

The work of Tove Birkelund for the International Subcommittee on Cretaceous Stratigraphy

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Historical background

It seems difficult now to realise that there was an International Subcommittee on Cretaceous Stratigraphy before Tove Birkelund, but there was. More strictly, there was a Subcommittee for the Upper Cretaceous. It had started as a 'Maastrichtian Committee', but at the 21st International Geological Congress in Copenhagen in 1960 the Committee were given the status of a 'Subcommittee of the Commission on Stratigraphy' on condition that their remit embraced the whole of the Upper Cretaceous (Thiadens, 1970). This new subcommittee prepared a report for the 22nd International Geological Congress in New Delhi, but no meeting took place, and their recommendations were even incorrectly reported by Sundaram & Iyengar (1974). Another meeting was planned for the 23rd Congress in Prague for 21 August 1968, but that meeting also never took place because the invasion of armies of the USSR and its allies closed the Congress before it had really started. By then the Subcommittee had decided – but with much internal disagreement – that the Danian should be retained within the Cretaceous System, although some members doubted the competence of the Subcommittee to make such a decision. They had also decided before the 23rd Congress (for the second time!) that the 'Subcommittee ... will be handed over to new officers, with the secretary preferably residing in France'. This was done and the Subcommittee entered a period of inactivity. It was now supposed to deal with the whole of the Cretaceous System, but the officers in France simply

made themselves incommunicado: letters from the Commission on Stratigraphy or from other members of the Subcommittee or from other geologists on matters of the definition or meaning of subdivisions of the system were all ignored. Eventually, the Commission on Stratigraphy tired of this. In 1975 they dismissed the whole Subcommittee and asked Tove Birkelund to re-found the Subcommittee on Cretaceous Stratigraphy.

A new Subcommittee

Tove Birkelund was 47, had been a Professor of Historical Geology for 10 years and Chairman of the Institute of Historical Geology and Palaeontology since 1967. Since the late 1950's she had an international reputation for her research on Campanian-Maastrichtian belemnites and ammonites. This work was marked for its understanding of the biostratigraphy as well as the well founded taxonomy. In the late 1960's she had extended her studies to the micro-architecture of ammonoid shells. For this work she was a pioneer in the use of electron microscopy to unravel the ultrastructure of molluscan shells, and her publications combined clarity, elegance and perspicacity. Thus she was an ideal candidate to establish an international organisation: she was a respected scientist with great mental energy; she had her own institute to provide both a centre and back-up facilities; her country was small, neutral and rich; and, dare I say it, in a largely masculine world, she was a charming woman.

At 09.15 on Monday, 10 May 1976, some dozen geologists met in a committee room at the Institute. All but one or two had been invited by Tove. In her choice she had not tried to be representative, either by geography or stratigraphy. We were almost all European; there was no-one from the USSR and only one from North America. Most of us were researchers on cephalopod-stratigraphy (there was only one micropalaeontologist and one sedimentologist) and overwhelmingly workers on the Upper Cretaceous. We had the impression that few people invited had been unable to come but several obvious names were absent. In fact it would be fair to say that Tove had simply invited a collection of her cronies with whom she knew she could work. Supporters of democracy and balance would not approve, but Tove understood to get a group that would function immediately, and effectively both then and later, they needed to know some of the others before the meeting: at that stage a proper balance was not necessary. The result was we were all happy to let each speak his mind. She had invited a small number to give their individual views on how stratigraphy functioned and I remember a particularly elegant presentation by Pierre Juignet. But everybody had time to present their views. All the while Tove was noting how strongly each view was held and where the consensus lay. During the afternoon of the first day she announced that to save us the trouble of looking for restaurants in the evening, her husband, Svend, would be bringing something for us to eat and drink. At about 6.30 Svend arrived with not just something but a full feast of chicken, ham and salamis, bread and cheeses, beers and wines. This was another piece of Tove's political wisdom, for we remember those with whom we have eaten and got drunk better than those who have impressed us with their scholarship; of course the two might coincide.

For three days the meetings continued. At one point where we were discussing the intricacies of Aptian sub-zones there was a passionate outburst by Dave Jones from California: we European geologists just did not understand what most of the world was like; here we were arguing about ammonite distributions through a few feet of sediment; in California he was lucky to find one ammonite for every thousand feet of sediment. From time to time Tove would sound me out on

my personal opinions and no doubt each of the others felt this too. On the third day we agreed that most of us should have our names put forward to the Commission to be Titular Members (= Voting Members in current parlance) of the new Subcommittee, with the addition of a very small number of other names, e.g. D. Naidin in the USSR. In the event the Commission asked for a few more names to spread the geographical representation, but for the most part that collection of Tove's cronies formed the majority of the new Subcommittee on Cretaceous Stratigraphy, with Finn Surlyk as Secretary.

Working Groups of the Subcommittee

Tove Birkelund realised from the start that the Cretaceous System itself was too extensive for one group of geologists to work on the whole system. Therefore she divided the system into three: pre-Albian stages; Albian to Turonian; Coniacian to Maastrichtian. For each of these a working group was established. This arrangement enabled much data to be collected for the successful 1983 conference (see below).

Cretaceous-Tertiary boundary events

The remit of the Subcommittee was mainly to obtain international agreement on the internal boundaries within the Cretaceous System. Tove reminded us from time to time that there were separate international working groups trying to reach agreement on the Jurassic-Cretaceous boundary and the Cretaceous-Palaeogene boundary. Nevertheless, the higher boundary had always been important in her own research. In 1979 she organised an international meeting in Copenhagen on Cretaceous Tertiary boundary events under the combined auspices of the Cretaceous Subcommittee, the Boundary Working Group and the Geological Institutes of the University of Copenhagen. Tove obtained financial support from the Carlsberg Foundation (of which she had been a director since 1978) and the Danish Natural Science Foundation (of which she was a member). The two volumes of papers were published before the meetings, 20-22 September 1979, the costs of printing coming from Dansk

Boreselskab A/S (Birkelund & Bromley, 1979; Christensen & Bromley, 1979).

Tove's international contacts ensured that there were representatives from all over the world. For the first time since the end of the Cultural Revolution there were geologists from the Peoples' Republic of China. When the first of their speakers reached the podium, the whole conference burst into spontaneous applause.

It was possible to hold a discussion on the placement of the Cretaceous-Palaeogene boundary with representatives from almost all major countries. It was clear that the overwhelming majority of geologists (Erhard Voigt dissenting) were now in favour of placing the system boundary between the Maastrichtian and the Palaeocene, with the 'Danian' firmly in the Tertiary. Dmitrii Naidin from Moscow, whilst supporting this viewpoint, warned that the party-line of the National Committee for Geology in the USSR continued to be that the Danian was Cretaceous. It was probably this Copenhagen meeting that persuaded the Soviet National Committee in 1984 to bring their own placing of the boundary into line with the majority of geological opinion.

The wide range of topics discussed at the general meeting included the first public presentation and discussion of the Alvarez hypothesis of an extra-terrestrial source for anomalously high concentrations of Iridium in some Cretaceous-Tertiary boundary-clays.

Cretaceous stage boundaries

By 1983 the working groups of the Subcommittee were approaching agreement on what were the possible standards for the boundaries between the stages in the Cretaceous System. Accordingly, Tove and Finn Surlyk organised a major conference in Copenhagen for 18–21 October 1983. There was not as large a geographical spread of geologists as that attending the 1979 meeting, but a much better coverage of specialities and, of course experts on all levels of the system. Two to four page abstracts of the papers were sent to participants in August, so that we arrived in Copenhagen with much factual data.

After the presentation of the papers, each working group reconvened to summarise their conclusions on each stage boundary. Then each

boundary was discussed by the whole conference, and we listed each definition in current use according to which group of fossils was used. It says a great deal for Tove's abilities as a chairman that the different standards were discussed without rancour. We even had the ammonite workers proposing the use of foraminifera to define the boundaries because ammonites were rare in many sections and unknown in oceanic deep-sea sediments. No, no, said the micropalaeontologists: ammonites were so much more accurate and reliable and less likely to show climatic diachronism.

The conclusions from this discussion were put together by Tove, helped by seven members of the conference with voluminous correspondence (Birkelund *et al.*, 1984). This was published with some of the other papers from the conference in the *Bulletin of the Geological Society of Denmark*; other papers appeared in *Cretaceous Research*. Together they form the most coherent survey of the world's biostratigraphy of any system ever produced.

At the meeting, Svend exceeded all his previous efforts. A great feast was held in the central hall of the university, with the graduate students of the Institute and their girlfriends and boyfriends to lay out the tables and serve the guests.

Conclusions

In August 1984 Tove Birkelund stood down as Chairman of the International Subcommittee on Cretaceous Stratigraphy. Less than two years later she was dead from multiple cancer. In just eight years from start she had achieved a uniform set of biostratigraphic standards for the Cretaceous System. She was always careful to emphasise that we were not laying down legal definitions: they would come later and would be settled by post between the Voting Members. But the first thing to be done was to decide on the biostratigraphic criteria. This she did. The results of that 1983 conference are still being digested. Only now in 1991 has there been sufficient further research to work out some of the relative stratigraphic positions of the various possible boundary levels for each stage. Thanks to Tove we are now ready to start on those legal definitions.

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