

## A tribute to the late Felder brothers – pioneers of Limburg geology and prehistoric archaeology; introduction

J.W.M. Jagt<sup>1,\*</sup>, E.A. Jagt-Yazykova<sup>2</sup> & W.J.H. Schins<sup>3</sup>

<sup>1</sup> Natuurhistorisch Museum Maastricht, de Bosquetplein 6-7, NL-6211 KJ Maastricht, the Netherlands.

<sup>2</sup> Uniwersytet Opolski, Katedra Biosystematyki, ul. Oleska 22, PL-45-052 Opole, Poland.

<sup>3</sup> Nederlandse Geologische Vereniging (NGV), Afdeling Limburg, St. Martinusstraat 30, NL-6245 GE Eijsden, the Netherlands.

\* Corresponding author. Email: john.jagt@maastricht.nl

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### Abstract

All contributions in the current memorial volume are briefly commented upon, with the emphasis on how these issues touched upon, or were linked to, the long and productive professional careers of the late Felder brothers, in the fields of geology, palaeontology and human prehistory. Pertinent literature references are added, some of which are covered in the various papers, while others illustrate their wide range of interests and prolific publishing lives.

**Keywords:** Felder brothers, Limburg, commemoration, geology, prehistory, palaeontology, publications

### Introduction

In assembling the present volume over the past two years, we have attempted to cover all aspects of Neolithic archaeology (prehistory) and Late Cretaceous stratigraphy, palaeontology, geology and geochemistry, in which the late Felder brothers, Werner and Sjeuf (Fig. 1), took an interest, knowing that this would turn out to be a near-impossible task. Such has been their impact in these fields, that for generations to come their papers will be consulted and referred to, and their data used.

Werner's work revolved primarily around the formal lithostratigraphical subdivision of strata of Late Cretaceous (Santonian-Maastrichtian) and early Paleogene (mostly Danian) age (W.M. Felder, 1975a, b). During a period of at least forty-five years, he produced logs of all outcrops, both working quarries and temporary exposures, in southern Limburg (the Netherlands) and contiguous areas, the so-called 'Ontsluitingenarchief', and he never missed an opportunity to update on one or more of these, in particular the section exposed at the ENCI-Heidelberg Cement Group quarry at Maastricht (W.M. Felder & Bosch, 1998, 2000). Thus, we now have key data on outcrops long gone, such as those along the 'toeristenweg Epen-Vaals' (W.M. Felder et

al., 1962; W.M. Felder, 1977). Werner also took a keen interest in geological mapping (W.M. Felder, 1981, 1996), flint genesis and ichnofossils (W.M. Felder, 1980) and, when in the field, had a good eye for macrofossils of various kinds, although belemnite-like coleoids and echinoids ranked amongst his favourites.

Although covering the same field, Werner and Sjeuf did not always see eye to eye on matters stratigraphical, to put it mildly. Sjeuf's bioclast-based ecozones proved to conflict with Werner's formal lithological units (W.M. Felder, 1987) on several occasions. In later years, the brothers found a way to deal with their differences of opinion, by simply agreeing (P.J. Felder & W.M. Felder, 2008) that they were both right!

The Felder brothers co-operated closely during the excavation, exploration and documentation of Neolithic flint mines at Rijckholt-St. Geertruid (P.J. Felder et al., 1998). This meticulous work did not go unnoticed in countries all over the world, and in fact led to the working group being invited to support similar work done in England and elsewhere.

Sjeuf's career revolved mostly around the theme of bioclasts and ecozonation, which he introduced (P.J. Felder, 1981) as a new means to correlate and date Upper Cretaceous and lower



Fig. 1. Werner Maria Felder (1930-2008; left) and Peter Jozef (= Sjeuf) Felder (1928-2009; right). Picture taken July 2008; courtesy of Miel Doumen.

Paleogene strata in southern Limburg and adjoining areas. From the start, he worked out this method in great detail, and as soon as it appeared to work, and work well, he was invited to assess borehole cores, mostly from southern Limburg and the Campine (Kempen) area in northeast Belgium, but also from further afield (P.J. Felder, 1994, 1995, 2001a, b; P.J. Felder et al., 1985a, b).

During the mid- and late 1970s, Sjeuf co-operated with students of the Biology Department of the Katholieke Universiteit Nijmegen (Fig. 2), who he introduced in the intricacies of correlation and bioclast ecozonation. In addition, his educational work brought him in close contact with the 'common folk'; in an unsurpassed way, he was able to tell these people, in laymen terms, about complex geological processes but also about the use of natural resources through time (P.J. Felder, 2001c, 2006).

To us, Sjeuf's major contributions to our knowledge of Limburg geology involve those papers which link bioclast ecozonation to existing lithostratigraphy, resulting in key data on local tectonics, both in southern Limburg, the Campine area, the Hautes Fagnes area and the vicinity of Folx-les-Caves and Orp-le-Petit. In fact, the combined bioclast zones and frequency curves of benthic foraminifera and ornamented/unornamented ostracods provided a reliable correlation tool, even in condensed sections. In this way, a lot of previously puzzling issues could



Fig. 2. Sjeuf Felder (centre) and Katholieke Universiteit Nijmegen students, Marcel Roelofs (left) and Eric Mulder (right) in 1978; photograph by Jan van Eyk.

be resolved, e.g. for the Kunrade limestone facies of the Maastricht Formation and the Vijlen Member of the Gulpen Formation (P.J. Felder et al., 1985b; Bless & Felder, 1989; P.J. Felder & Bless, 1989, 1994; Bless, 1991; Bless et al., 1986, 1987, 1991a, b, 1993; P.J. Felder, 1997).

A profusely illustrated book, entitled *Het Fenomeen Felder*, was written by one of us (Schins, 2008) on the occasion of the 60th anniversary of the Afdeling Limburg (NGV). It illustrates the impact the Felder brothers had, and still have, on all things geological and prehistoric in southern Limburg. To commemorate them, also two special issues of the Dutch periodical *Sprekende Bodem*, published by the NGV Afdeling Limburg, have appeared in recent years, with contributions written by former colleagues and close friends: *Sprekende Bodem* 53(3): 76-124 (for Werner) and *Sprekende Bodem* 54(3): 72-120 (for Sjeuf). For the present volume we have assembled papers written by former colleagues and co-workers, as well as by other geologists and palaeontologists who knew the Felder brothers well. In our introductory notes below, we wish to indicate how these papers relate to their scientific careers.

## The present volume

### *The Veldwezelt loess series*

A temporary section along the Albert Canal near Veldwezelt (Belgium) is discussed by Meijs (2011). In preserving the transition between downslope and uphill areas as well as a south-east trending stream, this section has enabled a reconstruction of a very detailed Late Saalian, Eemian and Weichselian loess sequence and furnished important pedological, sedimentological, faunal, tephrochronological and cryogenic data. Associated remains of human occupation could thus be placed in various pedo-sedimentological cycles. Werner in

particular was fascinated by such issues, having discovered in the early 1980s a Palaeolithic flint tool at the nearby Belvédère gravel pit (Maastricht-Caberg; see Van Kolfshoten & Roebroeks, 1985), which sparked a renewed interest in early prehistory. Moreover, his geological mapping of southern Limburg included logging of various loess sections.

### ***An Albian lyelliceratid ammonite***

During the early 1980s, Sjeuf came to the conclusion that it was better, at least for him, to give up trying to identify macrofossils at the generic and specific level. This also explains why he never collected fossils the way his brother Werner did. Werner was a keen collector, with a good eye for detail, and his collections include material from places visited while on family holidays (in e.g., France, Switzerland, Germany) or during pre- and post-conference excursions throughout Europe. Unlike Sjeuf, Werner wished to have the full names of the specimens he had collected and he would have been delighted to see a previously recognised form from the Albian of southern France properly named herein.

### ***Trace fossils and parataxa***

In view of the fact that they are closely related to flint genesis (see Zijlstra, 1994) and are of importance palaeoecologically, Werner took an interest in trace fossils, and even erected his own ichnospecies, *Bathichnus multiturbatae* W.M. Felder, 1980, from the Vaals Formation in the type area. Breton (2006) subsequently introduced a new ichnogenus, *Felderichnus*, to accommodate this form. Only in recent years has a taxonomic assessment of the ichnofossil suites of the Maastrichtian type area been initiated, and more discoveries may be expected, as shown here by Donovan et al. (2011).

### ***Brachiopods***

Sjeuf used certain brachiopods (see P.J. Felder, 1981) in his bioclast analyses, in particular peaks in the distribution of the thecideid *Thecidea papillata* (Von Schlotheim, 1813); other species were noted, but not identified. The Maastrichtian type area has a long history of brachiopod research, going back to the early days of Faujas de Saint-Fond (1799-?1802) and Von Schlotheim (1813). The greatest boost came from Joseph de Bosquet (1854, 1859), who described numerous new species, notably craniids and thecideids. Later work includes a revision of those thecideids by Backhaus (1959) and of craniids by Krutzer (1969). Various subsets in the collections of the Natuurhistorisch Museum Maastricht (i.e., L. Blezer, W.M. Felder, J.W.M. Jagt, S. Renkens / H. Zijlstra, H. Senden) are currently being assessed by Simon (1993, 2003, 2004a, b, 2005, 2007a, b; Simon & Owen, 2001). The paper on *Terebratulina chrysalis* in the present issue (Simon, 2011) is a good example of what can still be achieved in this field.

### ***Dinocysts and correlations***

Following taxonomic/stratigraphical evaluations of dinocyst assemblages by Slimani (1994) and Foucher (in Robaszynski et al., 1995), the interest in these microfossils grew steadily, mainly because they were the prime tool in borehole core analyses in the Campine area (Belgium) and proved to be of great importance for the first sequence-stratigraphic interpretation of the type Maastrichtian (see Brinkhuis & Schiøler, 1996; Schiøler et al., 1997; Slimani, 1996, 2000; Slimani et al., 2011). In acknowledgement of their achievements, Brinkhuis et al. (2000) named a new genus and species after the Felder brothers, *Spumadinium felderorum*.

### ***Belemnitellid coleoids***

Although in recent years some doubt has been cast over the long-distance correlative value of belemnites, stratigraphically well-documented collections do yield important data for local/regional correlation (events; see Keutgen et al., 2010; Keutgen, 2011) and can also be used for isotopic studies, as the present example by Vonhof and co-workers shows.

### ***Echinoids***

Werner in particular was interested in macrofossils of all kind, but first and foremost echinoids. When he finally succeeded in tracing 'Müller's Bed' (Müller, 1847-1859), he set to collect as much as possible from this particular level, which yielded numerous silicified macrofossil taxa, notably heteromorph ammonites. Later, Sjeuf joined the ranks and both brothers produced a marvellous set of lacquer peels, now contained in the collections of the Natuurhistorisch Museum Maastricht. The new species of hemiasterid, here named after both of them (Van der Ham et al., 2011), acknowledges their perseverance.

### ***Marine turtles***

It was Sjeuf who wrote an overview of all remains of sea turtles (P.J. Felder, 1980) contained in various collections, both at home and abroad. Most of these skeletal remains can be ascribed to *Allopleuron hofmanni* (Gray, 1831), the commonest species in the area. Despite its regular occurrence, there still remains a lot to be discovered, as the contribution by Janssen et al. (2011) shows.

### ***City walk – building stones galore***

On occasion of the reopening of the completely refurbished Natuurhistorisch Museum Maastricht in 1977, Sjeuf wrote a brochure on building stones used in the city of Maastricht. A comparable leaflet (Dubelaar et al., 2006) was published a few years ago, while the present contribution by Dubelaar et al. (2011) is an updated version of the 1977 walk, this time with full-colour illustrations.

## Tourtia ammonites

The Mons Basin in southern Belgium was within the range of Werner's activities. There too, a sequence of stratigraphic gaps, with some chalk or limestone in between, was developed, which could thus serve as a 'touchstone' for the Liège-Limburg Basin. During the construction of boat lift at Strépy-Thieu, Werner joined forces with a few colleagues and collected large suits of silicified macrofossils of late Albian age, inclusive of some ammonites (Kennedy et al., 2008). Younger ammonite faunas, of early Cenomanian to Turonian age, occur in condensed sequences, locally referred to as 'tourties' (Kennedy et al., 2011).

## Tauw

Indurated levels within the Maastricht Formation always mystified both Werner and Sjeuf alike, who took a keen interest in hardgrounds and similar beds. Duser et al. (2011) now present a detailed analysis of 'Elt tauw', and it would have pleased the Felder brothers immensely to see the contribution by 'amateurs' (a word used here in the best possible way!) properly acknowledged. In fact, they always encouraged non-professionals to publish their findings and ideas as widely as possible.

## Isotope stratigraphy

Although some preliminary geochemical work had been done (P.J. Felder & Boonen, 1988; Clausen, 1994; P.J. Felder et al., 2003), oxygen, carbon and strontium isotope data remained few and far between, until Vonhof & Smit (1996) published preliminary work on the upper Maastricht Formation and the base of the overlying Paleocene Houthem Formation, straddling the Cretaceous/Paleogene (K/Pg) boundary. Here, Vonhof et al. (2011) add data obtained from a range of belemnite-like coleoids collected from the entire section exposed at the ENCI-Heidelberg Cement Group quarry (Maastricht) and some nearby outcrops and quarries. These allow the first detailed comparison of the type section of the Maastrichtian Stage with sequences elsewhere. Further work along these lines is anticipated for the near future.

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