A biography and obituary of Svein B. Manum (1926–2015)

Gunn Mangerud[1]*, Jorunn Os Vigran[2], Knut Bjørlykke[3] and James B. Riding[4]

[1]*Department of Earth Sciences, University of Bergen, PO Box 7803, N-5020 Bergen, Norway*

[2]*Mellomila 2, N-7018 Trondheim, Norway*

[3]*Department of Geosciences, University of Oslo, Sem Sælands vei 1, N-0371 Oslo, Norway*

[4]*British Geological Survey, Environmental Science Centre, Keyworth, Nottingham NG12 5GG, UK*

*Corresponding author. Email: Gunn.Mangerud@uib.no

(insert the two photographs of Svein Manum supplied here side-by side. The monochrome image should be placed on the left, and its caption should read: "Svein Manum working at the microscope at the University of Oslo in 1952 when he was undertaking his *Candidatus realium* research. Photographer unknown." The colour photograph should be placed on the right, and its caption should read: "Svein Manum at the microscope in December 2014. The image was taken by Ronny Setsaa, and is used with permission.")

1. Introduction

Professor Emeritus Svein B. Manum was a true pioneer in both national Norwegian and international palaeobotany and palynology. Specifically, he singlehandedly instigated pre-Quaternary palynology in Norway. He sadly passed away on September 30th 2015 when he was nearly 89 years old. Svein had a long career as a researcher in, and a teacher of, palaeobotany and palynology. This article on Svein Manum's life and career is based on the collective memories of the authors, correspondence and unpublished notes by Svein (see also Mangerud 2015; Vigran 2016).

2. Childhood, education and family life

Svein Bendik Manum was born on October 3rd 1926 to Ivar Rui Manum and Anna Walborg. He grew up in the town of Askim, in Østfold, southeast Norway, where his parents ran a grocery shop. Svein graduated from Askim Senior High School in 1945 then became an

undergraduate at the University of Oslo in 1946, shortly after the end of World War II. He was one of those students who were the first from their families to attend university. Svein had an advantage over many of his contemporaries because he was able to attend a senior high school in Askim, which prepared him well for applying for higher education. At this time, Norway was recovering from five years of German occupation which had severely affected science in the country. He completed his bachelor's degree in botany, mathematics and physics in 1950, and aspired to become a secondary school teacher despite the very limited funding for postgraduate study during the post-war period. Svein married Randi Hafting in 1953, and they had three children together; these are Ivar, Ketil and Kari, who were born in 1958, 1962 and 1966 respectively.

3. Ove Arbo Høeg and the early development of palynology in Norway

In order to get a perspective on the scientific career of Svein Manum, it is essential to understand how palynology first developed in Norway. The earliest pre-Quaternary palynology in Norway was undertaken by the eminent botanist and palaeobotanist Ove Fredrik Arbo Høeg (1898–1993) at the University of Oslo during the 1920s. Høeg worked on modern Norwegian lichens for his master's in the early 1920s. During his master's, Arbo Høeg attended lectures on the work of William H. Lang and Robert Kidston on the fossil plants from the Lower Devonian Rhynie Chert of Scotland (Kidston & Lang 1917). His mentor was Professor Th. Kierulf, who also introduced Høeg to the Lower Devonian macrofloras of Spitsbergen. Consequently, Høeg became deeply interested in the anatomy and taxonomy of these early land plants, and undertook pilot studies on their spores as part of his PhD. While Høeg was a research assistant at the Botanical Museum in Oslo between 1924 and 1926, he was contacted by state geologist Gunnar Holmsen, who was a Quaternary specialist. Holmsen had attended the 16th Scandinavian Meeting of Natural Scientists in Oslo in 1916 when the Swedish geologist and naturalist Lennart von Post presented his pioneering analysis of pollen in Quaternary peat deposits (von Post 1916; Manten 1967). As a direct consequence, Holmsen asked Arbo Høeg to undertake Quaternary pollen analyses in Oslo. Høeg's interest in early land plants, and the relatively new discipline of Quaternary pollen analysis, made him a confirmed palaeobotanist/palynologist, and consequently he did not pursue lichnology following his master's. He moved to Trondheim in 1926 as the leader and curator of the Botany Department at the Videnskapsselskapets Museum. Høeg was also a

lecturer at the Norwegian Teacher Training College. Over his career, Høeg worked on various areas of pharmaceutical botany, but his main research was on fossil plants from the Lower Devonian plants of Spitsbergen (Høeg 1937; 1942). Arbo Høeg left Trondheim in 1947 to become Professor of Botany in the Department of Pharmacy at the University of Oslo, where botany was still an important part of the study of pharmacy. In 1947, a national centre for Quaternary palynology was established in Bergen by Knut Fægri (Hafsten 1989; Birks 2002) and, by the 1950s, Norway had a very active research community working on Quaternary pollen.

4. Svein Manum the postgraduate student

At secondary school, Svein became fascinated by the modern floras of the Svalbard archipelago (Resvoll-Holmsen 1927) and therefore anticipated that the fossil floras from this region would be equally interesting. During the final year of his bachelor's degree, he became aware of the work of Arbo Høeg at the University of Oslo on the palaeobotany of Western Norway and Spitsbergen. Consequently, after he obtained his bachelor's in 1950, Svein approached Høeg to ask if he would be his supervisor on a *Candidatus realium* postgraduate research programme (broadly equivalent to a master's) on the fossil plants of the high Arctic. Høeg agreed to this having noted Svein's clear enthusiasm and perceptively suggested a novel topic, the palynology of Paleogene coals from Spitsbergen. The pollen and spores of coeval deposits were well known further south in Europe, but had not been studied in Svalbard or elsewhere in the northern high latitudes. As previously mentioned, Høeg had not done much palynology, except notably the extraction of spores from the fertile structures in two Devonian plant species from Spitsbergen. Høeg arranged for Svein to participate in a field excursion for mapping coal seams in Spitsbergen led by Harald Major, a coal geologist with the Norwegian Polar Institute, to collect material for his dissertation. The field party made the journey to Spitsbergen on a coal transport ship. Svein visited Adventdalen and Reindalen during the summer of 1950, which was the warmest year in decades.

The field trip in 1950 was the first of several expeditions to Svalbard by Svein. At this time rowing boats where used for local transport, and there was much heavy carrying. Svein loved this fieldwork and made several films. Footage taken by him in Spitsbergen during 1964, is available at http://www.mn.uio.no/geo/tjenester/kunnskap/film-manum/index.html. On his return from Spitsbergen, Svein learned how to extract and prepare palynomorphs in the

laboratory. Arbo Høeg's facilities in the Department of Pharmacy were rather rudimentary. There was a fume cupboard and a sink at opposite ends of a long kitchen worktop, and a hand-powered centrifuge without a cover. Given the chemicals used, the use of this centrifuge was therefore rather dangerous. Svein prepared around 200 coal samples from three of the major Paleogene coal seams on Spitsbergen in this laboratory. The bituminous coals are of high rank, and consequently require aggressive oxidation treatment with Schultze's solution for around one full day to make the palynomorphs transparent and light enough for study (Manum 1956). Svein had been a keen photographer since his teenage years, and had images of Norway's liberation following World War II published. He made use of Høeg's well-equipped darkroom, and purchased a used Exacta camera with his own funds in 1950. At this time, the Exacta was the most advanced single-lens reflex 35 mm camera on the market. Svein used extension tubes to attach his camera to the microscope, and he used this configuration until 1964. He relied on trial and error regarding exposure times until 1960, when he acquired a photometer.

Arbo Høeg had an excellent reprint library which included all significant publications since the early 1930s on the palynology of the Carboniferous coals of Europe and the USA, and the Paleogene/Neogene lignites of Germany. These articles were invaluable to Svein as he learned about topics such as nomenclature and taxonomy. He also used Erdtman (1943) and Fægri & Iversen (1950) to research the modern equivalents of his Paleogene pollen grains. One of us (GM) now owns Svein's copy of Erdtman (1943), which was given to him during a visit to Gunnar Erdtman in Stockholm during 1954.

Høeg sent Svein to visit Knut Fægri in Bergen during 1951 for training in palynological preparation techniques, because the highly bituminous coals from Spitsbergen were rather difficult to process. Despite his best efforts, trying acetolysis, bleaching and staining, Knut Fægri could not improve upon Svein's procedure. This gave Svein much confidence that his processing techniques were close to optimal. In the spring of 1952, Høeg arranged for Svein to visit Robert Potonié, the head of palaeobotany at the Geological Survey of Nordrhein-Westfalen in Krefeld, Germany. This visit was organised and funded because Høeg had to travel to Lucknow in India, for around one year, on a UNESCO-sponsored mission to become the director of the Birbal Sahni Institute of Palaeobotany after the sudden death of its founder and leader in 1949 (Thomas 1950). Arbo Høeg felt great remorse about leaving his research student, but believed that Svein could learn much from Potonié because

of his work on the palynology of Paleogene/Neogene lignites in the 1930s. However, at that time, Potonié was significantly preoccupied working on several of his major papers (e.g. Potonié & Kremp 1954; 1955; 1956; Potonié 1956; 1960), and undertook little or no practical palynology (i.e. laboratory and microscope work). Svein found Robert Potonié to be a rather aloof, distant and elusive figure who would loudly discuss taxonomic philosophy with Gerhard O.W. Kremp for hours on end behind closed doors in his office. However, at Krefeld, Svein met German researchers like Hilde Grebe, Gerhard O.W. Kremp and Paul W. Thomson, and overseas visitors such as Clair A. Brown and Wilhelm Klaus from the USA and Austria respectively. Paul W. Thomson helped Svein immensely with his *Candidatus realium* research on the pollen of the Spitsbergen coals. Furthermore, Svein was also extremely grateful to Hilde Grebe and Wilhelm Klaus for advice on laboratory processing and slide production. Klaus, who was an established expert on the palynology of coal (e.g. Klaus 1954), was extremely enthused by Svein's research in Spitsbergen. He actively encouraged Svein to publish his results soon because of the unique nature of the data, and even provided Svein with a draft plan.

Back at Oslo, Svein and his student contemporaries benefitted enormously from attending Arbo Høeg's lunch meetings in his office. At these occasions, the students met visiting scientists from all over the world such as Harland P. Banks (USA), Mahendra N. Bose (India), Isabel C. Cookson (Australia), Knut Fægri (Norway) and Brita Lundblad (Sweden). Vigran (2016) described Høeg as 'a second father' to his students, and he and Svein remained lifelong friends and colleagues (Manum 1988). Svein finished his *Candidatus realium* dissertation in 1953. This was the first postgraduate project of any kind on pre-Quaternary palynology in Norway, and it was his first publication (Manum 1954). Svein's dissertation in 1953 represents the inception of the discipline of pre-Quaternary palynology in Norway.

After obtaining his *Candidatus realium* degree in 1953, Svein felt that the dissertation had some loose ends. He approached Arbo Høeg, who had only just returned from Lucknow, to ask if his work could be continued, even as a short term project. As a consequence, Svein obtained funding from the Norwegian Research Council for a research assistantship starting in January 1954. He expanded the sample base to other high latitude localities with Paleogene/Neogene coals such as Alaska, Arctic Canada (Ellesmere Island), Greenland and Iceland. As part of this work Svein visited the pioneer of Swedish palynology, Gunnar Erdtman, in Bromma, western Stockholm later that year. Erdtman was a pioneer of plant

158 taxonomy and pollen morphology (Nilsson & Praglowski 1978). Svein compared his
159 Spitsbergen Paleogene material with Erdtman's extensive collection of modern pollen, and
160 was instructed in microscopical techniques. Erdtman taught Svein how to produce *camera*
161 *lucida* drawings of pollen exines. He also enthusiastically encouraged Svein to continue his
162 research in order to obtain a PhD on the palynology of the Paleogene coals of the northern
163 high latitudes.

164 Research and teaching in geology and palaeontology at the University of Oslo took
165 place in different buildings until 1958. This was not an ideal situation, and plans were made
166 for a single earth science building in the early 1950s. Arbo Høeg had successfully argued for a
167 palaeobotany section for the new building, which was inaugurated in the autumn of 1958.
168 From his position in the Department of Pharmacy, Høeg began teaching palaeobotany in
169 1960, which was the first time this discipline had been formally taught in Norway. Svein
170 moved to new facilities in the new building, where he was joined by Jorunn Os Vigran, who
171 had started her research on the palynology of the Høeg's extensive collection of Devonian
172 plant-bearing sandstones.

173 On November 24th 1962, Svein defended his PhD thesis (Manum 1962); the opponents
174 were Knut Fægri of the University of Bergen and the Swedish palynologist Brita Lundblad.
175 Fægri was the pioneer of Quaternary pollen analysis in Norway (Birks 2002). Knut Fægri was
176 very enthusiastic about Svein's work, and commented that he had never seen such beautiful
177 photographic plates produced by a postgraduate student. After the successful thesis defence,
178 Svein became an associate professor in palaeobotany at the University of Oslo and took over
179 Høeg's course in late 1962.

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181 ## 5. The career scientific

182 Svein Manum's appointment as a faculty member at the University of Oslo in 1962 was
183 indeed a watershed moment for him. As a schoolboy, undergraduate and *Candidatus realium*
184 student, he thought that life as a university academic was beyond him. He worked for the
185 University of Oslo for all his 33-year professional career, and was promoted to professor in
186 1982.

187 An overseas visitor to Oslo had a profound influence on Svein's career. In 1959 and
188 1963, the eminent Australian palaeobotanist and palynologist Isabel C. Cookson visited the

university (Riding & Dettmann 2013, p. 119–121). She had been invited to Norway in 1959 by Arbo Høeg to discuss early land plants, and to lecture on palaeobotany and palynology to his students. However, Cookson had not been particularly active in palaeobotany for some years, and now concentrated virtually exclusively on palynology. Like most palynologists at this time, she had begun by studying terrestrial palynomorphs but, in the early 1950s, had turned her attention to marine palynology (Cookson 1953; Riding & Dettmann 2013). Isabel preferred to discuss palynology with Svein, rather than talk about early land plants with Arbo Høeg. She agreed to process several Arctic Paleogene samples which had just arrived in Oslo. Cookson found a new dinoflagellate cyst palynoflora in this material, and one of these forms was named for her as *Svalbardella cooksoniae* Manum 1960. These assemblages with their abundant and well-preserved dinoflagellate cysts immediately fascinated Svein, and Isabel Cookson mentored him closely in aquatic palynomorphs. Hence, Cookson inspired in Svein a lifelong interest in marine palynology (Mangerud 2015). Isabel and Svein collaborated a great deal, and Cookson's first visit to Oslo resulted in Manum (1960a; 1960b) and Cookson & Manum (1960). The second visit by Cookson to Oslo in 1963 also resulted in several papers including Manum (1963a) and Manum & Cookson (1964). However, their most significant collaboration was a joint study on Upper Cretaceous dinoflagellate cysts from Graham Island and Ellef Ringnes Island in the Canadian Arctic (Cookson & Manum 1964).

After one year (1965–1966) working with Professor Tom M. Harris on Arctic palaeobotany at the University of Reading on a NATO Science Fellowship, Svein, Randi and their three children travelled to Uganda. This visit was sponsored by the Norwegian Agency for Development Cooperation (NORAD), and Svein became Professor and Head of the Department of Botany at Makerere University in Kampala between 1967 and 1970. The undergraduate students in Kampala were taught about the highly diverse East African flora. Svein demonstrated his agility and flexibility by combining being Head of Department, and teaching modern tropical botany. The Manum family was able to travel extensively within Uganda, and they all enjoyed living in East Africa very much.

The Manum family returned to Norway in 1970. This was soon after the Ekofisk oilfield had been discovery by the Phillips Petroleum Company in the Norwegian sector of the North Sea during 1969. Svein's expertise in dinoflagellate cysts was suddenly in great demand. At this time, Svein joined a group of experts to establish laboratories to investigate the subsea geology of the North Sea and the Norwegian Shelf. So, from 1971, the Norwegian

Research Council for Science (NTNF) supported several laboratories which had close contacts with the University of Oslo. Jorunn Os Vigran was employed as a palynologist in Trondheim from 1972, and Bindra Thusu was appointed in 1973 to establish a new palynology laboratory in Oslo. The laboratories and offices in Oslo were moved to Trondheim in 1975 to become part of the Continental Shelf Institute (IKU), which today is SINTEF Petroleum. From the 1970s onwards, Svein supervised postgraduate students in projects which were related to petroleum geology and on the Norwegian Arctic. The first of these was Tor Bjærke, who graduated in 1975 with a study of the palynology of the Upper Triassic of the Arctic (Bjærke & Manum 1977). Another student, Torbjørn Throndsen, worked on the Paleogene dinoflagellate cysts of Spitsbergen (Manum & Throndsen 1986). Despite the enduring focus on the petroleum geology of the North Sea, Svein maintained a broad perspective in palynology both geographically and across the spectrum of palynomorph groups (e.g. Manum 1967; Balduzzi et al. 1993).

During the 1970s, Svein and colleagues undertook work on Deep Sea Drilling Project (DSDP, now the International Ocean Discovery Program) material from DSDP Leg 38 in the Norwegian Sea. They analysed ~1000 samples from Leg 38, and this material was the basis for the first Paleogene/Neogene (Eocene–Miocene) palynomorph zonation for offshore Norway (Manum et al. 1989). Svein later described this paper as his greatest scientific achievement. Also during the 1970s, Svein undertook highly significant collaborations such as with Bill Evitt of Stanford University, California and Graham Williams of the Geological Survey of Canada. In late 1976, he spent a sabbatical of several months with Bill Evitt at Stanford. Evitt had visited Oslo in July and August 1976 to present one of his famous *Teaching Conferences on Fossil Dinoflagellates* (Riding & Lucas Clark 2016, p. 73). At that time Evitt was developing his new ideas on the tabulation of dinoflagellates (Evitt 1985), thus Svein would have provided substantial input on this topic in the seminars that Bill gave at Stanford. Later Svein named a new dinoflagellate cyst genus, *Evittosphaerula*, to honour Bill Evitt (Manum 1979). During Svein's sojourn in California, he received training in vitrinite reflectance from Neely H. Bostick, one of Bill Evitt's former research students.

Svein collaborated with colleagues at the Italian oil company AGIP (now ENI) during the 1980s. This strong alliance resulted in annual field trips to Italy and the Mediterranean region for students at the University of Oslo, and it led to publications on Italian material such as Biffi & Manum (1988). At this time, Svein continued working on material from the

Greenland-Norwegian Sea and the Norwegian Sea (e.g. Boulter & Manum 1989; 1996; Manum et al. 1989; Hubbard et al. 1994; Poulsen et al. 1996; Williams & Manum 1999). Therefore Svein Manum was a major contributor on the Paleogene/Neogene dinoflagellate biostratigraphy of the high northern latitudes.

Palaeobotany was an enduring interest of Svein's throughout his career, with particular emphasis on Arctic palaeofloras and their palaeoecology (e.g. Manum 1960b; 1963b; 1966a; 1968; 1987; 1994; Manum et al. 1991a; 2000). The Indian palaeobotanist from Lucknow, Mahendra Bose, and Svein travelled to Spitsbergen to sample Cretaceous and Paleogene macrofossils in 1990 (Bose & Manum 1990; 1991). Svein also continued research begun by his mentor, Arbo Høeg, on Arctic material collected by the early Swedish explorers such as Alfred G. Nathorst and Thore G. Halle which is housed in the Swedish Museum of Natural History in Stockholm (Manum 1984; Kvaček & Manum 1993; 1997; Kvaček et al. 1994; Denk et al. 1999).

Svein found enigmatic, organic, net-like objects in coals from the Triassic onwards which intrigued him greatly. These were originally described by Harris and Rest (1966), who could not determine their affinity. However Svein identified them as the cocoons of representatives of the class Clitellata, which is in the phylum Annelidia (segmented worms), and includes the leeches (Manum 1996; Manum et al. 1991b; 1992; 1994).

The communication of science was an enduring passion for Svein throughout his life, and he frequently delivered lectures on scientific writing to students at the University of Oslo. He was also heavily involved in scientific outreach to the general public, and published many popular science articles (e.g. Manum 1960c; 1963c; 1966b; 1976; 2006; Manum & Bose 1988; Thomsen & Manum 2009).

This subsection has attempted to describe the scientific research of Svein Manum. In recognition of this body of work, he was elected a member of the Norwegian Academy of Science and Letters in 1980. Twelve years later, in 2002, the American Association of Stratigraphic Palynologists (AASP) awarded Svein their Medal for Scientific Excellence (Thusu & Vigran 2003). Svein has also been honoured by having dinoflagellate cyst taxa named for him. The important Late Cretaceous–Paleocene cavate peridinioid genus *Manumiella* was named after Svein by Bujak & Davies (1983, p. 160). Two dinoflagellate cyst species, *Chatangiella manumii* Vozzhenikova 1967 and *Impagidinium manumii* Matsuoka & Bujak 1988, were also established in his honour. In addition to his highly

significant efforts in research in palaeobotany and palynology, Svein undertook significant administration duties. For example, he was head of the Department of Geology at the University of Oslo for four different periods between 1971 and 1983, in addition to his performing similar duties in Kampala between 1967 and 1970 (see above). Svein also served on the Norske AGIP A.S. board between 1976 and 1989.

6. Retirement (1995–2015)

Svein Manum retired from the University of Oslo in 1995. His close friend and colleague Jorunn Os Vigran retired from IKU in Trondheim one year later in 1996, however, continued her work and kept an office in SINTEF until 2014. Svein feared that these retirements marked the end of academic research in pre-Quaternary palaeobotany and palynology in Norway. Following retirement, Svein remained very scientifically active until the last months of his life. His enduring passion for palynology was eloquently expressed via correspondence, interaction with colleagues and outreach papers. Svein enjoyed good health for many years following retirement, with the exception of his bad hearing, which he resolved by using the available technology. During the 2002 AASP award ceremony in London (see section 5 above), he was still fit enough to sit cross-legged on the floor and Svein amused the audience by rising directly to stand on his head. He also pursued various interests outside palynology including art, graphic art, literature, music, photography and poetry during retirement (Vigran 2016). Svein was the head of the Norwegian Society of Graphic Arts for many years. Gardening was also a major pastime, both on the small family-owned farm and at his home in Lommedalen, a village in Akershus County, west of Oslo in southeast Norway.

One of Svein's final duties was, with other colleagues, to open the new palynology laboratory run by Wolfram Kürschner at the University in Oslo in 2014. For him it was a watershed moment because, after nearly 20 years since he retired, pre-Quaternary palynology in Norwegian academia was experiencing a renaissance. The future of the discipline he pioneered in the 1950s and 1960s was secured for Norway. In recent years Svein's wife, Randi, became ill and he spent most of his time taking care of her, until the last few months which were spent in a nursing home.

Svein Bendik Manum was a pioneer in the study of dinoflagellate cysts, palaeobotany and terrestrial palynology, both in Norway and globally, publishing many scholarly scientific

papers (Vigran 2016), in addition to having wide cultural interests. Specifically, he instigated and nurtured pre-Quaternary palynology in his native Norway. Svein was one of the few palaeontologists to be consistently eminent in dinoflagellate cysts, palaeobotany and pollen/spores. Over an interval spanning ~50 years at the University of Oslo, he significantly advanced our knowledge of clitellate cocoons, dinoflagellate cyst biostratigraphy, morphology and taxonomy, the Mesozoic–Cenozoic macrofloras of the Arctic, and the biostratigraphy and palaeogeography of the North Atlantic region. He taught numerous undergraduate students, and supervised much postgraduate research, over a 33-year career at the University of Oslo. Svein Manum will be very fondly remembered as an outstanding friend and scientist by his many colleagues, not only in his native Norway, but all around the world.

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