



**Ninth International Brachiopod Congress,
St. Catharines, Ontario, Canada, 24th June – 2nd July, 2024**

Uwe Brand¹, Lucia Angiolini², Maria Aleksandra Bitner³ & Adam T. Halamski³

1: Department of Earth Sciences, Brock University, St. Catharines, Ontario L2S3A1 Canada

2: Dipartimento di Scienze della Terra A. Desio, Via Mangiagalli 34, 20133 Milano, Italy

3: Institute of Paleobiology, Polish Academy of Sciences, Twarda 51/55, 00-818 Warszawa, Poland

International brachiopod congresses started nearly forty years ago. Including the first session in Brest, and subsequently they convened every five years on various continents: three times in Europe (Brest, France, 1985; London, UK, 2000; Copenhagen, Denmark, 2005), twice in Australia–Oceania (Dunedin, New Zealand, 1990; Melbourne, Australia, 2010), once in North America (Sudbury, Canada, 1995), and once in Asia (Nanjing, China, 2015). Following the vote in Nanjing, their frequency was changed to triennial instead of quinquennial (Halamski, 2016) and the eighth session took place in Milano, Italy in 2018, where it was decided of holding the next congress in Berlin, Germany in 2021 (Halamski, 2019).

The Berlin Congress never materialized and it may be useful to remind us of the circumstances. The organising committee of the Berlin congress was led by Carsten Lüter (Museum für Naturkunde, Berlin, Germany) and quite rapidly two fieldtrips were proposed. One of them was going to head for the classical Silurian–Devonian boundary sections in the Dniester Valley. It was visited more than half a century ago by an international team as part of international discussions on the S–D boundary (Modzalevskaya, 1968). More recently, it was the object of a Polish–Ukrainian common research project devoted to the S–D boundary (Szaniawski, 2005; Baliński, 2012). This fieldtrip was to be led by a Polish–Ukrainian team with Andrzej Baliński and Adam T. Halamski both from the Institute of Paleobiology in Warsaw, and Ukrainian palaeontologists including Danylo Drygant (State Natural History Museum, Lviv). Preliminary discussions were held in autumn 2018, but further arrangements were stopped by the COVID-19 pandemic in early 2020. Meanwhile, mainly due to the pandemic, the congress was postponed first from 2021 to 2022 and then, a few months later, from 2022 to 2023. In February 2022 the fieldtrip was cancelled first provisionally due to the tight international situation, then definitely due to the full-scale Russian invasion of the Ukraine.

The other fieldtrip, proposed by Ulrich Jansen (Senckenberg, Frankfurt am Main) was to visit classical Devonian outcrops in the Rhenish Slate Mountains (Germany). In June 2022, a one-day pre-excursion by U. Jansen and A.T. Halamski visited a few localities, including Lower Devonian sections in Haberscheid near Seifen (Westerwald) and in the valley of the Mosel River near Niederfell, to check for site suitability in hosting a large party. However, on the 18th August 2022 Carsten Lüter communicated to fellow brachiopodologists that quickly rising prices and insufficient institutional support would make organising a session in Berlin irresponsible, and the brachiopod congress in the German capital city was therefore cancelled.

In November 2022, the offer to organise the congress came from Uwe Brand (Brock University, Canada), but the time was too short to keep the 2023 date, so the session was announced for June 2024. The proceedings were first planned to be held in St. Catharines, then moved to Niagara Falls, but finally moved back to Brock University in St. Catharines. The cost associated with holding the congress at Brock kept escalating and it was decided to look for an alternative. Initial discussions suggested that holding the congress would be financially feasible, but that dream was quickly shattered. New negotiations and rolling most of the work onto the organizing committee, the congress was finally attainable and fiscally feasible of hosting it at Brock University.

Finally, six years after the previous session, the 9th International Brachiopod Congress started on the Main Campus of Brock University in St. Catharines on 24th June, 2024 with Uwe Brand acting as the General Chair. The designation chosen for the 2024 brachiopod congress was: “Brachiopods: Sentinels of the Phanerozoic”.

The attendance was reduced in comparison to earlier sessions: 45 participants compared to 104 in 2015 and 150 in 2018. The delegates represented 13 countries. The most numerous represented country was China with 12 delegates, followed by Canada, the host country (7 delegates). Other delegations were smaller: USA and UK (5 delegates each), Germany, Italy and Japan (3 delegates each), and Poland (2 delegates). Denmark, Estonia, France, Hungary, and Sweden were represented by single delegates.

On the first day two workshops took place. The first one was on “Microstructure and textural analysis of biological and geological materials”, presented by Erika Griesshaber, and the second one was entitled “A Call to Action: Chemical Evolution of Paleozoic seawater: an update” and presented by Uwe Brand. The official Icebreaker Party was held at Brock University that evening with food and drink and prizes for attendees.

During the other three days, the delegates attended three plenary talks and 34 oral presentations, which were 20 minutes long with five minutes for discussion. The talks were supplemented by poster presentations ranging in scope from modern brachiopods to counterparts from as far back as the Cambrian.

The plenary talks were as follows:

Tuesday 25th June: Wolfgang W. Schmahl, *Brachiopod shells – What they teach us about biologic control of mineral growth and morphology, the interplay of ontogeny and phylogeny*. This talk focused on knowledge gained by using modern investigative methods like SEM, TEM, AFM, and EBSD, leading to a general conclusion that brachiopod shells are composites of minerals and organic matrix, in which the biological control of their formation results in uniquely different from the morphology of crystals of the same mineral formed in inorganic processes (Schmahl, 2024).

Wednesday 26th June: Lars E. Holmer, *Phylogeny of Cambrian Brachiopods*. The origin of brachiopods through retention of the larval bivalve shell of tommotiids seems now fairly certain, but this body plan has apparently originated independently in linguliformeans and rhynchonelliformeans. The details of evolutionary patterns in the Cambrian are still contentious (Holmer *et al.*, 2024).

Thursday 27th June: Sandy J. Carlson, *Brachiopod Evolution: The Interplay of Ontogeny and Phylogeny*. This talk focused on the relationships of the three modern orders of articulated brachiopods, the rhynchonellides, the terebratulides, and the thecideides. Genetic data seem to indicate that the terebratulides originated from the rhynchonellides through peramorphosis, and the thecideides from the terebratulides through progenesis. Both the rhynchonellides and the terebratulides would thus be paraphyletic (Carlson *et al.*, 2024).

The sessions and presentation of the last day of the Congress were dedicated and reserved for Early Career Researchers to present their work. Presentations included everything from biologic aspects to geochemical investigations. It is hoped that this ‘feature’ of having a session reserved for just ECRs becomes a permanent fixture of future congresses.

Since brachiopods dominate many Palaeozoic benthic communities, numerous talks were about Palaeozoic brachiopods, including several on Carboniferous and Permian ones. There were also some talks on Recent brachiopods, and just a few on Mesozoic faunas. A selective choice of a few talks that either seem to be of more general scope or have been particularly well presented follows. Brand *et al.* (2024) discussed a new palaeothermometer based on the Li/Ca ratio in secondary layer calcite of brachiopods. Guo & Chen (2024) compared the rate of morphological innovations in brachiopods and their declining diversity during the post-Palaeozoic. Juriková *et al.* (2024) argued that boron isotope compositions of brachiopod shells may provide a tool for reconstructing the carbon cycle throughout the Phanerozoic. Sedlmeir *et al.* (2024) reported on living brachiopods subjected to shell damage and repair under controlled conditions. Zhan *et al.* (2024) studied the Great Ordovician Biodiversification Event based on Chinese brachiopods, concluding that the radiation started earlier in South China than in other regions and happened first in normal benthic environments, then expanded to more offshore and shallower-water marine areas. Zhang *et al.* (2024) documented an important taxonomic turnover between epochs 3 and 4 of the Cambrian.

The congress was followed by a field trip to Friday Harbor, San Juan Island, Washington State, U.S.A. (29th June–2nd July, 2024) to sample living brachiopods as well as other benthic invertebrates. Seven participants used the RV Kittiwake for two trips into the sea, one in the morning and one in the afternoon of July 1. Trips were about two hours long, and non-brachiopods or not collected material was returned to the sea at the end of each trip. The ship visited two locations about one hour from the harbour in Friday Harbor; one with rocky bottom (depth ca. 65 m) and one with more sandy bottom (depth ca. 85 m). We dredged at both locations, the former was more productive than the latter. Bivalves were the most common organisms, but there were plenty of brachiopods and with the most frequently encountered species being *Terebratalia transversa*, a well-known object of several studies (e.g., Paine, 1969; Eshleman & Wilkens, 1979; Helfenbein *et al.*, 2001; Tomašových *et al.*, 2008), some of which had been conducted precisely near San Juan Island (Schumann, 1990). Another set of complementary brachiopods was obtained from the intertidal zone at Friday Harbor Laboratories courtesy of John Allen (William & Mary University).

This fieldtrip was an unparalleled experience that allowed the participants to sample in-situ biotic archives and to eventually test their fidelity as tools for palaeoclimatic and palaeoenvironmental reconstructions in the geological past. This is particularly important for end Permian and end Ordovician studies, as brachiopods are one of the best and most abundant archive of proxies to survive these time intervals. It is clear that we still have so much to learn from the Present to understand the geologic Past.

The initially announced palaeontological fieldtrip to the classical Ordovician and Silurian sections on Anticosti Island as well as one to Churchill, Manitoba were unfortunately cancelled due to high costs and in the first case also lack of interest.

The proceedings of the present congress will be published as a special volume of the journal *Palaeogeography, Palaeoclimatology, Palaeoecology*. The call for contributions has gone out to all participants and other brachiopod workers. The delegates decided that the next, 10th International Brachiopod Congress will be held in Cambridge, UK in three-years' time (exact date to be determined) with Elizabeth M. Harper as the host.

Authorship of the text. *The introduction and the description of the preliminaries related to the cancelled congress in Berlin are by A.T. Halamski. The description of the congress in St. Catharines is by U. Brand, L. Angiolini, and M.A. Bitner. The final editing of the text is by A.T. Halamski and U. Brand.*

- Baliński, A. 2012. The brachiopod succession through the Silurian–Devonian boundary beds at Dnistrove, Podolia, Ukraine. *Acta Palaeontologica Polonica*, 57 (4): 897–924. <https://www.app.pan.pl/article/item/app20110138.html>
- Brand, U., Rollion-Bard, C., Azmy, K., Griesshaber, E., Bitner, M.A., Laroche, J. & Morrison, A., 2024. Li/Ca, a new paleothermometer: unlocking ancient seawater temperatures. In: Brand, U. (ed.), *9th International Brachiopod Congress – Congrès international sur les Brachiopodes: Brachiopods: Sentinels of the Phanerozoic. Program with Abstracts*. Niagara Falls – St. Catharines, Ontario, Canada.
- Carlson, S.J., Jaecks, G.S. Dievert, R.K.V., Mendonca, S.E., Sclafani, J.A. & Sperling, E.A., 2024. Brachiopod evolution: the interplay of ontogeny and phylogeny. In: Brand, U. (ed.), *9th International Brachiopod Congress – Congrès international sur les Brachiopodes: Brachiopods: Sentinels of the Phanerozoic. Program with Abstracts*. Niagara Falls – St. Catharines, Ontario, Canada.
- Eshleman, W.P. & Wilkens, J.L., 1979. Brachiopod orientation to current direction and substrate position (*Terebratalia transversa*). *Canadian Journal of Zoology*, 57 (10): 2079–2082. <https://cdnsiencepub.com/doi/10.1139/z79-274>
- Guo, Z. & Chen, Z., 2024. Morphological innovation did not drive biodiversification in Mesozoic Brachiopods. In: Brand, U. (ed.), *9th International Brachiopod Congress – Congrès international sur les Brachiopodes: Brachiopods: Sentinels of the Phanerozoic. Program with Abstracts*. Niagara Falls – St. Catharines, Ontario, Canada.
- Halamski A.T., 2016. Seventh International Brachiopod Congress Nanjing, China, 22–25 May 2015. <http://paleopolis.rediris.es/BrachNet/REF/Pub/halamski-2016.html>.
- Halamski A. T., 2019. Eighth International Brachiopod Congress Milan, Italy, 11th-14th September, 2018. <http://paleopolis.rediris.es/BrachNet/REF/Pub/halamski-2019.html>.
- Helfenbein, K.G., Brown, W.M. & Boore, J.L., 2001. The Complete Mitochondrial Genome of the Articulate Brachiopod *Terebratalia transversa*. *Molecular Biology and Evolution*, 18 (9): 1734–1744. <https://academic.oup.com/mbe/article/18/9/1734/1000753?login=false>
- Holmer, L.E., Popov, L., Ghobadipour, M. & Zhang, Z., 2024. Phylogeny of Cambrian Brachiopods. In: Brand, U. (ed.), *9th International Brachiopod Congress – Congrès international sur les Brachiopodes: Brachiopods: Sentinels of the Phanerozoic. Program with Abstracts*. Niagara Falls – St. Catharines, Ontario, Canada.
- Juriková, H., Garbelli, C., Whiteford, R., Trudgill, M., Müller, T., Reeves, T., Viaretti, M., Liebetrau, V., Gutjahr, M., Eisenhauer, A., Iurino, D.A., Tomašových, A., Zhang, Y., Wang, W., Shi, G.R., Shen, S., Rae, J.W.B. & Angiolini, L., 2024. Pushing the frontier in boron-based CO₂ reconstructions into deep geologic time with boron isotopes in brachiopods. In: Brock, U. (ed.), *9th International Brachiopod Congress – Congrès international sur les Brachiopodes: Brachiopods: Sentinels of the Phanerozoic. Program with Abstracts*. Niagara Falls – St. Catharines, Ontario, Canada.
- Modzalevskaya, T.L., 1968. *Third international symposium on Silurian–Devonian boundary and Lower and Middle Devonian stratigraphy. Atlas of Silurian and early Devonian fauna of Podolia (appendix to the guide)*. 37 pls. Ministry of Geology of the USSR, All-Union Scientific–Research Geological Institute (VSEGEI), Leningrad.
- Paine, R.T., 1969. Growth and Size Distribution of the Brachiopod *Terebratalia transversa* Sowerby. *Pacific Science*, 23: 337–343. <https://scholarspace.manoa.hawaii.edu/server/api/core/bitstreams/e71f214e-739f-42d9-8e85-3adc068aa23f/content>
- Schmahl, W.W., 2024. Brachiopod shells – What they teach us about biologic control of mineral growth and morphology the interplay of ontogeny and phylogeny. In: Brand, U. (ed.), *9th International Brachiopod Congress – Congrès international sur les Brachiopodes:*

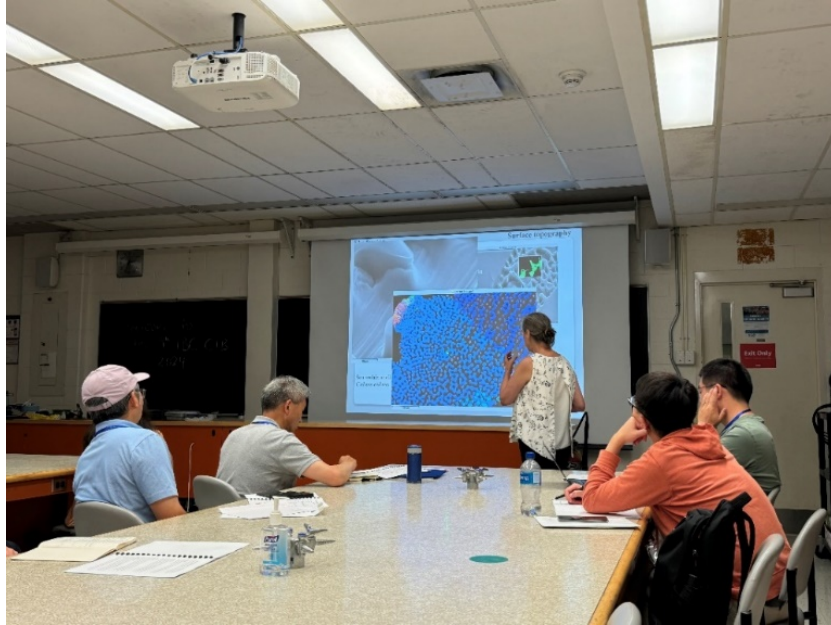
Brachiopods: Sentinels of the Phanerozoic. Program with Abstracts. Niagara Falls – St. Catharines, Ontario, Canada.

- Schumann, D. 1990. Hydrodynamic influences in brachiopod shell morphology of *Terebratalia transversa* (Sowerby) from the San Juan Islands, USA. In: MacKinnon, D.I., Lee, D.E. & Campbell, J.D. (eds), *Brachiopods through Time. Proceedings of the 2nd International Brachiopod Congress, University of Otago, Dunedin, New Zealand, 5–9 February, 1990.* A.A. Balkema, Rotterdam–Brookfield, p. 265–271.
- Sedlmeir, A., Stephan, C., Griesshaber, E., Robinson, J. & Schmahl, W.W., 2024. How do the modern brachiopods *Calloria inconspicua* and *Liothyrella neozelanica* repair their shell? In: Brand, U. (ed.), *9th International Brachiopod Congress – Congrès international sur les Brachiopodes: Brachiopods: Sentinels of the Phanerozoic. Program with Abstracts.* Niagara Falls – St. Catharines, Ontario, Canada.
- Szaniawski, H. 2005. Polsko-ukraińskie badania geologiczne na Podolu subsydiowane przez NATO [in Polish, with English title: Polish-Ukrainian geological research in Podolia, sponsored by NATO]. *Przegląd Geologiczny*, 53 (7): 557–559. https://www.pgi.gov.pl/images/stories/przegląd/pdf/pg_2005_07_15.pdf
- Tomašových, A., Carlson, S. & Labarbera, M., 2008. Ontogenetic niche shift in the brachiopod *Terebratalia transversa*: relationship between the loss of rotation ability and allometric growth. *Palaeontology*, 51 (6): 1471–1496.
- Zhan, R., Rong, J., Harper, D.A.T. & Zhang, Y., 2024. Study of the GOBE in China: examples from brachiopods. In: Brand, U. (ed.), *9th International Brachiopod Congress – Congrès international sur les Brachiopodes: Brachiopods: Sentinels of the Phanerozoic. Program with Abstracts.* Niagara Falls – St. Catharines, Ontario, Canada.
- Zhang, Z., Holmer, L.E., Zhang, Z., Chen F. & Yue, L., 2024. Brachiopods with soft parts from the Early Cambrian Wulongqing Formation (Series 2, Stage 4), Yunnan, South China. In: Brand, U. (ed.), *9th International Brachiopod Congress – Congrès international sur les Brachiopodes: Brachiopods: Sentinels of the Phanerozoic. Program with Abstracts.* Niagara Falls – St. Catharines, Ontario, Canada.

----- Citation :

Brand U., Angiolini L., Bitner M.A. & A.T. Halamski, 2024. Ninth International Brachiopod Congress, St. Catharines, Ontario, Canada, 24th June – 2nd July, 2024. *BrachNet*, http://paleopolis.rediris.es/BrachNet/REF/2024/9th-IBC_Brand-et-al_2024.html, 10 p.

9th Brachiopod Congress – Photographs



Congress proceedings, Monday 24th June, 2024: workshop on Microstructure and textural analysis of biological and geological materials led by Erika Griesshaber and Wolfgang W. Schmahl. E. Griesshaber presenting.

Session du congrès. Lundi 24 juin 2024: atelier sur l'analyse des microstructures et des textures des matériaux biologiques et géologiques, dirigé par Erika Griesshaber et Wolfgang W. Schmahl, présenté par E. Griesshaber.



Congress proceedings, Wednesday 26th June, 2024: participants assembled near the entrance of the hall where the Congress took place.

Session du congrès. Mercredi 26 juin: participants près de l'entrée de la salle où se tenaient les sessions.



Group photo of the 9th International Brachiopod Congress “Brachiopods: Sentinels of the Phanerozoic” taken on front of the building of the Brock University where the session was taking place. The Chair Uwe Brand is in the foreground. Thursday, 27th June, 2024.

Participants du 9e Congrès international sur les brachiopodes “Brachiopodes – Sentinelles du Phanérozoïque” devant le bâtiment de l’Université Brock où le congrès a eu lieu. Le président Uwe Brand accroupi le premier rang. Jeudi 27 juin 2024.



Some of the early career researchers attending, participating and presenting at the 9th IBC/CIB, representing Japan, Estonia, Italy, Denmark, USA, Canada, United Kingdom and China. Thursday, 27th June, 2024.

Quelques-uns des chercheurs en début de carrière, participants au 9^e ICB et venant du Japon, Estonie, Italie, Danemark, Etats-Unis, Canada, Royaume-Uni et Chine. Jeudi 27 juin 2024.



Congress proceedings, Thursday 27th June, 2024. Marco Viaretti presenting.

Session du congrès. Jeudi 27 juin: Macro Viaretti présentant.



Participants of the Friday Harbor Field Trip, 9th IBC/CIB. San Juan Island, Washington State, USA. Aboard the Washington State ferry heading from Anacortes to Friday Harbor, San Juan Island. Inter-island channel heading west (Saturday, June 29, 2024).

Participants de l'excursion à Friday Harbor, île de San Juan, Etat de Washington, USA. A bord du ferry parti d'Anacortes en direction de Friday Harbor, île de San Juan. Chenal entre les îles, vue vers l'Ouest. Samedi 29 juin 2024.



San Juan Island and the RV Kittiwake that served for sampling the marine fauna. View from Friday Harbor Laboratories that is associated with the University of Washington, and serves as a principal research complex of marine life and anything oceanographic in nature (Sunday, June 30, 2024).

Ile de Sain Juan et le RV Kittiwake qui servit à récolter la faune. Vue prise des laboratoires de Friday Harbor, associé à l'Université de Washington, servant de centre d'études sur la faune marine et de recherches océanographiques. Dimanche, 30 juin 2024.



Dredging of the benthic fauna, first location aboard the RV Kittiwake. Monday 1st July, 2024.

Dragage de la faune benthique, première station, à bord du RV Kittiwake. Lundi 1^{er} juillet 2024.



Dredging of the benthic fauna, second location. Monday 1st July, 2024.

Dragage de la faune benthique, 2^s station. Lundi 1^{er} juillet 2024.



The collected fauna is inspected and sampled. Monday, 1st July, 2024.

Tri et échantillonnage du dragage récolté. Lundi 1^{er} juillet 2024.