982, where she explains the genesis of this artwork inspired by a *Globigerina*, and suddenly she saw the form of the Madonna and Child in the microfossil, which appears illustratively in a sketch in the letter sent to Claire Portheine.

.During her time in Venezuela in the 1950s, the Avila Mountain Range in Caracas and its surrounding areas served as an inspiration for Dr. Caudri, to paint oil landscapes in her free time, clearly reflecting the beauty characteristic of the environment that surrounded her through these artworks that continuing with a long tradition started by renowned European painters who captured the Venezuelan natural landscape such as Ferdinand Bellermann (1814-1889) and Anton Goering (1836-1905). In a short autobiography written by her on August 29, 1987 for Dr. Peter Soder of the Natural History Museum in Basel, she highlighted, in addition to her profession, this important artistic work carried out during her stay in the country (DOCUMENTARY APPENDIX 2).

In several of her wonderful artworks, in addition to faithfully representing the mountain in front of Caracas, she perfectly captures the Eastern Peak and Naiguata Peak and also visited other places of this mountain range, among these she visited the Hacienda San Diego in Carabobo state, capturing in some of them the houses of the rural environment of that time. She also made a painting of the Caribbean Sea in the central coast. She depicted the plants characteristic of the tropics, among which, for example, banana and bucare trees stand out with great artistic precision (Figure 56).



Figure 56. Oil paintings made by Dr. Bramine Caudri of the Avila Mountain Range and surrounding areas during the 1950s in varying sizes, where she realistically captures the vivid colors of the mountains and nature characteristic of this central region of Venezuela, the coast, towns, as well as the plants (banana and bucare trees) and old colonial aqueduct.

She also painted the remains of an old colonial hydraulic engineering work corresponding to an aqueduct with great realism and, based on our research, it can be deduced that it was located in the Aragua Valleys (Figure 57). These paintings

are now preserved by her relatives, as well as other types of personal objects such as her travel chest from Trinidad.



Figure 57. Section of an old colonial aqueduct in the Aragua Valleys, which may have inspired Dr. Caudri to paint one of her paintings showing this type of hydraulic work. Source: ARCILA (1961)

Dr. Caudri also had an appreciation for poetry and she preserved a notebook of poems among her belongings (Figure 58) that is currently kept by her niece Ellen van Nierop, in which she transcribed in English and Dutch some poems alluding to themes such as war and nature. We can mention among these outstanding poems "*The Soldier*" (DOCUMENTARY APPENDIX 3), written by the British Rupert Brooke (1887-1915) in 1914 and the poem "*Before Action*", also written by the British William Noel Hodgson (1893-1916) just 2 days before his death, on June 29, 1916. Both poets were victims of terrible conflict of the First World War. This book also highlights a poem alluding to nature entitled "*De Hemelspiegel*" (The Mirror of Heaven), written in her native language, and between its pages she also preserved pieces of paper containing Christmas carols such as "*Stille Nacht*" (Silent Night) in German, a church service alluding to Easter (Dutch) and the sheet music of the popular Swiss folk song known as "*Ranz des Vaches*" along with a newspaper clipping with it translation from the Gruerien patois dialect (Arpitan) into French.

In addition to all this fruitful artistic activity developed in her life, Dr. Caudri donated three typical ethnographic works from Venezuela and one from Colombia, acquired when she lived in both countries, to the collection of the Museum of Cultures in Basel, Switzerland, which is one of the main ethnographic museums in Europe (Figure 59). Among these donations highlight a handle basket from the aboriginal culture of the Gran Sabana in 1969, a hammock made in the Lara state in 1972, a basket from the Pemon culture of Canaima in 1990 and a bowl from the Quimbaya culture of Nariño, Colombia, donated in 1967.

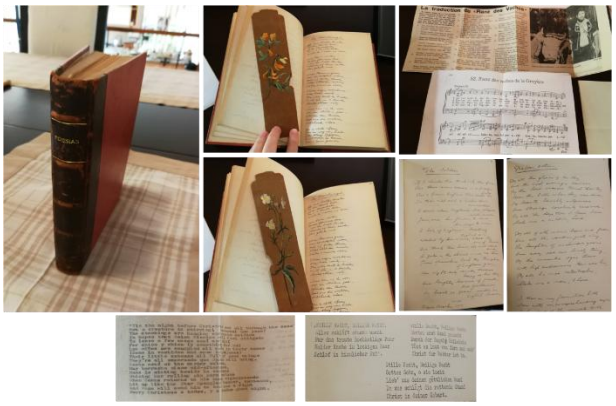


Figure 58. Poetry notebook belonging to Dr. Caudri (left image) with extract of some poems copied by her in Dutch (De Hemelspiegel) in the central part and English ("*The Soldier*", "*Before Action*") in central right, as well as Christmas carols (*Silent Night*) in the bottom and the sheet music of the Swiss folk song "*Ranz des Vaches*" (top right corner)

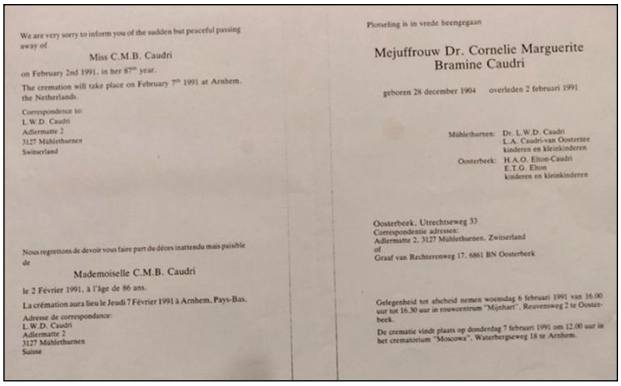


Figure 59. Museum of Cultures in Basel, Switzerland, where ethnographic works from Colombia and Venezuela donated by Dr. Caudri are stored. Taken by the author in 2012

After a long life, spanning almost 30 years in La Tour de Peilz, Switzerland (Figure 60), Dr. Caudri retired to Oosterbeek, the Netherlands, where she passed away peacefully at the age of 86 on February 2, 1991. Five days later, on Thursday, February 7, 1991, at 12 noon, her remains were cremated in the "*Moscowa*" cemetery in the nearby city of Arnhem (Figure 61).



Figure 60. Dr. Bramine Caudri at the age of 74, holding and feeding the grandson of her brother Dr. L.W.D. Caudri in mid-October 1979 in Groningen, the Netherlands. She went to visit him, as he was only a few months old and the family would honor her by naming the child as Bram Caudri.



We are very sorry to inform you of the sudden but peaceful passing away of

Miss C.M.B. Caudri

on February 2nd 1991, in her 87th year.

The cremation will take place on February 7th 1991 at Arnhem, the Netherlands.

Correspondence to:
L.W.D. Caudri
Adlermatte 2
3127 Mühlethurnen
Switzerland

Nous regrettons de devoir vous faire part du décès inattendu mais paisible de

Mademoiselle C.M.B. Caudri

le 2 Février 1991, à l'âge de 86 ans.

La crémation aura lieu le Jeudi 7 Février 1991 à Arnhem, Pays-Bas.

Adresse de correspondance:
L.W.D. Caudri
Adlermatte 2
3127 Mühlethurnen
Suisse

Pioneering is in vrede heengegaan

Mejuffrouw Dr. Cornelie Marguerite
Bramine Caudri

geboren 28 december 1904 overleden 2 februari 1991

Mühlethurnen: Dr. L.W.D. Caudri
L.A. Caudri-van Oosterzee
kinderen en kleinkinderen

Oosterbeek: H.A.O. Elton-Caudri
E.T.G. Elton
kinderen en kleinkinderen

Oosterbeek, Utrechtseweg 33
Correspondentie adressen:
Adlermatte 2, 3127 Mühlethurnen, Zwitserland
of
Graaf van Rechterenweg 17, 6861 BN Oosterbeek

Gelegenheid tot afscheid nemen woensdag 6 februari 1991 van 16.00 uur tot 16.30 uur in rouwcentrum "Mijnhart", Reuvenweg 2 te Oosterbeek.

De crematie vindt plaats op donderdag 7 februari 1991 om 12.00 uur in het crematorium "Moscowa", Wasenbergseweg 18 te Arnhem.

Figure 61. Note informing (in English, French and Dutch) of the death of Dr. Bramine Caudri by her brother Dr. L.W.D. Caudri in Switzerland and other relatives in the Netherlands, which occurred on February 2, 1991 in Oosterbeek, as well as details of her subsequent funeral. Image courtesy of Dr. J. T Van Gorsel

FINAL COMMENTS

Dr. Bramine Caudri had a long and distinguished professional and personal life, leaving an important legacy in the field of micropaleontology of larger foraminifera not only in Indonesia but also in the Caribbean for almost 30 years, working for academia and the oil industry in this American region. She made an effort to publish much of her research carried out in Trinidad, Barbados, Colombia, and Venezuela. With this biography we want to honor her memory 120 years after her birth and make visible to the scientific community her lifetime of significant efforts and contributions in geology and paleontology, as well as her outstanding works in the artistic field, each of which are worthy of recognition.

There have been many women who have played a decisive role in the history of geosciences, although, unfortunately, their contributions have not been sufficiently recognized, largely because it has been interpreted as a field of knowledge exclusively dominated by men. However, Bramine Caudri was an exceptional woman and pioneer in her field of research, which, together with a notable dedication and character, allowed her to shine and stand out among important personalities in the world of micropaleontology.

ACKNOWLEDGEMENTS

The author would like to express his gratitude for the important support and fundamental collaboration of the relatives of Dr. Bramine Caudri, which includes: Claire Portheine, Gijsbert Jan Portheine, Eric Portheine, Marien van Nierop, Ellen van Nierop, Ernst van Nierop, Willem Caudri, Bram Caudri, Daan Caudri, Lotte Caudri, Joyce Meijer-Elton, and Stephanie Fijten, who contributed with all kinds of reference information such as photos, letters, texts, artworks, among others, without which this research would not have been possible. Also, a very special thanks to Dr. J. T. van Gorsel in Houston, Texas for providing us with relevant material of Dr. Caudri, as well as M.Sc. Gilberto Soto from the "Dr. Pedro Joaquin Bermudez" Micropaleontology Center, M.Sc. Lisskell Franco from the Technical Information Center, and M.Sc. Mauricio Hernandez from the Exploration Management of INTEVEP, S.A., for their valuable documentary materials and technical discussions in the preparation of this paper.

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DOCUMENTARY APPENDIX 1

Contract signed by Dr. Caudri with the Texas Petroleum Company in Caracas on December 5, 1950
(*Source: Willem Caudri*)

TEXAS PETROLEUM COMPANY
APARTADO No. 267
CABLE AND TELEGRAPHIC ADDRESS "TEXPET"
CARACAS, VENEZUELA

December 5, 1950

Miss C. M. B. Caudri
Caracas, Venezuela

Dear Miss Caudri:

In order that you may be fully informed as to the conditions under which you will enter the service of the Texas Petroleum Company, there is outlined hereafter pertinent information. Your signature at the end of this letter will indicate that you fully understand and agree to these conditions.

1. GENERAL

The Company's policy regarding foreign service employes must necessarily be flexible to meet conditions which arise in the various countries and the requirements of local laws of each country involved. Therefore, some of the following conditions may be modified or canceled and others made applicable. The Company will endeavor to keep you informed of such changes as will affect you.

2. PERIOD OF EMPLOYMENT

It is desired by the Company that you regard your employment as a career. Therefore, your employment will cover no fixed period, but will continue as long as your services are satisfactory and the Company has a position available which you are qualified to perform.

3. TRANSPORTATION

The Company will assume all reasonable and necessary transportation expenses incurred to your point of assignment and returning you to your point of origin for home leave. Upon attainment of "Married Resident Status," such expenses also incurred with respect to your family will be absorbed by the Company.

4. RETENTION FUND - NOT APPLICABLE

~~Cost of transportation from point of origin to point of assignment will be paid by the Company, but the sum of $250 will be deducted from your salary in two monthly installments of $83.33 each and one installment of $83.34.~~

- 2 -

~~This sum of $250 will be set up in a retention fund, and will be returned to you at the end of one year's satisfactory service plus 3 1/3%.~~

5. SHIPMENT OF PERSONAL AND HOUSEHOLD EFFECTS

In addition to personal effects which are brought by you to the zone of operations as "Accompanied Baggage," the Company will pay transportation and insurance charges from the United States to the zone of operations on a limited amount of personal and household effects, excluding articles of furniture. Details respecting this matter are outlined in our "Baggage Instructions" with which you have been, or will be furnished.

6. BASIC FURNITURE PLAN

For the convenience of employes who have attained "Married Resident Status," the Company will provide basic furniture, at the employe's option, on a nominal monthly rental basis. If you are interested, a listing of the furniture provided will be submitted either by this office or by our local office.

7. HOME LEAVE

The home leave granted an employe may be affected in some degree by local operating conditions. However, you will be eligible, upon the completion of two years of service in the zone of operations, for a home leave of approximately sixty days. Eligibility for pro rata home leave is only attained after the completion of one year of employment in foreign service. Transportation expenses incurred in returning you and, if on "Married Resident Status," your wife and dependent children under eighteen, if any, to your point of origin, and upon completion of your home leave, to the area to which you are assigned, will be absorbed by the Company.

8. POSITION

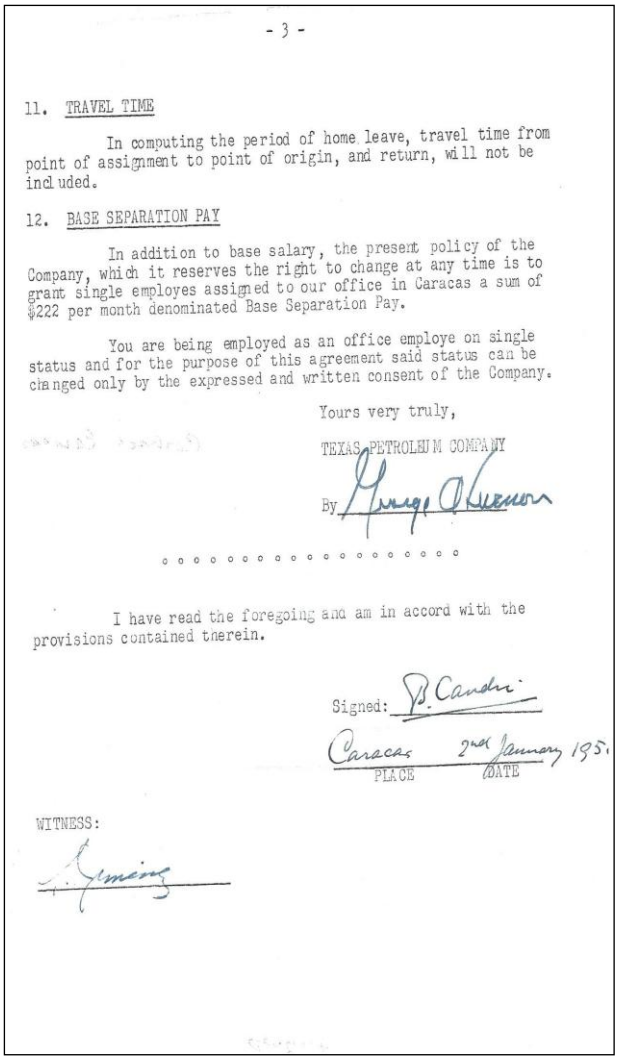
For payroll classification purposes, the position for which you are being employed is that of Senior Paleontologist in Venezuela, South America. You will be expected to perform all duties related to this position, and it is to be understood that when occasion demands, you may be required to perform unrelated duties which in Management's opinion you are capable of performing based on your experience and general qualifications.

9. BASE SALARY

Your base salary, effective November 4, 1950AM will be US $550.00 per month, payable monthly.

10. POINT OF ORIGIN

It is agreed that your point of origin is New York City, New York.



- 3 -

11. TRAVEL TIME

In computing the period of home leave, travel time from point of assignment to point of origin, and return, will not be included.

12. BASE SEPARATION PAY

In addition to base salary, the present policy of the Company, which it reserves the right to change at any time is to grant single employes assigned to our office in Caracas a sum of $222 per month denominated Base Separation Pay.

You are being employed as an office employe on single status and for the purpose of this agreement said status can be changed only by the expressed and written consent of the Company.

Yours very truly,

TEXAS PETROLEUM COMPANY

By

o o o o o o o o o o o o o o o o o o o o

I have read the foregoing and am in accord with the provisions contained therein.

Signed: B. Caudri

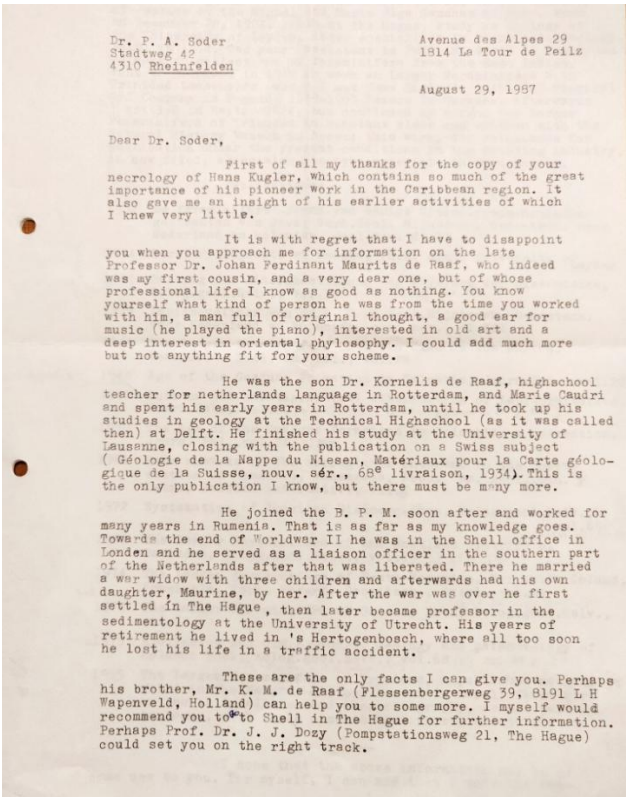
Caracas 2nd January 195.
PLACE DATE

WITNESS:

DOCUMENTARY APPENDIX 2

Autobiography of Dr. Bramine Caudri sent to Dr. Peter Soder of the Natural History Museum in Basel, Switzerland, on August 29, 1987, when she was 82 years old.

(*Source: Natural History Museum in Basel, Switzerland*)



Dr. P. A. Soder
Stadtweg 42
4310 Rheinfelden

Avenue des Alpes 29
1814 La Tour de Peilz

August 29, 1987

Dear Dr. Soder,

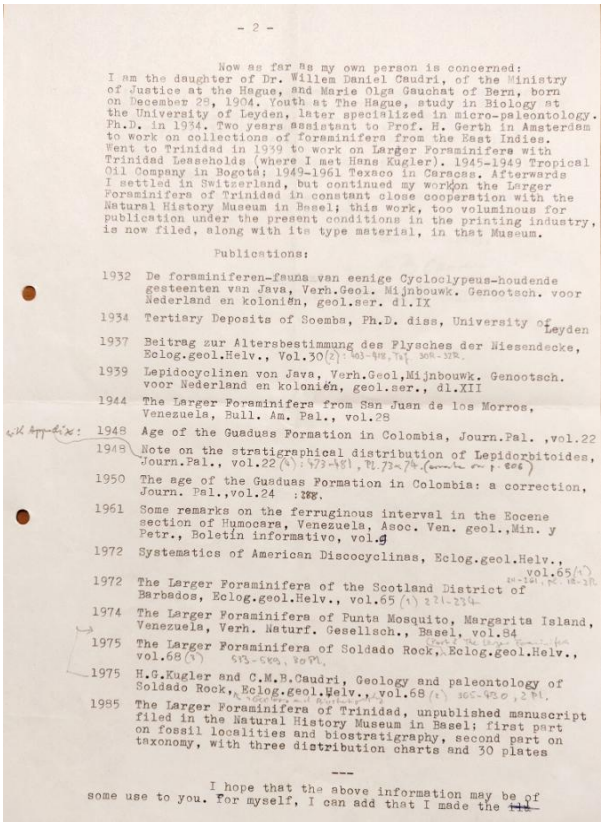
First of all my thanks for the copy of your necrology of Hans Kugler, which contains so much of the great importance of his pioneer work in the Caribbean region. It also gave me an insight of his earlier activities of which I knew very little.

It is with regret that I have to disappoint you when you approach me for information on the late Professor Dr. Johan Ferdinant Maurits de Raaf, who indeed was my first cousin, and a very dear one, but of whose professional life I know as good as nothing. You know yourself what kind of person he was from the time you worked with him, a man full of original thought, a good ear for music (he played the piano), interested in old art and a deep interest in oriental phylosophy. I could add much more but not anything fit for your scheme.

He was the son Dr. Kornelis de Raaf, highschool teacher for netherlands language in Rotterdam, and Marie Caudri and spent his early years in Rotterdam, until he took up his studies in geology at the Technical Highschool (as it was called then) at Delft. He finished his study at the University of Lausanne, closing with the publication on a Swiss subject (Géologie de la Nappe du Niesen, Matériaux pour la Carte géologique de la Suisse, nouv. sér., 68e livraison, 1934). This is the only publication I know, but there must be many more.

He joined the B. P. M. soon after and worked for many years in Rumenia. That is as far as my knowledge goes. Towards the end of Worldwar II he was in the Shell office in London and he served as a liaison officer in the southern part of the Netherlands after that was liberated. There he married a war widow with three children and afterwards had his own daughter, Maurine, by her. After the war was over he first settled in The Hague, then later became professor in the sedimentology at the University of Utrecht. His years of retirement he lived in 's Hertogenbosch, where all too soon he lost his life in a traffic accident.

These are the only facts I can give you. Perhaps his brother, Mr. K. M. de Raaf (Flessenbergerweg 39, 8191 L H Wapenveld, Holland) can help you to some more. I myself would recommend you to to Shell in The Hague for further information. Perhaps Prof. Dr. J. J. Dozy (Pompstationsweg 21, The Hague) could set you on the right track.



- 2 -

Now as far as my own person is concerned:
I am the daughter of Dr. Willem Daniel Caudri, of the Ministry of Justice at the Hague, and Marie Olga Gauchat of Bern, born on December 28, 1904. Youth at The Hague, study in Biology at the University of Leyden, later specialized in micro-paleontology. Ph.D. in 1934. Two years assistant to Prof. H. Gerth in Amsterdam to work on collections of foraminifera from the East Indies. Went to Trinidad in 1939 to work on Larger Foraminifera with Trinidad Leaseholds (where I met Hans Kugler). 1945-1949 Tropical Oil Company in Bogotá; 1949-1961 Texaco in Caracas. Afterwards I settled in Switzerland, but continued my work on the Larger Foraminifera of Trinidad in constant close cooperation with the Natural History Museum in Basel; this work, too voluminous for publication under the present conditions in the printing industry, is now filed, along with its type material, in that Museum.

Publications:

1932 De foraminiferen-fauna van eenige Cyclocypeus-houdende gesteenten van Java, Verh.Geol. Mijnbouwk. Genootsch. voor Nederland en koloniën, geol.ser. dl.IX

1934 Tertiary Deposits of Soemba, Ph.D. diss, University of Leyden

1937 Beitrag zur Altersbestimmung des Flysches der Niesendecke, Eclog.geol.Helv., Vol.30

1939 Lepidocyclinen von Java, Verh.Geol,Mijnbouwk. Genootsch. voor Nederland en koloniën, geol.ser., dl.XII

1944 The Larger Foraminifera from San Juan de los Morros, Venezuela, Bull. Am. Pal., vol.28

1948 Age of the Gusdus Formation in Colombia, Journ.Pal. ,vol.22

1948 Note on the stratigraphical distribution of Lepidorbitoides, Journ.Pal., vol.22

1950 The age of the Gusduas Formation in Colombia: a correction, Journ. Pal.,vol.24

1961 Some remarks on the ferruginous interval in the Eocene section of Humocaro, Venezuela, Asoc. Ven. geol.,Min. y Petr., Boletin informativo, vol.4

1972 Systematics of American Discocyclinas, Eclog.geol.Helv., vol.65

1972 The Larger Foraminifera of the Scotland District of Barbados, Eclog.geol.Helv., vol.65

1974 The Larger Foraminifera of Punta Mosquito, Margarita Island, Venezuela, Verh. Naturf. Gesellsch., Basel, vol.84

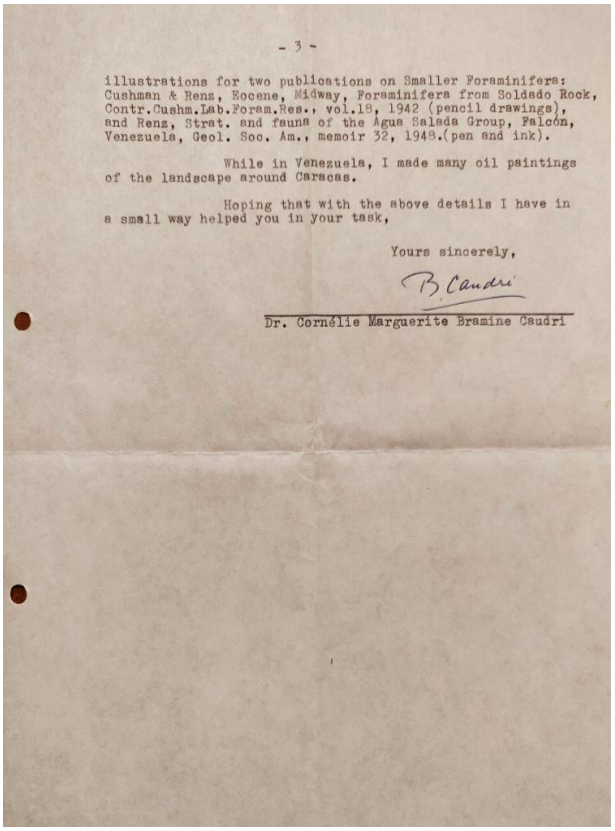
1975 The Larger Foraminifera of Soldado Rock, Eclog.geol.Helv., vol.68

1975 H.G.Kugler and C.M.B.Caudri, Geology and paleontology of Soldado Rock, Eclog.geol.Helv., vol.68

1985 The Larger Foraminifera of Trinidad, unpublished manuscript filed in the Natural History Museum in Basel; first part on fossil localities and biostratigraphy, second part on taxonomy, with three distribution charts and 30 plates

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I hope that the above information may be of some use to you. For myself, I can add that I made the ~~112~~



- 3 -

illustrations for two publications on Smaller Foraminifera: Cushman & Renz, Eocene, Midway, Foraminifera from Soldado Rock, Contr.Cushm.Lab.Foram.Res., vol.18, 1942 (pencil drawings), and Renz, Strat. and fauna of the Agua Salada Group, Falcón, Venezuela, Geol. Soc. Am., memoir 32, 1948.(pen and ink).

While in Venezuela, I made many oil paintings of the landscape around Caracas.

Hoping that with the above details I have in a small way helped you in your task,

Yours sincerely,

B. Caudri

Dr. Cornélie Marguerite Bramine Caudri

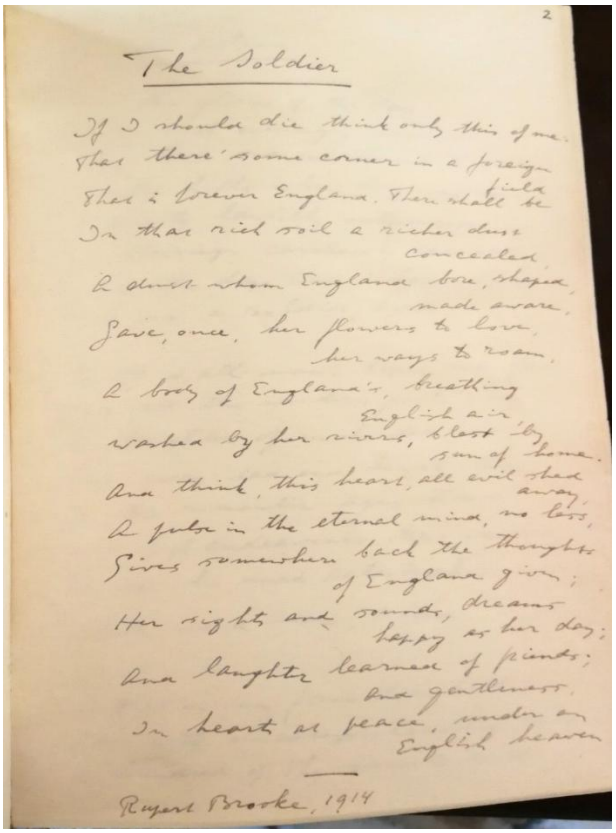
DOCUMENTARY APPENDIX 3

Poem "The Soldier" by British Rupert Brooke (1887-1915)

(*Source: Caudri's Poetry Notebook*)

"If I should die, think only this of me:
That there's some corner of a foreign field
That is for ever England. There shall be
In that rich earth a richer dust concealed;
A dust whom England bore, shaped, made aware,
Gave, once, her flowers to love, her ways to roam;
A body of England's, breathing English air,
Washed by the rivers, blest by suns of home.

And think, this heart, all evil shed away,
A pulse in the eternal mind, no less
Gives somewhere back the thoughts by England given;
Her sights and sounds; dreams happy as her day;
And laughter, learnt of friends; and gentleness,
In hearts at peace, under an English heaven."



2

The Soldier

If I should die think only this of me.
That there's some corner in a foreign
field that is forever England. There shall be
In that rich soil a richer dust
concealed
A dust whom England bore, shaped,
made aware,
Gave, once, her flowers to love,
her ways to roam,
A body of England's, breathing
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And think, this heart, all evil shed
away,
A pulse in the eternal mind, no less,
Gives somewhere back the thoughts
of England given;
Her sights and sounds, dreams
happy as her day;
And laughter learned of friends;
and gentleness
In hearts at peace, under an
English heaven

Rupert Brooke, 1914