

# FOSSILS AND STRATA

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Papers from the 6th International Conference  
on Trilobites and their Relatives



Edited by Alan W. Owen and David L. Bruton

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## Dedication

This volume is dedicated to the memories of Leif Størmer, Gunnar Henningsmoen and Valdar Jaanusson who were instrumental in the organisation of the first trilobite meeting held in Oslo in 1973. Each also made considerable contributions to the first trilobite treatise published in 1959. It is also fitting for a volume arising from the meeting in Tallinn that Valdar Jaanusson was born in Estonia and studied in Tallinn before fleeing to Sweden in 1944.

## Acknowledgements

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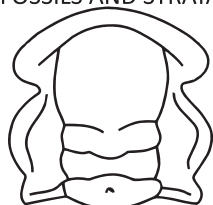
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# Papers from the 6th International Conference on Trilobites and their Relatives

ALAN W. OWEN AND DAVID L. BRUTON

FOSSILS AND STRATA



THE LETHAIA FOUNDATION

Owen, A.W., Bruton, D.L. 2019: Papers from the 6th International Conference on Trilobites and their Relatives. *Fossils and Strata*, No. 64. pp. 1–3.

This volume arises from the 6th International Conference on Trilobites and their Relatives held in Tallinn, Estonia, in July 2017. Seven papers on trilobites are included in the volume and are briefly summarized here. They range from systematic descriptions of taxa to considerations of ontogeny, biofacies, biostratigraphy and taphonomy, and together, they encompass trilobites from the Early Cambrian to the Late Devonian. The volume also includes a report of the Tallinn conference and a review of those that went before it. □ *Cambrian, Devonian, Ordovician, Silurian, Tallinn conference, trilobites.*

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The proceedings of the first International Conference on Trilobites and their Relatives held in Oslo in 1973 (Bruton 2019) were published in one of the earliest editions of *Fossils and Strata* (Martinson 1975). It is highly fitting, therefore, that with the return of the conference to Baltoscandia (Pärnaste 2018), the Lethaia Foundation, under whose auspices *Fossils and Strata* is published, kindly offered to publish a volume of papers arising from the sixth meeting held in Tallinn, Estonia, in July 2017.

The papers in the volume vary considerably in length. Although a notional page limit was given, it was made clear from the outset that there was some flexibility in this. The submission of a manuscript of almost monographic proportions (Geyer 2019) stretched this flexibility beyond what we had originally envisaged but the evident importance of the submission convinced us that it should be included. Geyer describes the remarkably diverse trilobite fauna from the lower Cambrian in the Anti-Atlas of Morocco, particularly the important global reference Tiot section. This fauna is crucial to the understanding of the earliest history of the trilobites and to the concept and correlation of Cambrian Series 2 and Stage 3. In the latter context, it enables a revised subdivision of the lowest of the Moroccan trilobite biozones. The paper includes descriptions of some 35 species, of which ten are new as are six genera. It includes description of the oldest unequivocally determinable trilobites from western Gondwana and possibly the world. The overall reassessment of the Bigotiniidae

involves revision of genera and species from other countries and the establishment of a new family within the Redlichiida.

Trilobites from the lower Cambrian are also described by Hou *et al.* (2019) from the Xiaoshiba Lagerstätte in Kunming, southern China. Whilst none of the described taxa are new, their description based on well-preserved material and their precisely located occurrences in measured sections points to the utility of some taxa in the eventual establishment of a robust species-based biostratigraphical division of the lower Cambrian of southern China. In particular, such a scheme of trilobite biozones should enhance the correlation of the successive Chengjiang, Xiaoshiba and Malong soft-bodied assemblages.

Trilobites from another exceptionally preserved fauna, the upper Tremadocian Fezouata Lagerstätte of the Moroccan Anti-Atlas, are described by Gutiérrez-Marco *et al.* (2019). These occur in large numbers in monospecific assemblages and belong to a new species of the nileid *Symphysurus*. A second species, *Symphysurus sicardi* (Bergeron), is described from a slightly higher horizon, close to the Tremadocian–Floian boundary and a third, possibly new, but not named, species is described from the upper Tremadocian. Gutiérrez-Marco *et al.* discuss the likely environmental setting indicated by the new Moroccan records of *Symphysurus* which in turn leads to the understanding of what has become a highly significant Lagerstätte.

Trilobites in yet another Lagerstätte are the subject of a taphonomic study by McCobb *et al.* (2019). Recent collecting in the largely neglected, upper

Katian, Slade and Redhill Mudstone Formation in South West Wales has revealed a large number of fossiliferous localities including one in which there are three thin echinoderm Lagerstätten. One of these also contains a rich trilobite fauna in addition to a diverse range of articulated echinoderms. Unlike the other faunas recovered from the formation, illaenids (including several enrolled specimens) dominate the trilobite fauna and complete exoskeletons are more common. Whilst disarticulated remains represent already dead or moulted individuals, the other aspects of the trilobite fauna provide the same taphonomic signal as the echinoderms – the rapid transport and burial of living animals, leading to their death.

Lagerstätten have provided increasingly important insights into trilobite morphology and taphonomy over recent years. Considerable advances have also been made in understanding trilobite ontogeny, again an area of investigation dependent on aspects of unusual preservation. Bernárdez *et al.* (2019) document early growth stages of the calymenacean trilobite *Prionocheilus mendax* (Vaněk) preserved in fine-grained mudstones in the Darriwilian (Middle Ordovician) Cofño Member of the Sueve Formation in northwestern Spain. These range from protaspides to meraspid degree 2 and include *in situ* exuviae with disarticulated librigenae. Clusters of pyrite spheres from the Bayo Member of the same formation are interpreted as possibly being trilobite eggs and are associated with the pliomerid *Placoparia* (*Coplacoparia*) *tournemini*. (Rouault). Both the calymenid larvae and the possible eggs are relatively large in relation to comparative material from elsewhere, and Bernárdez *et al.* raise the possibility that this may reflect lecithotrophy related to higher latitudes and/or the scarcity of organic matter.

Two papers in this volume address faunas that are in major need of revision, in terms of both material described decades ago and new collections:

Ebbestad & Fortey (2019) discuss the Upper Ordovician faunas of the Taimyr Peninsula in terms of their distribution within the modern lithostratigraphical and lithofacies framework and assess the biofacies into which these faunas fall. They use R- and Q-mode cluster analysis to identify two distinct biofacies. Black limestone and shales are typified by what they term the ‘raphiophorid association’ with many taxa very like those of the peripheral Laurentian Scoto-Appalachian faunas. In contrast, shelf limestones contain the ‘the monorakine–cheirurid–illaenid association’ which comprises a diverse range of monorakine genera endemic to the Siberian palaeoplate together with *Calyptaulax*, isotelines and cheirurids that also typify inshore settings on Laurentia.

Stocker *et al.* (2019) provide a very thorough taxonomic revision of all previously described trilobites belonging to the orders Proetida and Aulacopleurida from the Silurian and Devonian of Japan, along with descriptions of new material. Together this comprises 13 named species, one of which is new, belonging to nine genera, with three species described under open nomenclature. Stocker *et al.* identify species-level endemicity amongst these trilobites both compared to other East Asian terranes and between individual Japanese terranes. They argue that this endemicity may reflect palaeoenvironmental differences rather than simply geographical isolation.

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We are extremely grateful to the Lethaia Foundation and, in particular the chairman, Hans Arne Nakrem, for publishing this volume. We are also grateful to Svend Stouge, Editor-in-Chief of Fossils and Strata for his hard efforts in seeing this volume through to production. Sincere thanks must also go to the reviewers of the papers: Per Ahlberg, Brian Chatterton, Euan Clarkson, Andrei Dronov, Thomas Hegna, David Holloway, Michal Mergl, Frank Nikolaisen, Bob Owens, Alan Thomas, Xue-Jian Zhu, Anna Żylińska and three anonymous referees.

### References

- Bernárdez, E., Esteve, J., Laibl, L., Rábano, I. & Gutiérrez-Marco, J.C. 2019: Early post-embryonic trilobite stages and possible eggs from the ‘Túnel Ordovícico del Fabar’ (Middle Ordovician, northwestern Spain). *Fossils and Strata* 64, 23–33, (this volume).
- Bruton, D.L. 2019: From Oslo to Prague – the Trilobite Meetings 1973–2012. *Fossils and Strata* 64, 5–16, (this volume).
- Ebbestad, J.O.R. & Fortey, R.A. 2019: Stratigraphy and trilobite biofacies of the Late Ordovician of the Taimyr Peninsula, Arctic Russia. *Fossils and Strata* 64, 35–53, (this volume).
- Geyer, G. 2019: The earliest known West Gondwanan trilobites from the Anti-Atlas of Morocco, with a revision of the Family Bigotiniidae Hupé, 1953. *Fossils and Strata* 64, 55–153, (this volume).
- Gutiérrez-Marco, J.C., Rábano, I. & García-Bellido, D.C. 2019: The nileid trilobite *Symphysurus* from upper Tremadocian strata of the Moroccan Anti-Atlas: taxonomic reappraisal and palaeoenvironmental implications. *Fossils and Strata* 64, 155–171 (this volume).
- Hou, J.B., Yang, J., Zhang, X.G., Hughes, N. & Lan, T. 2019: Trilobite-based biostratigraphy of the Xiaoshiba Lagerstätte. *Fossils and Strata* 64, 173–191, (this volume).
- Martinsson, A. (ed.) 1975: Evolution and morphology of the Trilobita, Trilobitoidea and Merostomata. *Fossils and Strata* 4, 1–467.
- McCobb, L.M.E., McDermott, P.D. & Owen, A.W. 2019: The taphonomy of a trilobite fauna from an uppermost Katian echinoderm Lagerstätte in South West Wales. *Fossils and Strata* 64, 193–203, (this volume).

Pärnaste, H. 2019: The 6th International Conference on Trilobites and their Relatives: Tallinn calling, Estonia celebrating. *Fossils and Strata* 64, 17–22 (this volume).

Stocker, C.P., Siveter, D.J., Lane, P.D., Williams, M., Oji, T., Tanaka, G., Komatsu, T., Wallis, S., Siveter, D.J. &

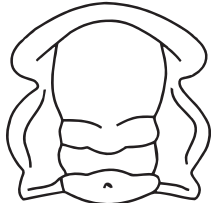
Vandenbroucke, T.R.A. 2019: The Silurian and Devonian proetid and aulacopleurid trilobites of Japan and their palaeogeographical significance. *Fossils and Strata* 64, 205–232, (this volume).



# From Oslo to Prague – the Trilobite meetings 1973–2012

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FOSSILS AND STRATA



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The following report is a personal account of the first five trilobite symposia from Oslo 1973 to Prague 2012 and some of the people who made these meetings so rewarding. In addition to providing a focus for a very active research community, all the symposia with associated field trips have given me the chance to become better acquainted with new faces and to forge lasting friendships. □ *International trilobite conferences, Oslo, Oxford, Prague, St Catharines, Toledo.*

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## Introduction

As the instigator and organizer of the first conference, held in Norway in 1973, I am delighted that others in our very active research community have followed my lead and convened further meetings on trilobites and other early arthropods. All the symposia with associated field trips have given me the chance to become better acquainted with new faces and to forge friendships which have lasted to the present. In this respect, I thank Fred Shaw, Richard Fortey, Derek Siveter and Derek Briggs all of whom were in Oslo in 1973 and have attended all of the meetings with me since then.

A summary of what is written here formed the basis for my talk at the most recent meeting, held in Tallinn in July 2017. It provides a personal account of the five meetings that preceded it.

## Oslo, Norway 1973 (July 1–8)

During my Ph.D studies (1962–1965), I had the great privilege of meeting with some of the big names working with trilobites both in Europe and North America. Three in Scandinavia come to mind, Valdar Jannusson in Stockholm and, in Oslo, Gunnar Henningsmoen and Leif Størmer (Fig. 1). It was Størmer who encouraged me to return to Oslo when I was

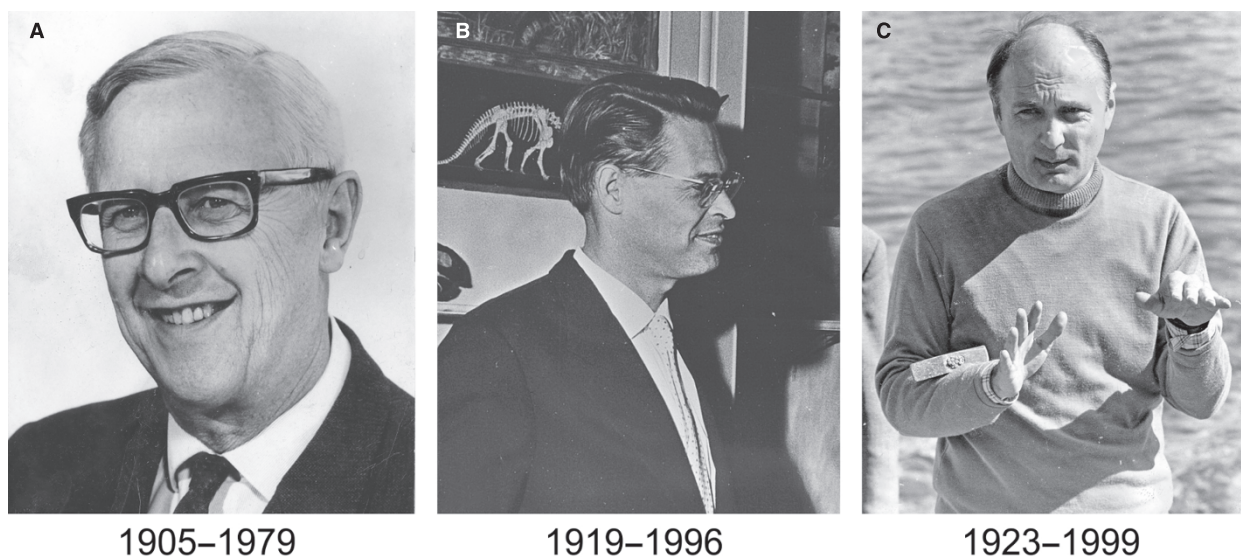


Fig. 1. Oslo 1973: The scientific committee. A, Leif Størmer; B, Gunnar Henningsmoen; C, Valdar Jannusson. Photographs: Natural History Museum, Oslo.



*Fig. 2.* Oslo 1973: Group gathering on the lawn of Voksenåsen conference centre just before the meeting banquet on July 7. Key to photograph: 1. Gunnar Henningsmoen. 2. Kari Henningsmoen. 3. Mike Romano. 4. John Cisne. 5. Jim Stitt. 6. Mrs. Stitt. 7. Anne Bruton. 8. David Bruton. 9. Chris Hughes. 10. Dian Teigler. 11. Harry Whittington. 12. Bob Hessler. 13. Derek Siveter. 14. Pierre Lespérance. 15. Natascha Heintz. (organization). 16. Leif Størmer. 17. Valdar Jaanusson. 18. Alberto Simonetta. 19. Ken McNamara. 20. Ken Towe. 21. Mrs Waterston. 22. Charles Waterston. 23. Derek Briggs. 24. Brian Norford. 25. Peter Jell. 26. Ken Campbell. 27. T. Hamada. 28. Dan Fisher. 29. Helmut Alberti. 30. Halszka Osmolska. 31. Mrs Hamada. 32. Allen Ormiston. 33. Fred Shaw. 34. Niles Eldredge. 35. Mrs. Eldredge. 36. Phil Lane. 37. Keith Ingham. 38. Tutti Størmer. 39. Sir James Stubblefield. 40. Ewa Tomczykowa. 41. Lady Stubblefield. 42. Jill Ross. 43. Mrs. Hessler. 44. Rube Ross. 45. Dorothy Whittington. 46. Maureen Hughes. 47. Pierre Morzadec. 48. Richard Fortey. 49. Jacques Destombes. 50. Mrs. Henry. 51. Jean-Louis Henry. 52. Alan Thomas. 53. John Temple. 54. Dick Robison. 55. Judy Shergold. 56. Bob Owens. 57. John Shergold. 58. Mrs. Dean. 59. Bill Dean. 60. Tove Bockelie (organization). 61. Jan Bergström. 62. John Dalingwater. 63. Euan Clarkson. Not present when the photograph was taken: Ladislav Marek and Mrs Marek, P. Chardy, David Schwimmer and Riccardo Levi-Setti. Photograph: Johan Fredrik Bockelie.

finished with my thesis and later was behind my employment at the University in 1967. Within a year, the first trilobite meeting was being planned with Leif, Gunnar and Valdar supporting me as organizer. Tutti Størmer and my wife, Anne, took care of the accounts; no mean task as the strength of the dollar changed at the time. This was before pocket calculators were in widespread use and Anne used her slide rule with great success.

The Norwegian scientist Gunnar Randers was, at this time, head of the NATO Scientific Affairs Division, and when approached, he

suggested we should apply for funding as Norway had not done this to any great extent and there was plenty of money available. We applied and were awarded USD 10,000. From IUGS, we received USD 1,000 while smaller sums came from the Norwegian Research Council and the IPA.

With this, we were able to invite 60 participants from 13 nations (Fig. 2) and pay all travel and accommodation for the three-day meeting with the addition of an excursion to classic localities in the Oslo Region. The meeting made a profit which

covered the publication costs of the proceedings (Martinsson 1975).

I worked with Harry Whittington at Harvard in 1964, and we were together for the second Burgess Shale expedition in 1967 (Bruton 2011). Leif Størmer, who had worked on the Burgess fauna, thought this was a good chance to include this on the programme and thus Harry lectured on the limbs of *Olenoides*. Also in the programme, John Cisne described the limbs of *Triarthrus*. This, I think, was the start of a focus on arthropod appendages, their form, function and use in high-level taxonomy which blossomed as further results from the Burgess Shale arthropod fauna became known and the term ‘Trilobitomorpha’ received a new meaning. Richard Fortey’s contribution on trilobite communities later became a classic in the study of community palaeoecology.

The organizers were especially interested in inviting non-trilobite workers and, to this end, contributions on *Limulus* by Daniel C. Fisher, on eurypterids by Charles D. Waterston and the relations of the trilobitomorpha to the crustaceans by Robert R. Hessler, provided for much discussion. All these are to be found in the extensive volume arising from the meeting (Martinsson 1975).

The meeting sessions and accommodation were in an attractive conference centre high up in the



Fig. 3. Oslo 1973: Conference excursion. Quarry with shales and *Ogygiocaris*. From the left: Euan Clarkson, David Bruton and Leif Størmer. Photograph: Brian Norford.

forest and overlooking the city of Oslo. The weather was perfect for an excursion by boat on the Oslo fjord and localities visited both ashore and on islands (Fig. 3). The excursion day ended with an unexpected thunder storm in the late afternoon forcing participants to run through town to board a private tram that took them nonstop to the conference centre. The group photograph (Fig. 2) was taken before the conference dinner and after all had dried out.

The year 1973 precluded participation from China and the fact that the meeting was



Fig. 4. St. Catharines, 1997: Outside conference centre, Brock University, Ontario, Canada. From the left: Joanne Klussendorf, Don Mikulic, Derek Siveter (partly hidden), Nigel Hughes, Suraj K. Parcha, Dave Rudkin, Tatyana Pegel, Rudolfo Gozalo. Photograph: Dave Rudkin.



Fig. 5. St. Catharines, 1997: Group picture. Key to photograph. Back row: 1. Hans-Hartmut Krueger. 2. Margaret Campbell. 3. Ingrid Krueger. 4? 5. Derek Siveter. 6. Robert Sensenstein. 7. Miriam Zelditch. 8. Helje Pärnaste. 9. Danita Brandt. 10. Joanne Kluessendorf. 11. ? Mark Webster. 12. Ralph Chapman. 13. Nigel Hughes. 14. Rolf Ludvigsen. 15. Brian Chatterton. 16. Tim McCormick. 17. Denis Tetreault. 18. Richard Fortey. 19. ?John Taylor. 20. Michael Cuggy. 21. David Rudkin. 22. Stephen Westrop. 23. ?Chris Nedin. 24.? 25. Tatyana Pegel. 26. Donald Mikulic. 27. John Shergold. Middle row: 28. Frank Habets. 29. Allison Palmer. 30. Gerd Geyer. 31. Roger Kaesler. 32. Gene Hunt. 33. DeDe (Diane) Dawson. 34. Brian Pratt. 35. David L. Bruton. 36. Fred Collier. 37. Doug Boyce. 38. ?Bruce Lieberman. 39. Brenda Miles. 40. Suraj Kumar Parcha. 41. Catherine Cronier. ?42. 43. Jonathan Adrian. 44. Gregory Edgecombe. 45.? Loren Smith. 46? 47. Bryan Levman. 48. Mark Peterson. Front row: 49. Kevin Brett, 50. Jeong Gu Lee. 51. Raimund Feist. 52. Robert Owens. 53. Rodolfo Gozalo. 54. Gerald Kloc. 55. Gian Luigi Pillola. 56. Shanchi Peng. 57. Alan Thomas. 58. Niles Elderidge. 59. Arne Nilesen. 60. Kristina Månsson, 61. Euan Clarkson. 62. Tom Whitely. 63. Dong-Chan Lee. 64. Duck Choi. At least eight persons on the programme lecture list have not been recognized. Photograph: Dave Rudkin who together with Helje Pärnaste, kindly produced the identification list.

organized with the aid of NATO money meant that no Soviet palaeontologists attended. However, we were especially fortunate in having Ladislav Marek from Czechoslovakia and Halszka Ósmolska and Ewa Tomczykowa from Poland. These were the only two women working with trilobites who participated at the meeting, but this changed markedly at future meetings.

### Brock University, St. Catharines, Ontario, Canada 1997 (August 22–25)

This conference which became known by its title ‘Trilobite paleobiology: Past, present and future’ was a North American initiative alone, and the



Fig. 6. St. Catharines, 1997: Pre-conference excursion to south central Ontario. Standing, from the left: Richard Fortey, Hans-Hartmut Krueger, Ingrid Krueger, Derek Siveter, Kristina Månsson, Margaret Campbell, Robert Owens, Ronald Garney, Mark Peterson, Doug Boyce, Alan Thomas and Gian Luigi Pillola. Kneeling: Kevin Brett (co-leader), Dave Rudkin (co-leader), Helje Pärnaste and Derek Armstrong (adjunct leader). Nine participants had left when this picture was taken. Photograph: Dave Rudkin.



Fig. 7. Oxford 2001: Jonathan Adrain and Harry Whittington in deep conversation. Photograph: Helje Pärnaste.

committee was chaired by Steve Westrop. As the photographs (Figs 4–6) show, this was a most popular and well-attended meeting.

For me, this was a chance to meet a large number of those who were only names to me until then. Many made up the organizing committee which included Jonathan Adrain, Brian Chatterton, Greg Edgecombe, Nigel Hughes, Ed Landing, Rolf Ludvigsen, Brian Pratt, Kevin Brett and Dave Rudkin. Rolf will be remembered for editing the trilobite newsletter after me. I remember an entertaining speech by Nigel Hughes who also sang for us at the dinner, and I had the pleasure of meeting up again with Ron Tripp. Ron was one of many gifted British amateur palaeontologists. He had left Britain long after retirement and was the living in Canada with



Fig. 8. Oxford 2001: Derek Siveter and Fred Shaw. Photograph: Helje Pärnaste.

his second wife. I also met up with Bill Fritz who had been a camp leader at Burgess almost 10 years to the day. In fact, I returned to Burgess with my wife after the meeting was over.



*Fig. 9.* Oxford 2001: From the left, Peter Jell, Mrs. Jell, Nigel Hughes and Peng Shanchi. Photograph: Helje Pärnaste.



*Fig. 10.* Oxford 2001: Alberto Simonetta and Winfried Haas at the conference reception, Oxford Museum. Photograph: D.L. Bruton.

Three ambitious field trips were held to the Avalon Terrane (led by Landing and Westrop), the Canadian Rocky Mountains (led by Chatterton and Pratt) and Ordovician stratigraphy and trilobite faunas of south central Ontario (led by Brett and Rudkin; Fig. 6).

The aim of this meeting covered a broad range of then current interests (as now) in the relationship between Cambrian and post-Cambrian clades, the Ordovician radiation of trilobites, what relation there is between the arthropods from the Burgess Shale and a cladistic analysis of Cambrian arachnomorphs. A note from the meeting was later published by Adrain & Westrop (1999a) as a forward to a valuable selection of papers that they edited from the conference (Adrain & Westrop 1999b). As they indicated (Adrain & Westrop 1999a), there had been a long gap since the Oslo meeting; happily, the meetings after that at St. Catharines have been at much shorter intervals.



*Fig. 11.* Oxford 2001: Excursion to Wren's Nest in the rain. Winfried Haas in pink poncho. Photograph: Helje Pärnaste.



*Fig. 12.* Oxford 2001: Excursion to Wren's Nest. From the left: Zhou Zhiyi, Bob Owens, Keith Ingham, Alan Thomas. Photograph: Helje Pärnaste.



Fig. 13. Oxford 2001. The conference dinner at St John's College. The author's speech of thanks at the high table, but what was so amusing? From the left: David Bruton, Derek Siveter, Richard Fortey, Alan Owen and Dick Robison. Photograph: Helje Pärnaste.



Fig. 14. Toledo 2008: Group photograph. Photograph through the courtesy of Helje Pärnaste.



Fig. 15. Toledo 2008: Pre-conference excursion. Giant asaphid trilobites at the Canelas quarry, Arouca, northern Portugal. Juan Carlos Gutiérrez-Marco and Euan Clarkson for scale. Photograph: D.L. Bruton.

### University of Oxford, England, 2001 (April 3–6)

The title of this meeting was 'Trilobites and their relatives' and was organized by a team led by Derek Siveter. It was well supported with a participation of



*Fig. 16.* Toledo 2008: Mid-conference excursion. A relief for some of the participants, having transport by tractor and trailer. Photograph: D.L. Bruton



*Fig. 17.* Toledo 2008: Mid-conference excursion. Lunchtime entertainment with some conference participants showing their prowess at dancing the tango. Photograph: D.L. Bruton.

over 120 from 20 nations including Russia, Korea and China.

The themes discussed were much the same as previous meetings and included functional morphology, evolution and palaeogeography and broader aspects of arthropod phylogeny. Proceedings from the meeting later appeared in a handsome publication dedicated to Harry Whittington (Lane *et al.* 2003).

This was the last meeting Harry attended (Fig. 7). He was then 85 but this did not prevent him travelling to Japan later in 2001 to receive the prestigious Emperor of Japan's International Biology Prize.

The Oxford meeting brought together many old friends (Figs 7–10). It was held at Eastertime and coincided with a most unfortunate outbreak of 'foot and mouth' disease that meant that walking in the

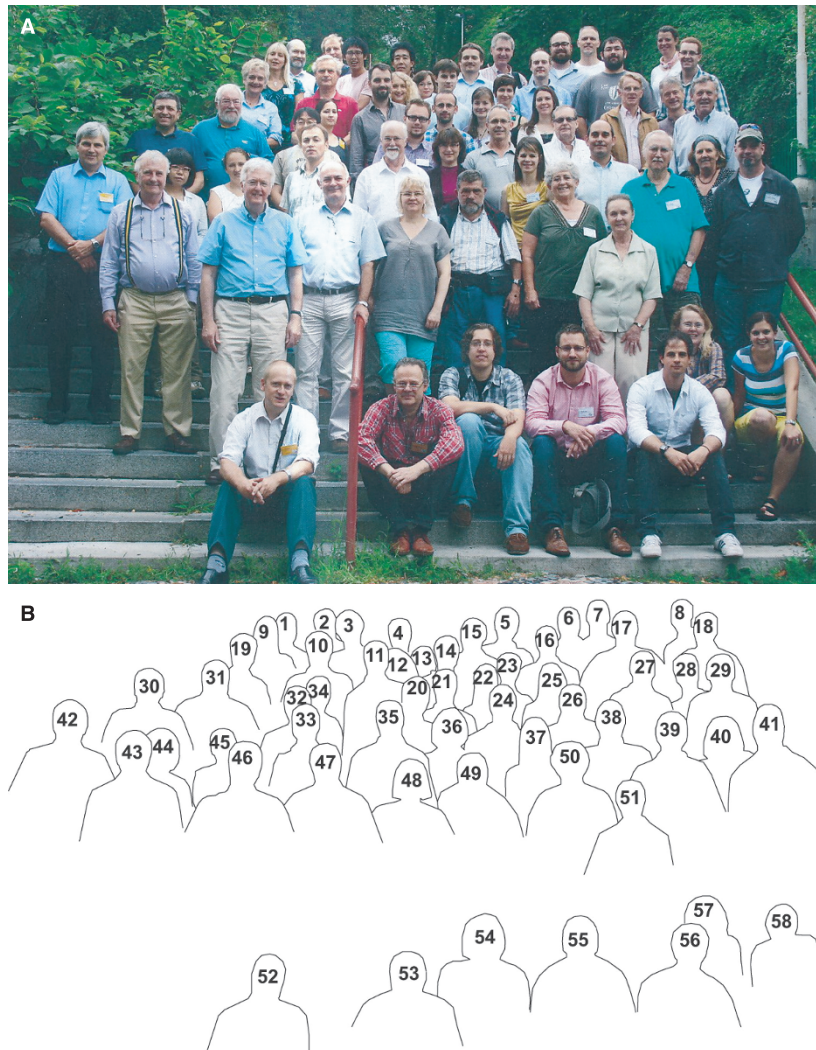


Fig. 18. Prague 2012: Group photograph taken on steps outside the meeting venue, July 3. Key to photograph: 1. Michael Zwanzig. 2. Klaus M. Weber. 3. Yuta Shiino. 4. Yutaro Suzuki. 5. Derek E.G. Briggs. 6. Ian R. Gilbert. 7. Robert Sensenstein. 8. Benedicte van Lidth. 9. Kristina Månsson. 10. Robert Johnson. 11. Štěpán Rak. 12. Martina Nohejlová. 13. Martina Aubrechtová. 14. Tomáš Weiner. 15. Martin David. 16. Paul Hille. 17. Jorge Esteve. 18. John Paterson. 19. Brigitte Schoenemann. 20. Lukáš Lajbl. 21. Matuš Hyžný. 22. Hedvika Poukarová. 23. Simona Horychová. 24. David Holloway. 25. Allison C. Daley. 26. Phil Lane. 27. Fred C. Shaw. 28. Nigel Hughes. 29. David L. Bruton. 30. Juan Carlos Gutiérrez-Marco. 31. Euan Clarkson. 32. Paul S. Hong. 33. Igor Korovnikov. 34. Petra Tonarová. 35. Brian Chatterton. 36. Elena Naimark. 37. Brenda Hunda. 38. Diego Garcia-Bellido. 39. Stewart J. Hollingworth. 40. Lee A. Hally. 41. Joe Collette. 42. Michal Mergl. 43. Richard A. Fortey. 44. Yumik Iwasaki. 45. Anastasiya Makorova. 46. Derek J. Siveter. 47. Paul A. Selden. 48. Helje Pärnaste. 49. Juan Antonio Vella Fernández. 50. Mary Hollingworth. 51. Tatyana Pegel. 52. Petr Budil. 53. Oldřich Fatka. 54. James C. Lamsdell. 55. Martin Stein. 56. Javier Ortega Hernández. 57. Stacey Gibb. 58. Marika Polechová. Photograph and naming of participants courtesy of Oldřich Fatka and Helje Pärnaste.

countryside was forbidden and both pre- and post-excursions had to be cancelled. We did, however, enjoy a coach trip in pouring rain to the famous Silurian, Wren's Nest, locality (Figs 11, 12) followed by a reception given by the Mayor of Dudley. The coat of arms of the city once included an outline of the 'Dudley Bug', *Calymene blumenbachii*, now, sadly, missing from the present-day coat of arms of more modern design.

During the 1800s, limestone at Wren's Nest was mined from the surface but later on, from

underground galleries and transported out by canal barges. We had the amusing experience of having to work our way into the 'Dark Cavern' with the sterling help of Diego Garcia-Bellido who, so-called, footed the barge using his feet on the tunnel roof while lying on his back. Historically, the Cavern, in 1839, was lit by gas for a lecture on geology by Sir Roderick Murchison for an audience of 15,000.

The conference dinner was held in the impressive surroundings of the dining hall of St John's College (Fig. 13).



*Fig. 19.* Prague 2012: Lunchtime break, to celebrate David Bruton's birthday on July 3rd. From the left: Richard Fortey, Derek Siveter, Derek Briggs, David Bruton, Paul Selden and Phil Lane. Photograph: Helje Pärnaste.



*Fig. 20.* Prague 2012: Mid-conference excursion on the deck of a Vltava River boat. Juan Carlos Gutiérrez-Marco meets 'Joachim Barrande (Petr Budil) opposite "Barrande's Rock". Photograph: D.L. Bruton.



*Fig. 21.* Prague 2012: Mid-conference excursion on the deck of a Vltava River boat. Juan Carlos Gutiérrez-Marco lifting Gian Luigi Pillola in a joyful attempt to throw him overboard. Photograph: D.L. Bruton.

## Toledo, Spain, 2008 (June 16–24)

This meeting with the title 'Trilo 08' was well organized by Isabel Rábano and Juan Carlos Gutiérrez-Marco with colleagues. Almost 100 participants took part in a meeting historically situated in the majestic city of Toldedo (Fig. 14). We were housed in various scattered hotels which many of us reached, suitcases clattering loudly over the cobbled streets, very late in the evening after a long drive from Arouca, northern Portugal. Here, under the excellent guidance of Artur Sá, we had seen the famous giant trilobites from Canelas during the pre-conference excursion (Fig. 15).

In the quarry, we examined a newly uncovered bedding plane scattered with huge asaphid trilobites and then saw similar specimens on shale slabs that reached in height up to our waists. Lunch in the museum grounds was a memorable affair, and a monument had been erected to our visit inscribed with names in alphabetical order after first names. My wife Anne was embarrassed at being high on the list.

In Arouca, we were also witness to the opening of the Geopark where Richard Fortey made a speech on our behalf and we walked to a roundabout in the nearby highway where there was a monument surmounted with a trilobite model.

The meetings in Toledo were held in Real Fundación de Toledo (Museo Victorio Macho). The programme was the most ambitious, and 45 papers were presented along with numerous posters. In my view, this was trilobite research at its best with remarkable preservations shown on material from Bohemia, Morocco and Beecher's Trilobite Bed in New York State. New methods combining sliced sections and 3D computer modelling emerged from work in the Hereford (Silurian) Lagerstätte. A total of 75 short papers were published in time for the meeting (Rábano *et al.* 2008).

Jonathan Adrian held a special session to demonstrate his global species database in preparation for

the revised Treatise. We await, with interest, the successors to the first volume in the new series (Whittington *et al.* 1997).

The mid-conference field trip on June 21 was devoted to the Ordovician trilobites and ichnofossils from the Toledo Mountains led by Juan Carlos Gutiérrez-Marco. A beautifully illustrated field guide was produced by him and his wife, Isabel Rábano. The day was hot, and we oldies were grateful for the tractor and trailer ride to and from an outcrop (Fig. 16). We examined the American quartzite and huge numbers of *Cruziana*. Slabs of these decorated the walls of a restaurant where we stopped for lunch. This was an extended affair with local dancers who encouraged the more athletic of us to try the tango (Fig. 17).



Fig. 22. Prague 2012: Mid-conference excursion on the deck of a Vltava River boat. Two meeting stalwarts, Helje Pärnaste (left) and Kristina Månson. Photograph: Anne Bruton.

### Prague, Czech Republic, 2012 (July 1–4)

This conference with title 'On trilobites and their relatives' was organized in Prague by Petr Budil and Oldřich Fatka. Over 90 participants from more than 20 countries were present at the conference (Fig. 18). Abstracts for 50 lectures were available (Budil & Fatka 2012) together with a field guide at mid-conference (Budil *et al.* 2012). Throughout the meeting, the emphasis was on trilobite morphology and systematics which was good to see when published (Budil *et al.* 2014).

For me this was a sort of 'homecoming' having lived and studied in Prague in 1962. Things have



Fig. 23. Prague 2012. Post-conference excursion to Sardinia. Porto di Canalgrande. Back row from the left: Bernhard Schoenemann, Brigitte Schoenemann, John Paterson, Allison Daley, Samuel Zamora, Andrea Mancosu, Salvatore Vacca, Helje Pärnaste, Salvatore Noli. Middle row from the left: David L. Bruton, Lee-Ann Hally, Linda McCollum, Antonio Vela. Front row from the left: Anne Bruton, Gian Luigi Pillola, Luo Kunll. Photograph: Diego Garcia-Bellido.

changed much since then, and it was a shame that the Narodni Museum was closed for refurbishment. While in Prague this time, I was able to celebrate my birthday with close friends (Fig. 19).

The mid-conference excursion entailed a river cruise down the Vltava valley (Figs 20–22) past some of the classic geological sites such as Lentná Hill and the Branik rock as far as the famous Barrande's Rock showing disharmonic folding of the Devonian succession. Joachim Barrande drew this locality several times during fieldwork, and here, our vessel stopped as we sipped champagne below the sign on the rock wall erected on 14 June 1884 in memory of Barrande. To our surprise, a figure dressed in clothes of the time appeared on deck: Petr Budil in the guise of Joachim Barrande himself (Fig. 20). Also on deck, Juan Carlos Gutiérrez-Marco lifted up Gian Luigi Pillola in a playful attempt to cast him overboard (Fig. 21)!

The day ended with a tram ride to the suburb of Barrandov and the village of Klukovice passing the picturesque sites in the Lower and Middle Devonian rocks before stopping in a woodland glade for a grilled sausage and salad lunch.

At the Toledo meeting, as already mentioned, one of the excursions was held outside Spain, in Portugal, while the post-conference excursion in connection with the Prague meeting was held in Sardinia and organized by Gian Luigi Pillola from July 5 to 8 (Pillola 2012a,b).

On separate days, we saw rocks and sections named for those who had worked on and described the faunas and stratigraphy. The coastal sections were most impressive with Lower Cambrian faunas in the Serra Scoris section near Gonnessa where we spent two nights. Later, we saw a Franco Rasetti locality at Porto di Canalgrande (Fig. 23) where the lunch stop was combined with a glorious swim in the clear sea. The last stop gave us the chance to meet Francesco Leone who took us to the type section of the Riu Is Arrus Member of the Monte Argentu Formation (Upper Ordovician) yielding exoskeletons of the nektaspid arthropod *Tariccoia arrusensis*.

'Gigi' was a wonderful guide and host. The heat was enervating as we left the capital Cagliari by train to the north of the island and flight home the following day from Olbia.

Trilobite research has continued to blossom since the first conference in 1973, new research themes have emerged, and new problems have been identified. The conferences, including the very successful sixth meeting in Tallinn in 2017 organized by Helje

Pärnaste, have provided a valuable and friendly opportunity for trilobite workers to gather, present new results and exchange ideas. I am sure that all will agree this must continue and I wish future organizers all the very best.

## Acknowledgements

I extend warm thanks to Hans Arne Nakrem and Karl Bruton for their help with photographs used here. Apart from my own collection, these have come from Helje Pärnaste, Dave Rudkin, Juan Carlos Gutiérrez-Marco, Petr Budil and Gian Luigi Pillola. Each has helped to identify those present, together with Derek Siveter, Diego Garcia-Bellido and Nigel Hughes.

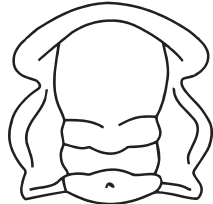
## References

- Adrain, J.M. & Westrop, S.M. 1999a: Trilobite Paleobiology: Past, Present, and Future. *Journal of Paleontology* 73, 161–163.
- Adrain, J.M. & Westrop, S.M. (eds) 1999b: Papers from the Second International Trilobite Conference, August 1997. *Journal of Paleontology* 73, 161–371.
- Bruton, D.L. 2011: The Cambridge University-Geological Survey of Canada excavation of the Burgess Shale in 1967. *Palaeontographica Canadiana* 31, 9–18.
- Budil, P., Fatka, O. (eds) 2012: *The 5th Conference on Trilobites and their Relatives. Abstracts*. 59 pp. Czech Geological Survey & Charles University, Prague.
- Budil, P., Fatka, O. & Polechová, M. 2012: *The 5th Conference on Trilobites and their Relatives. Mid-Conference Field Trip Guide*. 15 pp. Czech Geological Survey & Charles University, Prague.
- Budil, P., Fatka, O., Holloway, D.J., Hughes, N. (eds). 2014: From J. Barrande to H.B. Whittington. Papers from The 5th Conference on Trilobites and their relatives. *Bulletin of Geosciences* 89, 201–450.
- Lane, P.D., Siveter, D.J., Fortey, R.A. (eds). 2003: Trilobites and their relatives. Contributions from the Third International Conference, Oxford 2001. *Special Papers in Palaeontology* 70, 1–397.
- Martinsson, A. (ed) 1975: Evolution and morphology of the Trilobita, Trilobitoidea and Merostomata. *Fossils and Strata* 4, 1–467.
- Pillola, G.L. 2012a: Geological outline of Sardinia, Italy: Historical overview of Sardinia. 5th Trilobite Conference 2012. Fieldtrip Guide-Book Sardinia 5–8 July 2012.
- Pillola, G.L. (ed.) 2012b: Three stops: Franco Rasetti day, Giuseppe Meneghini - Jan. Geog Bornemann day and Michele Taricco - Wolfgang Hammann day. 5th Trilobite Conference 2012. Fieldtrip Guide book, Sardinia 5–8 July 2012.
- Rábano, I., Gozalo, R., García-Bellido, D. (eds). 2008: Advances in trilobite research. Cuadernos del Museo Geominero, 9, Instituto Geológico y Minero de España, Madrid, 448 pp.
- Whittington, H.B., Chatterton, B.D.E., Speyer, S.E., Fortey, R.A.F., Owens, R.M., Chang, W.-T., Dean, W.T., Jell, P.A., Laurie, J.R., Palmer, A.R., Repina, I.N., Rushton, A.W.A., Shergold, J.H., Clarkson, E.N.K., Wilmott, N.V. & Kelley, S.R.A. 1997: *Treatise on Invertebrate Paleontology, Part O, Arthropoda 1, Trilobita (revised)*, volume 1. The Geological Society of America and University of Kansas Press, New York and Lawrence.

# The 6th International Conference on Trilobites and their Relatives: Tallinn calling, Estonia celebrating

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FOSSILS AND STRATA



THE LETHAIA FOUNDATION

Pärnaste, H. 2019: The 6th International Conference on Trilobites and their Relatives: Tallinn calling, Estonia celebrating. *Fossils and Strata*, No. 64, pp. 17–22.

The 6th International Conference on Trilobites and their Relatives was held in Tallinn, Estonia in July 2017. Estonian trilobites have long been known worldwide especially through the works of Karl Eduard von Eichwald, Carl Friedrich Schmidt, Armin Aleksander Öpik, Valdar Jaanusson, Harry Mutvei, Reet Männil and others. Estonia was thus an ideal location for this gathering. The goal of the conference was to present recent progress in studies on all aspects of trilobites and their relatives. More than 80 participants from 20 countries took part. The associated field excursions were inspired by the footsteps of Friedrich Schmidt who, in 1897, led a field excursion in Estonia organized for the International Geological Congress held in St. Petersburg. □ *6th Conference on Trilobites and their Relatives, Arthropoda, Estonia, Schmidt, Tallinn, Trilobita.*

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The 6th International Conference on Trilobites and their Relatives was held in Tallinn, the capital of Estonia from 7 July 2017 to 10 July 2017. Estonia is celebrating its centenary as an independent country but the first descriptions of Estonian trilobites were published almost two centuries ago in 1825, by Baltic German geologist, physician and naturalist Karl Eduard von Eichwald (1795–1876). The basic knowledge of the majority of Estonian trilobites, with detailed descriptions and comparison with other regions of the world, was provided by Carl Friedrich Schmidt (1832–1908) in a series of monographs published between 1881 and 1907 (see also Bruton *et al.* 1997; Schmidt 1881, 1885, 1888, 1894, 1897, 1898, 1901, 1904, 1906, 1907). Armin Aleksander Öpik (1898–1983) refined the picture on the trilobites from the Ordovician System (1925–1930, 1937) before he had to escape from World War II to live in Australia where he became one of the most productive trilobite researchers of his time, describing over 300 species (Shergold 1985). Another trilobite specialist, Valdar Jaanusson (1923–1999) also escaped to Sweden as did Harry Mutvei (b. 1925) who has shed considerable light on ultrastructure of trilobite and other arthropod cuticles (e.g. 1974, 1977, 1981; Dalngwater *et al.* 1991). Schmidt's descriptions were extremely long and detailed, very useful for later recognition of his taxa, while Swedish taxonomic descriptions of that time were rather short and commonly lacking in detail. Jaanusson brought some clarity to the issue and revised the asaphid (Jaanusson 1953a; 1953b) and illaenid (Jaanusson 1954,

1957) trilobites with a more modern approach. He showed changes in position and size of the eyes during growth, emphasizing aspects of these taxonomically important characters, and he paid attention to the details on the ventral side of the exoskeleton, in particular the attachment of the hypostome. Reet Männil (1931–2005) refined our knowledge of Silurian taxa and also documented variants of their body plan depending on facies/depth (e.g. 1986, 1992). Ecological aspects were also pursued by Helje Pärnaste with various research teams in studying the Hirnantian faunas of Baltica (Popp & Pärnaste 2011; Hints *et al.* 2012; Ebbestad *et al.* 2015), Early to Middle Ordovician Baltic trilobites in comparison with those in Urals and China (Bergström *et al.* 2013; Pärnaste & Bergström 2013, 2014; Pärnaste *et al.* 2013), and the distribution of Baltoscandian proetids (Pärnaste *et al.* 2009; Pärnaste & Popp 2011; Popp & Pärnaste 2011). Further investigations of the earliest representatives of the Cheirurina (Pärnaste 2003; 2006a; 2006b) are in preparation, and work on Early Cambrian trilobites has recently been published (Schoenemann *et al.* 2017). With its long history of trilobite research, Estonia was an excellent candidate to host the trilobite conference and as the latest member of the succession of Estonian trilobite workers, I gladly organized it.

The goal of the conference was to present recent progress in studies on all aspects of trilobites and their relatives. More than 80 participants from 20 countries took part (Fig. 1). Amateur collectors were



*Fig. 1.* Conference group photograph taken in the Tallinn Song Festival Grounds at the end of the mid-conference excursion. Standing (from the left): S. Losso, C. Crônier, P. Budil, L. Laibl, R. Sensenstein, D. Siveter, M.A. Siveter, S. Pereira, D. Holloway, L. Holmer, G.L. Pillola, Z-L. Zhang, B. Schoenemann, B. Schoenemann, D. Briggs, C. Stocker, S. Pates, G. Geyer, B. Chatterton, P. Ahlberg, M. Zwanzig, J. Esteve, A. Zylinska, F. Pérez-Peris, A. Thomas, P. Selden, M. Selden, N. Hughes, S. Lei, S. Peng, J. Ortega-Hernández, R. Johnson, B. Pratt, K. Månsson, R. Fortey, R. Birch; sitting (from the left): D. Bruton, A. Bruton, J. Fortey, E. Czanyo, J.C. Gutiérrez-Marco, A. McIntyre, K. Brett, G. Brett, A. Brodskii, M. Kurth, H. Drage, Z-F. Zhang, L. McCobb, J-B. Hou, N. Machida, Ariuntogos M., S-B. Lee, J. Nowicki, M. Cyrulska-Nowicka, P. Hong, H. Pärnaste, A. Weug, M. Ghobadi Pour, L. Popov, A. Owen, S. Wernette, G. Owen, E. Tamm, S. Thomas, J. Briggs, M. Shaw, M. Johnson, M. Hopkins. (Photograph by H. Pärnaste).



*Fig. 2.* The participants on the 1897 field excursion led by Friedrich Schmidt gathered in front of the ruins of Tartu Cathedral which was renovated partly to house the University Library at that time. Standing (from the left): N.I. Kuznetsov, Ph. Lake, J. Wysogorski, Fr.von Huene, C. Gagel, A. Mickwitz, W. Rosenberg, J.P.J. Rawn, E. Stolley, unknown 1, unknown 2, F.T. Levinson-Lessing. People sitting are N. Andrussov, A. Rothpletz, J. Lemberg, H.G. Seeley, Fr. Schmidt, A. Remelé, L. Törnquist, A. André, G. Holm, F. Gebauer, W. Deecke, C. Gottsche, and lying on the ground are: F.A. Bather, P. Bamberg, unknown 3 (candidates for unknown persons: Prof J.P. Felix, Prof T.M. Hughes, Prof C. Malaise and Colonel Schewyrew). (Photograph No VN07-23 in Estonian geocollections database <http://geocollections.info/image/28818>).



Fig. 3. Pre-conference field-trip participants in front of the Armin Öpik's childhood house in Lontova village, Kunda. Standing (from the left): D. Bruton, S. Lei, S. Peng, J. Adrain, J. Ortega-Hernández, B. Chatterton, M. Kurth, R. Birch, B. Schoenemann, A. Żylińska, D. Holloway, B. Schoenemann, A. McIntyre, S. Pates, G. Geyer, A. Bruton, J-B. Hou, P. Hong, S-B. Lee, G.L. Pillola, N. Hughes, H. Pärnaste, A. Brodskii, A. Owen, A. Thomas, G. Owen, S. Thomas; crouching in front: X-J. Zhu, M. Hopkins, S. Wernette, H. Drage, N. Machida, B. Pratt, S. Pereira. (Photograph by H. Pärnaste).

also encouraged to participate especially as their input to the science has risen quickly in recent years with the development of social media channels allowing worldwide connection and the sharing of news and findings. The conference covered 55 oral and poster contributions split between the sessions on the following: (1) Lagerstätten; (2) functional morphology; (3) the early evolution of arthropods; (4) the trilobite Treatise, systematics, phylogeny and ontogeny; (5) Cambrian trilobites; (6) the Great Ordovician Biodiversification Event, biostratigraphy, biofacies and ecology (under the auspices of IGCP 653); and 7) Devonian trilobites. Some of the papers arising from these sessions are published in this special volume of *Fossils and Strata* thanks to the kind support of the Lethaia Foundation.

The pre-, mid- and post-conference field trips were inspired by the footsteps of Friedrich Schmidt who, in 1897, led a field excursion in Estonia (Fig. 2) in connection with the 7th International Geological Congress held in St. Petersburg (see <https://archive.org/details/comptendudelav01inte>).

The pre-conference field trip took us eastward from Tallinn to the Lower Cambrian outcrop with one of the earliest trilobite faunas in the world and to several localities through the Ordovician succession to examine the trilobite associations in near-shore temperate limestones. We also examined the extremely diverse fauna in the organic-rich Kukruse oil shale, and near equatorial Upper Ordovician and Lower Silurian reefs. Kunda, the hometown of Armin Öpik, was visited (Fig. 3) as was Tartu University, where most Estonian geologists receive their diploma and where Öpik's trilobite collections were displayed for us by Mare Isakar at the Natural History Museum. The famous Kukruse Stage was investigated both above and below ground at the mining museum in Kohtla-Nõmme, and one of the points on Struve's Geodetic Arc was examined near the Vöivere windmill where information on the astronomer and geodesist Friedrich Georg Wilhelm Struve (1793–1864) was provided.

The mid-conference field session, expertly led by Heikki Bauert and Jaak Nõlvak, brought us to the