

GSJ Bulletin Special Issue: Scientific results from InterRad XV in Niigata 2017 (Proceedings)

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InterRad is an international association of radiolarists, and is a non-profit organization that promotes research on all aspects of radiolarian biology, ecology, taxonomy, evolution, paleobiology, paleoecology, paleobiogeography and biostratigraphy. Since 1978, with the aim of providing an opportunity to exchange ideas for understanding all aspects of radiolarian-related topics beyond the radiolarian society, InterRad has convened conferences regularly every three years in which a wide range of research papers have been presented. The 15th meeting of the International Association of Radiolarists (InterRad XV) was held mainly in Niigata, Japan from 20 October to 1 November 2017, co-hosted by the Geological Society of Japan, the Palaeontological Society of Japan, the Society of Science on Form, Japan, and the Geological Survey of Japan, AIST (National Institute of Advanced Industrial Science and Technology). A total of 187 participants from 16 countries (Australia, China, France, Germany, Indonesia, Italy, Japan, Korea, Mongolia, the Philippines, Russia, Slovenia, Spain, Switzerland, Turkey and the United States of America) attended the conference. The next meeting (InterRad XVI), once decided during the business meeting to be held in Ljubljana, Slovenia in September of this year, is postponed until September 2021 due to the COVID-19 pandemic.

The scientific sessions, held at Niigata University on 23–27 October, focused on the five thematic topics (1–5) devoted as a special symposium reflecting the prevailing research directions and provided other eight general themes (6–13) to wide range of radiolarian studies. They are (1) Paleooceanography of Tethys and Panthalassa (chairs: S. Takahashi and P. O. Baumgartner), (2) Cenozoic paleoceanography in marginal seas (chairs: T. Itaki, Y. Okazaki and R. W. Jordan), (3) Biology and paleobiology of shelled Protista (chairs: K. Kimoto and F. Not), (4) An interface between function and evolution (chairs: Y. Tokuda and Y. Shiino), (5) Jurassic–Cretaceous boundary (chairs: A. Matsuoka and G. Li), (6) Insightful studies for radiolarians (chairs: Y. Aita and J. Rogers), (7) Biosiliceous records (chairs: J. Rogers and Y. Aita), (8) Modern oceanography (chairs: S. R. Hori and K. Kuwahara), (9) Paleobiogeography (chairs: K. Kuwahara and S. R. Hori), (10) Evolution and diversity (chairs: W. H. He and M. Chiari), (11) Biostratigraphy (chairs: M. Chiari and W. H. He), (12) Tibetan tectonics (chairs: T. Danelian and H. Luo) and (13) European tectonics (Chairs: H. Luo and T. Danelian). These sessions attracted 128 papers including oral and poster presentations and the abstracts were published as the Volume 40 of *Radiolaria*, the formal newsletter of InterRad.

The proceedings of the InterRad XV have been separately published as the special issues of *Island Arc* (Sashida *et al.*, 2019), *Paleontological Research* (Matsuoka *et al.*, 2019) and *Revue de Micropaléontologie*. This time the special issue of the *Bulletin of the Geological Survey of Japan* (this issue) is newly released to give representative research topics discussed at the InterRad XV as well as some later invited articles (five research articles, one report paper and one note and comment, together with Frontispiece, are included).

Radiolarian biochronological study:

Suzuki and Gawlick (2020) describe a well-preserved radiolarian fauna from bedded radiolarites of the Fludergraben section in the Northern Calcareous Alps, Austria. These radiolarites deposited just above the Klaus Formation dated by ammonites at latest Callovian or the Callovian–Oxfordian boundary, thus this fauna is undoubtedly assigned to the early Oxfordian age. New index species including *Kilinora spiralis*, *Fultacapsa sphaerica*, *Protunuma japonicus* and *Pseudoeucyrtis reticularis*, which were first appeared in the early Oxfordian, can be distinguished from long-lasting radiolarian species coming from the Callovian. The authors discuss these results and redefined the *Williriedellum dierschei* Zone (lower–middle Oxfordian), which was previously ranked as a subzone in the *Zhamoidellum ovum* Zone, on the basis of the new index species. These new findings fill a gap

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in the definition of the Oxfordian by radiolarians and result in a better resolution of the radiolarian biostratigraphy.

Nishizono and Yonemitsu (2020) report the first discovery of radiolarian fauna from seven localities of the uppermost Toyora Group, which is one of the representative Lower to Middle Jurassic strata in Japan and is famous for containing abundant ammonoid. The radiolarian faunas consist of representative species of the *Transhsuum hisuikyoense* and *Striatojaponocapsa plicarum* zones, which have formerly been correlated to the Aalenian–Bajocian and the lower Bathonian respectively. The authors point out that this age-assignment is slightly older than the age determined by previously reported ammonoids and inoceramids.

Ito (2020) first compiled the classification of intra-formational structures of striped chert observed in the Jurassic accretionary complexes in the Inner Zone of Southwest Japan, and their radiolarian ages. Furthermore, the author examined the relation between the type of striped chert and the age at four sections in Ashikaga and Sano cities of Tochigi Prefecture, Japan, and consequently summarizes the striped chert might be useful as an alternative age index for the Triassic at least for present four sections.

Radiolarian fauna related to Jurassic accretionary tectonics in Japan:

Uchino and Suzuki (2020) demonstrate the geological map, lithology and radiolarian age of accretionary complexes in the North Kitakami Belt in the northeastern Shimokita Peninsula, Tohoku, Japan. The authors extracted radiolarian fossils such as *Eucyrtidiellum cf. pyramis* from mudstone near the previously U–Pb dated sandstone and indicate that it is the Kimmeridgian as well as the depositional age of the sandstone. This radiolarian age proves that the accretionary complex in the peninsula is tectono-stratigraphically divided into the Late Jurassic and the Early Cretaceous units. They also illustrate the revised schematic compilation diagram of the ages and lithostratigraphic columns among the North Kitakami Belt.

Isotopic analyses for paleoceanic environmental study:

Bôle *et al.* (2020a, b) conducted isotopic analyses by respectively measuring $\delta^{30}\text{Si}$ and $\delta^{18}\text{O}$ of radiolarian tests for understanding the global silica cycle and paleoceanographic environment. Bôle *et al.* (2020a) measured $\delta^{30}\text{Si}$ of the Mesozoic radiolarian molds in the Inuyama section, central Japan by SIMS, indicating that the range of $\delta^{30}\text{Si}$ (-0.3 to 2 ‰) is consistent with that of modern and the Cenozoic ones, and that the 10-Myr scale trend of $\delta^{30}\text{Si}$ of the Mesozoic radiolarian molds from 250 Ma to 180 Ma is overall out-of-phase relation with biogenic silica (BSi) burial flux. This relation contradicts with the interpretation of $\delta^{30}\text{Si}$ as a productivity proxy. Bôle *et al.* (2020b) also measured $\delta^{18}\text{O}$ of Mesozoic radiolarian molds from Japan, Italy, Switzerland and Romania by SIMS. The result shows that the range from 19.8 to 35.8 ‰ is consistent with that of modern and the Cenozoic radiolarian tests from deep-sea cores of the equatorial Pacific. A slightly positive excursion during the Early–Middle Triassic, a high plateau in the Late Triassic, a negative excursion in the Early Jurassic, a slightly positive excursion in the Middle Jurassic and a few low values for the Cretaceous are recognized, although the Early Jurassic negative excursion is not consistent with $\delta^{18}\text{O}$ trend of less-diagenetic low–Mg calcite shells in shallow marine Tethys. This phenomenon implies a potential preservation of an environmental component even after the diagenesis of biogenic silica.

Bibliographic lists related to radiolarian studies by GSJ:

Ito *et al.* (2020) made a large effort to compile previous radiolarian-related publications by the Geological Survey of Japan, including geological maps, bulletins, cruise reports and newsletters with bibliographic lists from 1950 to 2019. The compilation effort aims to provide bibliographic lists related to radiolarians for future reference.

Since 1980s, the Geological Survey of Japan has been supporting and leading the radiolarian studies in Japan as a national center of geological research (see Ito *et al.*, 2020), and the consequent editing and publishing of this special issue under co-hosting InerRad XV are another form of the supporting. We believe that the articles in the issue will contribute to and profoundly affect future radiolarian researches not only by themselves but also in collaborating with other fields of geological sciences.

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