

InterRidge: International Cooperation in Ridge-Crest Studies

www.interridge.org



Steering Committee Meeting 2019 – draft report

**13-14 June 2019
Tokyo, Japan**

**Jérôme Dymont, Co-Chair
Nadine Le Bris, Co-Chair
Kamil Szafrński, Coordinator**

July 2019

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Absent Steering Committee Members:

Yongshun Chen (China)

Chunhui Tao (China)

Daniel Sauter (France)

Neil Mitchell (UK)

Meeting Agenda Day 1, Thursday, 13 June 2019; 9:30 – 18:30

<i>Meeting Agenda Day 1, Thursday, 13th June 2019; 9:30 – 18:30</i>		
1	9:30	Welcome address
2	9:45	Adoption of the Agenda, and confirm Steering Committee Members
3	10:00	Adoption of the minutes from 2018 Steering Committee Meeting
4	10:15	Status of Membership in 2020
<i>10:30 Coffee break</i>		
5	11:00	InterRidge Coordinator's report
<i>12:15 Lunch, group photo</i>		
6	13:30	National updates
<i>15:30 Coffee break</i>		
7	16:30	Working groups - updates
8	17:15	Scheduled workshops and InterRidge Theoretical Institute
<i>18:30 End of Day 1</i>		
<i>19:30 DINNER</i>		

Meeting Agenda Day 2, Friday, 14 June 2019; 9:00 – 19:10

<i>Meeting Agenda Day 2, Friday, 14th June 2019; 9:00 – 18:30</i>		
1	9:00	InterRidge – ISA: participation at ISA 25 th Session
2	9:45	InterRidge – SCOR, International Indian Ocean Expedition and related projects
<i>10:30 Coffee break</i>		
3	10:50	Bid for the next InterRidge Office 2020-2022
<i>12:20 Lunch</i>		
4	13:30	InterRidge Fellowships, InterRidge Cruise Bursaries
5	14:30	Budget 2018 and 2019
<i>15:30 Coffee break</i>		
6	15:50	Discussion: What are the next big projects for InterRidge? How to attract/keep member countries, communities, individual scientists?
7	17:30	Next Steering Committee meeting location and date
8	18:00	List of actions
9	18:15	Meeting adjourns
<i>18:30 End of Day 2</i>		
<i>19:00 DINNER</i>		

1 Welcome and introduction

Local organizers welcomed members and guests to the University of Tokyo.

2 Adoption of the Agenda, and confirm Steering Committee Members

Meeting agenda has been adopted unanimously.

Current Steering Committee members:

China – John Chen

China – Jiabiao Li

France – Daniel Sauter

France – Nadine Le Bris (also InterRidge Co-Chair)

Germany – Philipp Brandl

India – John Kurian

Italy – waiting for nomination

Japan – Shinsuke Kawagucci

Korea – Sung-Hyun Park

Norway – Rolf Pedersen

Norway – Cédric Hamelin

UK – Neil Mitchell

InterRidge Co-Chair – Jérôme Dymont

InterRidge Coordinator – Kamil Szafranski

3 Adoption of the minutes from 2018 Steering Committee Meeting

The agenda of the 2018 Steering Committee meeting was circulated electronically to all Steering Committee members prior to the meeting. The 2018 meeting report can be found on the InterRidge website:

http://www.interridge.org/files/interridge/St_Comm_Report_2018.pdf

Minutes from the previous meeting have been accepted unanimously.

4 InterRidge Coordinator's report

Since its creation in early 1990's, [InterRidge](#) has been an international forum for ocean ridge (MOR) scientists, expanded to other oceanic spreading centers and related processes. InterRidge promotes interdisciplinary studies by creating a global research community, planning and coordinating new science programs that no single nation can achieve alone, exchanging scientific information, and sharing new technologies and facilities. InterRidge plays a dual role. Its primary aim is to favor the emergence of new concepts and makes possible ambitious experiments at international level. InterRidge also supports community-wide initiatives such as the definition and dissemination of a code of conduct for scientific studies in relation to chemosynthetic hot-spot ecosystems and their vulnerable environments. More recently, with the growing interest of countries and industries for deep-sea mineral resources, including sea-floor massive sulfide (SMS) deposits at MOR, InterRidge has become a voice of expert scientists in different fora. Through its observer status at the International Seabed Authority (since 2012), particularly, InterRidge developed formal interactions with this organization created under the United Nations Law of the Sea (UNCLOS).

InterRidge scientific activities are currently led under the frame of the 3rd Decadal Plan 2014-2023 'From Ridge Crest to Deep-Ocean Trench: Formation and Evolution of the Oceanic Crust and Its Interaction with the Ocean, Biosphere, Climate and Human Society' launched in 2012. Beside its affiliation with SCOR (GEOTRACES programme), InterRidge program has links with international research programs such as the International Ocean Discovery Program and the International Lithosphere Project. InterRidge activity includes meetings and workshops where the advancement of scientific knowledge, new issues, methodological improvements and standardized protocols are discussed. InterRidge also dedicates itself to interact with the public, scientists and governments, and to provide a voice for ocean ridge researchers worldwide. While committed to the level of fundamental science, an increasing role for InterRidge is our involvement in compiling information and advice for policy makers. The multidisciplinary coverage of InterRidge working groups give the organization a key role in expert discussions concerning the exploration and exploitation of mineral resources associated with Ridges, volcanic arcs and back-arcs and associated hydrothermal systems.

InterRidge has a Steering Committee comprising representatives of the member countries and of working group chairs that are scientists nominated for their expertise in a particular field. The Steering Committee meets at least once a year (the last meeting was held on 20-22 June 2018 in Bergen (Norway), the next one took place on 13-14 June 2019 in Tokyo (Japan). The Steering committee considers updates to its Science Plan, endorses InterRidge memberships, approves the budget, decides on membership fees, oversees the operation of the InterRidge Office, reviews bids for the InterRidge Office and nominates the Program's chair. It also evaluates IR fellowship applications, working group progress, validates cruise bursaries, assesses and admits/rejects working group proposals, and nominates the working group leaders.

The InterRidge contribution is 25 000 US\$ for a Principal Member country and 5 000 US\$ for a Regular Member country. Considering the present membership (China, France and Norway as Principal members and Canada, Germany, India, Italy, Japan, South Korea and UK as Regular members) and the double contribution for the host country, the resulting annual budget is c.a. 150 000 US\$.

Achievements and changes during the last year

InterRidge Office

The InterRidge Office is hosted at the Institut de Physique du Globe de Paris (IPGP), which is responsible for the budget management and administration of the program. The French National Center for Scientific Research (CNRS) is the French institution affiliated to InterRidge and is paying the French host contribution. Jérôme Dymont (jdym@ipgp.fr; IPGP - CNRS, marine geophysics) and Nadine Le Bris (lebris@obs-banyuls.fr; Sorbonne Université - CNRS, Marine ecology and marine environmental sciences) are the co-chairs of the program. Kamil Szafranski (interridge@ipgp.fr) is the InterRidge Coordinator since 1 April 2017. Since the final establishment of an operational office in Paris in early 2017, all the activities of InterRidge have been restarted.

Steering Committee

The Steering Committee met on 20-22 June 2018 in Bergen (Norway) and discussed the different aspects of the InterRidge activity. The discussions and the decisions related to all matters of importance for the program (scientific strategies, actions to be taken, procedures, budget...). Below the summary of the discussions and the decisions taken:

a) Ten representatives, both co-chairs and two Working Group leaders participated at the meeting. National and Working Group updates were presented by the national representatives. The coordinator summarized the activity of InterRidge Office in its report. Representatives of member countries and working group leaders have presented their national updates.

b) The InterRidge Steering Committee has approved the creation of two new Working Groups on: (1) Mid-Ocean Ridge Islands and Seamounts and (2) Seafloor Massive Sulfides along Mid-Ocean Ridges. Both working groups are working on their final organization following the recommendations of the Steering Committee. Their first workshops will be organized in September 2019.

c) The applications for InterRidge Student and Postdoctoral Fellowship of Simone Pujatti (University of Calgary, Canada), A. Srinivas Rao (National Center for Antarctica and Ocean Research, India), Loes van Dam (The University of Rhode Island, USA) and Unyime Udoudo Umoh (School of Ocean and Earth Science, Tongji University, China) have been accepted for funding. Fellows are going to the laboratories in the Netherlands, France, Norway and UK, respectively.

d) The applications for InterRidge Cruise Bursary program (Dominik Zawadzki, Elvira Latypova – Cocos-Nazca Rift Cruise and Thomas Guigère – SO293 cruise) have been endorsed by the Steering Committee.

e) The Steering Committee has accepted the budget of InterRidge for 2018 and the preliminary budget for 2019, pending some minor modifications to the proposed funding plans.

f) The Steering Committee has discussed the plans for next months (IR-SCOR interaction, IR-ISA interaction, Code of Conduct on responsible behavior at hydrothermal vents, organization of the Theoretical Institute, bid for the next IR Office) and possible improvements of InterRidge (big projects attracting new member countries, communities and scientists; highlighting achievements; encouraging new working groups; deep sea observatories).

g) In 2018 InterRidge attended both parts of the 24th session of the ISA Council on 5-9 March 2018 and of the ISA Council and Assembly on 16-26 July 2018. In 2019 the InterRidge representative has attended the 25th session of the ISA Council from 25 February to 1 March 2019. The InterRidge observer status gives opportunity to discuss IR – ISA collaboration like the joint fellowships, reports on IR activity, and contribute discussions about legal questions concerning research activity in the area of permits. Comments on the revised draft regulations on the exploitation of mineral resources in the Area have been a major point of the program of work of the ISA Council during the last meetings.

h) The rotation of InterRidge Office has been officially postponed to the end of 2019. This decision taken at the previous Steering Committee meeting has been endorsed by the French funding agencies.

i) An InterRidge Theoretical Institute will be organized in November 2019. The Office has collected ideas for this meeting, has presented the first draft of the agenda for the discussion at the next Steering Committee meeting and has launched its organization in Banyuls-sur-Mer (France).

j) Japan has invited the Steering Committee meeting to take place in Tokyo on 13-14 June 2019.

InterRidge Working Groups

InterRidge Working Groups build small task forces to meet, brainstorm on specific topics and ultimately draft reports and plans. Working Groups convene group meetings and community-wide workshops, promote and coordinate new cruises, experiments, and related work. They generally expand their interaction with the interested community by organizing an InterRidge Workshop or a session at an international conference. Working Groups should address emerging research themes or bridge communities working on a unique geographic setting along global ridge-crests and spreading centers. New proposals should be innovative in their objectives as regard to existing or former Working Groups. They are coordinated by two co-chairs and are gathering about ten active members reflecting the national and disciplinary diversity of InterRidge, which work closely with the InterRidge Steering Committee and the InterRidge Office. Working Groups convene group meetings and community-wide workshops, promote and coordinate new cruises, experiments, and related work.

In 2017 the Steering Committee has decided to support the creation of two new Working Groups on: (1) Oceanic Transform Faults and (2) Integrating Multidisciplinary Observations in Vent Environments (IMOVE). Those working groups have organized their first workshops. In 2018 Steering Committee has approved the creation of two new Working Groups on: (1) Mid-Ocean Ridge Islands and Seamounts and (2) Seafloor Massive Sulfides along Mid-Ocean Ridges. Both working groups will organize their first workshops in September 2019.

A review paper has been published in *Frontiers in Marine Science* by the "Hydrothermal energy transfer and the ocean carbon cycle" SCOR-IR WG members in early 2019. This review has been initiated from the works of the SCOR-InterRidge working group 135 lead by N. Le Bris and C. R. German, with P. Lokabharathi, S.M. Sievert, and P. Girguis also being members. With this second review, the WG has finalized its activities.

Le Bris N, Yücel M, Das A, Sievert SM, LokaBharathi P and Girguis PR (2019) Hydrothermal Energy Transfer and Organic Carbon Production at the Deep Seafloor. Front. Mar. Sci. 5:531. doi: 10.3389/fmars.2018.00531

Report on activities of the InterRidge Working Groups

Working group on Oceanic Transform Faults

Co-Chairs: Marcia Maia (France, geophysics, tectonics), Barry Hanan (USA, isotope geochemistry), Daniele Brunelli (Italy, petrology)

This working group, would like to focus on five questions that are likely of large interest to the Earth sciences community:

- 1) How do large and mega- transform domains react to both far- and near-field stress changes?
- 2) How do transforms interact with the underlying mantle. What are the effects of temperature, rheology and composition?
- 3) What is the interplay between transform dynamics and magmatism?
- 4) Which relationship exist between oceanic transform faults and their counterparts on continental margins?
- 5) Are oceanic transform faults sites of intense fluid-rock interaction and biogeochemical exchange?

The first workshop of the InterRidge Working Group on Oceanic Transforms took place from 22nd to 24th May in Brest/Plouzané (France). The workshop was attended by more than 40 international scientists from 7 specialities (geochemistry, petrology, geophysics, tectonics, structural geology, hydrothermalism, modelling). Participants dedicated the first day and a half for oral presentations and poster session discussing the state of the art on transform faults (TF) and fracture zones (FZ) concerning all aspects of the mechanics, petrology, structure, morphology and dynamics of the system. The acronym Transform Fault System (TFS) has been proposed to identify the whole tectonic system from the active part to its prolongation into the drifting plates. Afterwards, the attendants discussed all aspects necessary to identify the key questions for a comprehensive understanding of

TFS. Experiments were proposed on how to answer basic questions on imaging the TF to FZ transition and thermo-mechanical, compositional alteration and stress-strain relationships to constraint physical parameters that control the TFS evolution through time. A major point was to find appropriate target regions where to apply these experimental approaches. Two major outcomes of the workshop are: the need to systematically integrate modelers to the exploratory and experimental actions and the need for high frequency investigation of TFS over long time stretches. To achieve this aim, the participants propose to launch a call for white papers addressing the different aspects putting together integrated experimental and modeling approaches to the main TFS problematic. It also appears necessary to sustain the exchange in the community by dedicated workshops and/or sessions at AGU-EGU. The full text of the final report from the workshop can be found at:

http://interridge.org/files/interridge/Final_complete_report_OT_WS_Brest.pdf

The members of the Working Group on Oceanic Transforms have also organized a session at the European Geoscience Union (EGU) General Assembly in Vienna (Austria) on 7-12 April 2019: “Oceanic and continental transform faults: towards a multi-disciplinary approach”. João C. Duarte (Portugal) was the session convener, the co-conveners were: Daniele Brunelli, Barry Hanan, Marcia Maia, Mathieu Rodriguez.

This session, promoted by the Oceanic Transform Faults WG, aimed to present recent results on studies of these large features, especially on the rheology, deformation patterns, rupture processes, fluid circulation and physical properties of transform faults. Scientists working on observational studies on strike-slip and transform faults (both continental and oceanic), on fracture zones and on transform continental margins (structural geology and tectonics, geophysical imaging of the crust and lithosphere, petrology and geochemistry, seismology, fluid circulation and rock alteration, geodesy) as well as on modeling studies (both analogue and numerical) were welcome to submit their abstracts and cross-disciplinary approaches were particularly encouraged.

Working Group on Integrating Multidisciplinary Observations in Vent Environments (IMOVE)

Proponents board led by Thibaut Barreyre, University of Bergen (Norway) and Marjolaine Matabos, IFREMER (France)

WG objectives and timeliness – IMOVE will contribute to the InterRidge research community by fostering and coordinating the integration of hydrothermal data from vent fields where observatory-style data have been acquired. A large set of temporal and spatially-variable multi-disciplinary data have been collected from deep-sea vent fields at considerable cost to the international community, but to this point the datasets have mostly been analyzed in a piecemeal fashion. Systematic efforts to integrate data from different disciplines and synthesize these products into quantitative, cross-disciplinary models relevant to hydrothermal processes on the global MOR system have the potential to produce transformative scientific results, and are clearly needed at this point in time. This WG will provide an international framework for this effort, and the relatively modest funding

required will effectively leverage all of the previous funding allocated (logistical and scientific) to gather and study this data by individual countries and organizations.

The inaugural workshop of the iMOVE working group took place on 6-8 February 2019 in Bergen (Norway). iMOVE aims to bring together ridge crest observatory operators and scientists to facilitate data and technology transfer and sharing, and develop new research ideas. The very successful Bergen workshop assembled 24 people from 6 countries, representing disciplines ranging from geophysics to microbiology, and for the first time, brought together representatives from the three ridge-crest seafloor observatories operated by the EMSO, OOI and ONC networks. The group spent two and a half days exchanging ideas, providing updates on observatory status and developing plans for future collaborations.

Working Group on Seafloor Massive Sulfides Resource along Mid-Ocean Ridges

Co-Chairs: Chunhui Tao (Second Institute of Oceanography, SOA, China), Georgy Cherkashov (VNIIOkeangeologia, Russia), Maurice Tivey (Woods Hole Oceanographic Institution, USA)

The working group aims to address the following scientific problems:

- 1) Understand the geological factors that contribute for the formation, distribution and preservation of seafloor massive sulfide deposits, including geological and tectonic setting;
- 2) Characterize the geological, geophysical and geochemical signatures that allow for the detection and documentation of inactive and buried sulfide deposits at Mid-Ocean Ridge-axis or off-axis settings;
- 3) Identify multi-scale observations that could be used to predict past, present and possibly future hydrothermal deposit formation;
- 4) Determine the spatial distribution pattern and resource potential of mid ocean ridges with various spreading rates;
- 5) Understand the timing and variations in the geological drivers for hydrothermal activity across mid-ocean ridge segment-scale systems;
- 6) Determine the dimensional structure and metal inventory for mid-ocean spreading ridges based on long-term heat flow, volcanism, fluid fluxes and sedimentation rates;
- 7) Understand the processes of seafloor and sub-seafloor sulfide formation, weathering, and their impact on crust-to-water column exchange in metals.

The first workshop organized by the InterRidge Working Group on Seafloor Massive Sulfides Resource along MOR will be held between 19 and 21 September 2019, in Hangzhou (China). The theme is “Hydrothermal ore-forming processes and the fate of SMS deposits along slow and ultraslow spreading MOR”. This workshop aims to understand several key scientific questions related to hydrothermal circulation mechanisms and the geological factors that contribute to the formation, distribution and preservation of SMS deposits along different spreading MOR. The Working Group hopes to capture the known/unknown BIG questions and identify future ways to address them

through this workshop. This workshop will provide partial financial support to several excellent early career scientists (International and Chinese) to help cover their flight fares and accommodations.

Working Group on Mid-Ocean Ridge Islands and Seamounts

Leading proponents: Neil Mitchell (Manchester, UK), Rui Quartau (Instituto Hidrográfico, Lisbon, Portugal), Christoph Beier (GeoZentrum Nordbayern, Friedrich-Alexander Universität Erlangen-Nürnberg; Department of Geosciences and Geography, University of Helsinki)

The working group aims to address the following scientific problems (preliminary set of questions to be addressed, which will be refined with the input of participants of the workshop and other meetings, and online contributions):

1) How frequent is catastrophic failure in submarine slopes? How important are small compared with large movements in terms of net volume? What are the implications of these disturbances for ecosystem functioning on island slopes? Does it lead to significant burial of organic carbon? Can we link faults already mapped on land with signs of recent deformation in shallow-marine geophysical data to improve estimates of earthquake risk to local populations?

2) Can we relate changes in plate tectonic regime with changes in magmatic extrusion in an individual magmatic system? How do mantle plumes affect a mid-ocean ridge where the mantle buoyancy flux is small? To what extents do tectonic processes affect formation and movement of melts? How do magmatic activity and styles of eruption relate to mantle composition, tectonic setting and local geology?

3) How do fauna and flora vary from deep spreading centres to shallow depths of ocean island shelves and coasts, in response to varying temperature, pressure, substrate geology, currents and ambient light? How do seabed populations change with time after catastrophic events and with other changes, such as associated with climate change? How do topographically controlled fluid dynamics and sediment disturbances affect the distribution of Fe-Mn crusts on island and seamount slopes? How do the depths and distributions of sedimentary deposits on the shelves of volcanic islands relate to ocean physical conditions, in particular, waves? What roles do island shelves and, in particular, rhodolith beds have in carbon cycling and regulating water properties?

The first workshop organized by the InterRidge Working Group on MOR Islands and Seamounts will be held between 19 and 21 September 2019, in Lisbon (Portugal). The workshop aims to identify priority areas for research in all aspects of islands and seamounts located near to ridges, including geological, oceanographic and biological aspects. Participation in the workshop is open to anybody outside the WG and will involve an extended poster session on the first day. Working Group on MOR Islands and Seamounts has received 5000 US\$ generously provided by the Scientific Committee on Ocean Research (SCOR) for bursaries to support the attendance of a small number of developing-country early-career researchers to the workshop.

Full information on the activity of all Working Groups can be found on the InterRidge website: www.interridge.org

SCOR - InterRidge Meeting on "Mid-Ocean Ridges and Other Geological Features of the Indian Ocean"

Both the Ridge community and the Marine Geology and Geophysics community have been only marginally involved in the International Indian Ocean Expedition - 2 (IIOE-2) and therefore one of the major goal was to develop new international collaboration and programs on geology and geophysics of the Indian Ocean, under IIOE-2. The following seven themes cover the main peculiarities of the Indian Ocean ridges and geology:

- 1) Indian Ocean mid-ocean ridges: hydrothermalism, fragile ecosystem, and deep-sea mining exploration
- 2) Indian Ocean mid-ocean ridges: tectonics and magmatism in a wide range of spreading rates
- 3) Evolving lithosphere of the Indian Ocean: from mid-ocean ridges to basins to active or passive margins
- 4) Complex physical and geochemical aspects of the Indian Ocean mid-ocean ridge system
- 5) Aseismic ridges, oceanic plateaus, micro-continents and seamounts of the Indian Ocean
- 6) Implications of the collision and subduction on the complex history of the Indian Ocean
- 7) Submarine fans and sedimentation history in the Indian Ocean

The Meeting on "Mid-Ocean Ridges and Other Geological Features of the Indian Ocean" organized jointly by Scientific Committee on Oceanic Research and InterRidge, hosted jointly by CSIR-National Institute of Oceanography and ESSO-National Centre for Polar and Ocean Research took place on 14 - 16 November 2018 in Goa (India). The workshop was attended by 128 scientists. Ten international attendants and 17 young scientists from India were supported with travel awards funded jointly by SCOR and InterRidge. Thirty oral presentations have been organized in 7 thematic sessions and completed with 42 posters presented at 'Poster Talk' session. Both Scientific Committee on Oceanic Research and InterRidge have supported the organization of the meeting (10000 US\$ each) and allowed students, young scientists, or other scientists to participate by covering travel costs.

The abstract book and more details about the meeting can be found under the following link:

http://interridge.org/files/interridge/ABSTRACT_SCOR-InterRidge_2018-1.pdf

InterRidge Info is a e-newsletter sent to our subscribers on InterRidge-members mailing list, and is published every 2-3 weeks. It contains current and most important information to be disseminated within the InterRidge community. In 2018, 21 newsletters and 2 special issues on "Mid-Ocean Ridges and Other Geological Features of the Indian Ocean" organized jointly by Scientific Committee on Oceanic Research and InterRidge, have been

sent to the mailing list of about 1600 e-mail addresses. Past issues can be consulted in the InterRidge Info archive at: <http://interridge.org/publications>.

Cruise Information is a section of InterRidge website promoting the exchange of information, technologies and facilities among international research groups. All scientists are continuously invited to provide InterRidge with any details on recent or upcoming ridge-related cruises to feed the InterRidge Cruise Database.

InterRidge actions for early-career scientists

InterRidge Fellowships promote the involvement of young scientists in international, collaborative, and interdisciplinary studies of oceanic spreading centers. The fellowships are designed to encourage international collaboration on any aspect of InterRidge science by graduate students or postdoctoral researchers, fostering long-standing partnerships for their future careers.

InterRidge announced the next edition of call for proposals for the Student and Postdoctoral Fellowship Program in May 2018. The Fellowships of up to 5000 US\$ each can be used for any field of research identified in the InterRidge 3rd decade plan (<http://interridge.org/thirddecade>). Applications were to be submitted to the IR Office by 17th June 2018. Six applications were received, including 1 to the IR/ISA Endowment Fund fellowships. Fellowships have been awarded to 4 young scientists.

In 2019, up to 6 IR Fellowships including can be granted. The Office is currently waiting for evaluations of applications received in April 2019.

InterRidge Cruise Bursaries

These bursaries are awarded for travel and subsistence costs to encourage new collaborations across the InterRidge member nations and to enable early-career scientists to participate to research cruises. Bursaries of up to 2 000 US\$ may serve for travel costs to join the cruise. Applicants should have a clear role on the research cruise and not be part of the original research team. Preference is given to applicants from InterRidge member countries and from countries other than those of the cruise leader. The call for IR Cruise Bursaries was launched in May 2017, candidates can apply at all time. Five bursaries were granted in 2018.

Support to InterRidge Workshop on Oceanic Transform Faults

The Organizing Committee has awarded travel grants (300 - 700€) to encourage the participation of young scientists. Five attendants were supported: 3 from USA, 1 from China and 1 from Germany.

Spare berths information is a section of InterRidge website informing about any berth availability for young scientists, that could eventually led to support request by the Cruise Bursary program. All members are asked to notify the IR Coordinator about any berths available.

Update of the IR website and Vent Database

The InterRidge website (www.interridge.org) and vent database (<http://vents-data.interridge.org/>) are running at IPGP and are updated regularly since April 2017.

The InterRidge Vents Database (<http://vents-data.interridge.org/>), upgraded to Version 3.4 and revised by Stace Beaulieu (stace@whoi.edu) (supported by the [NSF Grant “Metacomunity Dynamics at Hydrothermal Vents”](#)) and in relation with the InterRidge Office, has more than 700 records – confirmed or inferred active vent fields in the database and the corresponding kml file for visualization in Open Ocean Maps. InterRidge coordinator is responsible for the Database management and updating. Since October 2017, during weekly Skype calls with Stace Beaulieu (WHOI, USA), 20 new sites have been added to the database, 41 records have been edited, 1 site has been merged with another one.

Bridges between the scientific community and the society

A scientific voice to international/national agencies, policy makers, etc.

InterRidge has built a privileged relationship with the International Seabed Authority (ISA). It is affiliated to the Scientific Committee for Ocean Research (SCOR) and has developed specific interactions through joint working groups and conferences. Through these specific relationships and new partnerships to be developed, InterRidge should be recognized as one voice of the scientific community, providing expert advises on societal topics such as environmental impacts of Sea-floor Massive Sulfides (SMS) exploration or exploitation.

The peculiar ecosystems found at MOR hydrothermal systems are important with respect to biodiversity, and several of such systems have been recognized as Ecologically and Biologically Significant Areas (EBSA) and are or may be later proposed as Marine Protected Areas (MPAs). InterRidge supports innovative interdisciplinary works and collaborations to provide decision-makers with the most accurate and recent knowledge and identify knowledge gaps to help considering the need for conservation and/or management with the necessary scientific exploration and provide relevant scientific information in the design and regulations of such MPAs.

24th and 25th annual sessions of the International Seabed Authority

InterRidge co-chairs (Nadine Le Bris and Jérôme Dymont) attended the 24th Session of the ISA in Kingston (Jamaica). This time, the InterRidge observer status allowed to emphasize the importance of up-to-date knowledge bases, interdisciplinary integration and international cooperation as proposed by InterRidge in supporting best available evidence and expertise for the assessment of risks, elaboration of norms and management plans in this context. InterRidge reminded the Council "the crucial need of fundamental knowledge to answer questions on the vulnerability of ecosystems, the scales and intensity of environmental perturbations, the cumulative impacts of climate change and exploitation. This should involve all willing research teams, beyond those associated with the permit holders".

InterRidge was represented by its co-Chair Jérôme Dymont at the first part (25 February – 1 March 2019) of the 25th session of the International Seabed Authority (ISA). The Council of the ISA met to continue its examination of the Draft regulations for exploitation of mineral resources in the Area. Documents prepared by the Secretariat addressed several crucial points such as the Financial model, Standards and guidelines, Decision making

processes, Precautionary approach, Inspection mechanisms, the Regional Environmental Management Plans (REMPs), and their Independent assessment. On the latest point, InterRidge was satisfied to note that the Authority considers the involvement of independent scientific experts and expressed its interest in helping it to access the international scientific community in its diversity. InterRidge hosts and maintains a list of many scientists who may be happy to provide independent expertise on topics related to solid earth sciences, oceanography, ecology and biology.

Outreach

Although InterRidge does not have the resource to produce its own outreach material – a task that would be hampered by the diversity of languages in which this material should be produced – the office can play a role in facilitating attempts by Working Groups, member countries or any third party to produce media material related to MOR and ABA (e.g., papers for the general press, movies, websites...).

Plans for future development of InterRidge

- maintain and reinforce **InterRidge as an efficient scientific forum of experts**
- ensure the **transition of the Office** to the new host country
- open new **InterRidge Working Groups**
- co-organize **workshops** with current Working Groups in September 2019
- organize an **InterRidge Theoretical Institute** in November 2019
- attract member countries, communities, individual scientists by **new big projects**

5 National Updates (waiting for the texts of other countries)

Canada National Update 2019

Melissa Anderson, University of Toronto

The Canadian InterRidge community continues to grow, with Canadian-led research initiatives on the Juan de Fuca Ridge, NE Lau Basin, and Canadian participation in international research endeavors around the globe.

On the Endeavour Segment of the Juan De Fuca Ridge, Ocean Networks Canada completed two maintenance cruises to service cabled observatory infrastructure located in the Main Endeavour and Mothra hydrothermal vent fields (Chief Scientist: Kim Juniper, ONC). The first cruise (19 June – 3 July 2019) deployed the ROV ROPOS on the Canadian Coast Guard Ship John P. Tully. The second cruise (21 July – 4 August 2019) used the Exploration Vessel Nautilus and its Hercules ROV. Maintenance activities included in situ cleaning (Ifremer Tempo mini-camera), deployment of a 600 kHz ADCP and 3 new short-period seismometers, deployment of four new vent fluid geochemistry/biogeochemistry instruments from the Institute for Deep-sea Science and Engineering in Sanya, China, hydrothermal fluid sampling and sampling of ROV push cores in hydrothermal sediments. Background suspension feeding organisms, away from activity hydrothermal vents were also sampled, for a project involving three organizations, the Royal BC Museum, who will confirm identifications and archive specimens in the Museum's collection; the University of Victoria Department of Biology who will provide DNA barcode information through a collaboration with the Barcode of Life laboratory at the University of Guelph; and the Natural History Museum of London who will use portions of the samples for a paleontological investigation of adaptations of 'modern background' fauna that are enable them to live in proximity to hydrothermal vents. Through Canada Foundation for Innovation funding to marine petrologist Laurence Coogan (University of Victoria), various instruments have been added to the ONC cabled observatory over the last few years for monitoring/sampling hydrothermal vents, cameras, seismometers, sediment traps and coring, etc.

Marine biologist Verena Tunnicliffe (University of Victoria) was involved with three initiatives over the past year: (1) A student supported by InterRidge joined the TongaRift cruise (SO263) to the Tonga volcanic arc, as part of a larger project to understand regional diversification of vent faunas; (2) Continued engagement with the NOAA EOI vent program to integrate geo-fluid-mico-macrobiology examination of arc vs. back-arc processes in the Mariana region; and (3) Interactions with the Deep Ocean Stewardship Initiative to support delivery of science advice to policy development around seabed mining, including presentations by VT at the UN (CoP Law of the Sea) and at the International Seabed Authority.

Biological oceanographer Anna Metaxas (Dalhousie University) has also been busy working on a project describe the biological communities that inhabit inactive hydrothermal vents. She has also been active in generating scientific evidence and advice for deep-sea

mining by writing publications, participating in ISA and non-ISA organized workshops, and at the ISA annual council meetings through DOSI.

Geologist Benjamin Tutolo (University of Calgary) also had a Ph.D. student, Pujatti Simone, sponsored by the InterRidge Student and Postdoctoral Fellowship Program to travel to the Utrecht University (Netherlands) in February 2019 to perform FIB-SEM analyses on natural serpentinites. The aim of this program is to collect imaging data with ultra-high-resolution recording of the nanoporosity content of serpentinitized rock to test the interactions of peridotites with aqueous fluids. The team was successful in finding nanopores in the analyzed samples. The datasets are currently being processed at the University of Calgary and will be presented at the AGU Fall Meeting 2019.

Marine geologist John Jamieson (Memorial University of Newfoundland) was involved in several ridge-related research projects this year, including: (1) Arctic Mid-Ocean Ridge System, involving exploration and sampling (rock and fluid) of hydrothermal systems along the Mohs and Knipovich Ridge, in collaboration with the University of Bergen (R/V G.O. Sars); (2) IODP Expedition 376: Brothers Flux to Brothers volcano, involving drilling (coring) and fluid sampling of a hydrothermally-active arc volcano (Joides Resolution); (3) Endeavour Hydrothermal Fields, including ROV rock sampling of inactive hydrothermal fields and pushcore sediment sampling (on and off axis), in collaboration with Woods Hole Oceanographic Institution (R/V Kilo Moana); and (4) EPR 9N Alvin cruise to study microbial ecosystems on active and inactive vents, in collaboration with WHOI and Texas A&M (R/V Atlantis).

Mark Hannington, an economic geologist at the University of Ottawa and GEOMAR, is leading the Modern-Ancient Ocean Crust project as part of the Canadian “Metal Earth” research initiative funded by Canada first research excellence fund, with support from post-doctoral researchers (Margaret Stewart and Allan Baxter), GIS specialists (Justin Emberley and Kaitlyn Breker), and graduate students. This initiative studies modern ocean environments to develop an understanding of the factors that localize deposits on the seafloor, which seeks to provide insights that can be applied to understanding ancient deposits in the Canadian Abitibi and Superior Craton. As part of this initiative, Mark led the ARCHIMEDES I (SO267) cruise to the NE Lau Basin (11 December 2018 – 26 January 2019) in collaboration with scientists from the GEOMAR Helmholtz Centre for Ocean Research Kiel and the Bundesanstalt für Geowissenschaften und Rohstoffe (BGR), with R/V Sonne and AUV Abyss. The primary objective of this expedition is to investigate arc rifting, metallogeny, and microplate evolution of the Fonualei Rift system, which is an active rift and spreading center propagating into the active Tofua volcanic arc. This fall, the Metal Oceans team will release a geological map of the Lau Basin. This will be one of the first geological maps of the sea floor. After the collection of data is complete in January, they will be analyzing and interpreting the data to be able to start making comparisons with the Metal Earth team in the spring of 2019. Mark was also a co-PI on the POS524 “Grimsey EM” expedition to Iceland on R/V Poseidon (8-27 June 2018), and continues to

lead the Marine Mineral Resources working group at GEOMAR (Germany), who are involved with multiple ridge-related research initiatives.

Economic geologist Melissa Anderson is the newest member of the marine geoscience community in Canada with her appointment as assistant professor at the University of Toronto in August 2018. Her work focuses on understanding the links between geodynamic processes, volcanism, and hydrothermal venting on the seafloor in subduction zone environments, including the Vanuatu arc-backarc, the NE Lau Basin, and the Mariana back-arc. She works in collaboration with partners in Canada (Memorial University of Newfoundland, University of Victoria), Germany (GEOMAR, FAU-Erlangen, Jacobs University, MARUM), the USA (NOAA-PMEL, University of Hawai'i), and industry partner Neptune Minerals, Inc. She recently joined the TongaRift Cruise (SO263 on R/V Sonne) to the NE Lau Basin, and will be heading to the Reykjanes Ridge (Iceland) this summer (AR-35 on R/V Neil Armstrong), led by F. Martinez at the University of Hawai'i.

China National Update 2019

Jiabiao Li and Y. John Chen

The China ridge community pays more attention to the hydrothermal processes of the global mid-ocean ridges and their environmental baseline studies, completed three ridge cruises and developed some deep sea scientific equipment in 2018-2019. These survey cruises were focused on the Southwest Indian Ridge (SWIR) and the South Atlantic Ridge. Chinese scientists continued exploration activities in SWIR, mainly including resource exploration and baseline survey in the contract area in the SWIR, mining and metallurgical technology development, training and international cooperation.

Survey cruise

Cruise one: In the Southwest Indian Ridge Cruise (May - July 2019), Second Institute of Oceanography, Ministry of Natural Resources of China (PI: Xianming Deng) used the R/V "Dayangyihao" to conduct polymetallic massive sulfide resources exploration and environment baseline research (DY52). The deep-tow system, "Qianlong III" AUV, and the electromagnetic detection system, 20-m borehole coring system were used to obtain geological, geophysical, environmental and biological samples and data of the investigation area. This cruise is still underway.

Cruise two: Institute of Deep-sea Science and Engineering, Chinese Academy of Sciences (PI: Dr. Xiaotong Peng) and Second Institute of Oceanography, Ministry of Natural Resources of China (PI: Dr. Jin Liang) used the manned submersible ShenhaiYongshi to investigate the geology, hydrothermal organisms and the hydrothermal vent in the Southwest Indian Ridge during December 2018 to February 2019.

Cruise three: First Institute of Oceanography, Ministry of Natural Resources of China (PI: Dr. Chengjun Sun) used the R/V "Dayangyihao" on March 2019 to May 2019 to investigate the Indian Ridge for the hydrothermal ecosystems, the hydrothermal organisms, the chemical parameters and the hydrological environment.

Resource exploration results in the SWIR

The cruise (DY52) is still underway. Based on the data acquired by the deep-tow system in the Cruise, turbidity anomalies in the water column and the distribution will be investigated. The map of turbidity anomalies was plotted for the cluster of Exploration Blocks. Geochemical characteristics of the ore-forming elements in sediments will be analyzed and the element combination features will be achieved. Combining the exploration results of the previous years, the target area for further exploration has been delineated.

"u-loop" plan

A multidisciplinary environmental survey was carried out during the DY52 cruise. Seven dives using the ROV Hailong III were performed at Longqi and Duanqiao hydrothermal fields to survey the environmental characters and mega-/macrofauna there. A new venting site (Tiantang) at Tiancheng field was discovered, which was the first chimney-like structure found at Tiancheng. The investigation also included a broad-scale transect covering the segment of the Southwest Indian Ridge (SWIR) between 42°E and 70°E, and two fine-scale transects aiming at Longqi and Tiancheng hydrothermal vent fields. The obtained data and sample will help to construct the geological, physical, chemical and biological baseline, as well as the biodiversity, biogeography and connectivity of vent fauna on the SWIR.

Environmental baseline studies in the SWIR

Based on the CTD and ship-board ADCP measurement data collected during the third leg 52th Cruise, the temperature-salinity profile and the ocean currents in the contract area were investigated for the physical baseline. For the chemical baseline studies, analysis was made on the chemical characteristics of the water column, such as the pH value, nutrients, dissolved oxygen. The cruise is still underway.

Technology and metallurgical tests

One advanced technology is the 4500-meter autonomous underwater vehicle (AUV).

The 4500-meter AUV, Qianlong-III, (shown in Fig. 1), is developed on Qianlong-II, it is the newest AUV in China. It consists of a submersible system and an exploration system. The submersible system is the platform for scientific sensors and has a highly intelligent control system, excellent maneuverability, and high-precision positioning and navigation. Scientific sensors consist of geophysical sensors such as a multi-beam sonar system, a bathymetric sidescan sonar system (BSSS), a three-component magnetometer, oceanographic sensors consisting of a CTD, multi-parameter water probe meters and a methane sensor and optical sensors consisting of camera. Compared to Qianlong-II, it is more stable, longer battery life and more carrying capacity.



Fig. 1 Qianlong-III AUV

International cooperation

1. Visit of Russian specialists to the Second Institute of Oceanography, SOA

In December 2018, in order to further implement the memorandum of cooperation on marine resources & environment, a Russian delegation led by Deputy Director Georgy Cherkashev of All-Russia Scientific Research Institute for Geology and Mineral Resources of the Ocean visited the Second Institute of Oceanography, Ministry of Natural Resources. On December 11, the 5th China-Russian Ocean Ridge Sulphide Resources Exploration Academic Conference was held at the Second Institute of Oceanography.



Fig. 2 Russian delegation led by Deputy Director Georgy Cherkashev of All-Russia Scientific Research Institute for Geology and Mineral Resources of the Ocean visited SIO.

2. Attending the InterRidge Seminar

By the invitation of SCOR and InterRidge, in November 2018, Academician Jin Xianglong, Academician Li Jiabiao and Prof. Tao Chunhui from SIOMNR had participated in the International Seminar on Indian Ocean Mid-Ridge and its Geological Characteristics in India. The seminar focused on hydrothermal, environmental and sedimentary evolution history of the Indian Ocean Ridge, aiming at promoting new international cooperation and projects in geology and geophysics of the Indian Ocean under the IIOE-2 program. 128 scientists from China, India, France, Germany, Russia, Korea, Indonesia made 30 oral presentations and 42 poster presentations. During the meeting, Academician Li Jiabiao proposed the Indian Ocean deep drift seismometer array plan. Prof. Tao Chunhui made a presentation on Indian Ocean hydrothermal circulation system and received active response from the audience. Academician Jin Xianglong and Li Jiabiao also visited the National Oceanographic Research Institute of India and had a meeting with its director and the director of the Indian National Research Center for Antarctic and Oceanic.

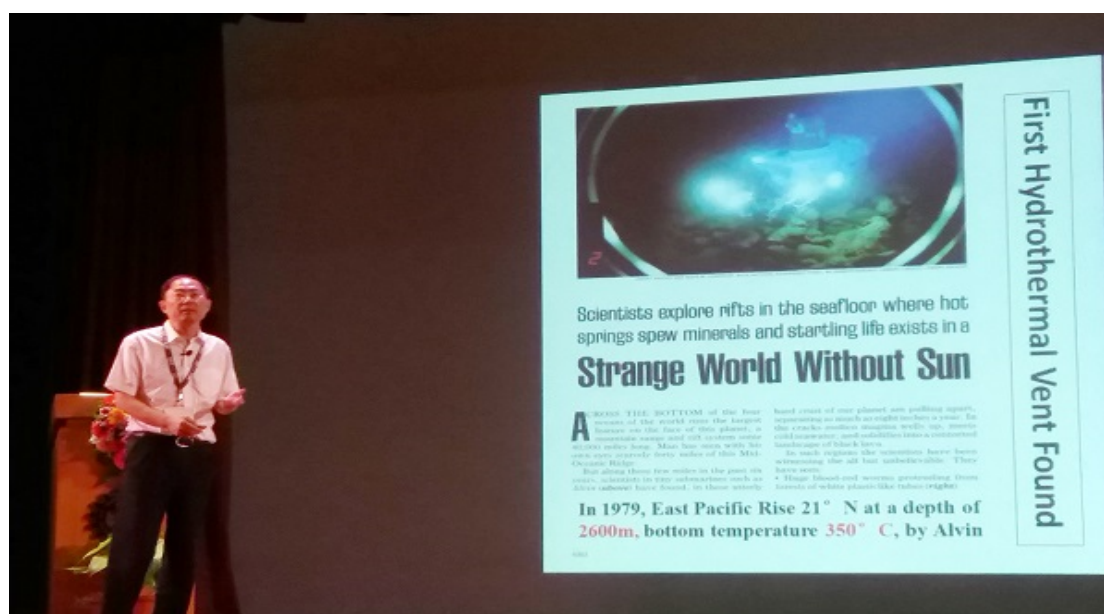


Fig. 3 Academician Li Jiabiao's report at the InterRidge seminar



Fig. 4. Academician Jin Xianglong, Academician Li Jiabiao and Prof. Tao Chunhui at the InterRidge seminar.

3. Establishment of the InterRidge Sulphide Resource Working Group promoted by SIO

In December 2018, with the support of COMRA and Academician Li Jiabiao, Director of the SIOMNR, the InterRidge Working Group of Seafloor Massive Sulphides Resource along Mid-Ocean Ridges, led by Tao Chunhui, Professor of the Key Laboratory of Submarine Geoscience, was approved by the InterRidge and officially established. The official website of the working group is also online (http://www.interridge.org/WG_SMS_MOR).

Germany National Update 2019

Representative

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Contributions

¹ GEOMAR Helmholtz Centre for Ocean Research Kiel (Magmatic & Hydrothermal Systems, Devey/Hannington)

² GEOMAR Helmholtz Centre for Ocean Research Kiel (Marine Geobiology, Perner)

³ Alfred-Wegener-Institut (AWI) Bremerhaven (Schlindwein)

⁴ Max Planck Institute for Marine Microbiology (Dubilier/Amann)

⁵ Jacobs University Bremen (Koschinsky)

⁶ Senckenberg Gesellschaft für Naturforschung (Brandt)

⁷ GeoZentrum Nordbayern, FAU Erlangen-Nürnberg (Haase)

⁸ MARUM/University of Bremen (Bach)

⁹ Bundesanstalt für Geowissenschaften und Rohstoffe (Schwarz-Schampera)

¹⁰ Universität Hamburg (Hübscher)

¹¹ Christian-Albrechts Universität zu Kiel, Institut für Geowissenschaften (Garbe-Schönberg)

¹² Leibniz-Universität Hannover, Institut für Mineralogie (Köpke)

Summary

German researchers continued their manifold activities in ridge-related research. In 2018/19 more than 10 research cruises took place with specific focus on the Atlantic, Western Pacific backarcs and the German exploration license in the Indian Ocean. The community is vital as seen by the track record of peer-reviewed publications (>30) and outreach activities. At the meeting of the German geosocieties (GeoBonn 2018) the interdisciplinary session “InterRidge: Multidisciplinary research on oceanic ridges” was organized, seeing 13 contribution and a large audience. On the downside, however, a further engagement of Germany is hindered by the acquisition of external funding of the membership fee to InterRidge. Thus, Germany will remain a regular member and looks forward to contribute to a revitalized InterRidge program.

Research activities (e.g. cruises, field trips)

- RV Poseidon cruise **POS535** (electromagnetic investigations and coring plus heatflow north of Iceland and on Mohns Ridge) ¹
- RV Maria S. Merian cruise **MSM75** (July-Aug 2018, Reykjanes Ridge, detailed mapping (ship and AUV) and sampling (ROV, Wax corer, dredge) of the Reykjanes Ridge at segments near 63°N, 60°N, 59°N and 57.7°N, RAMESSES area). ¹
- RV Sonne cruise **SO267** (geophysical and petrological work, plus mapping, AUV, sediment sampling, heatflow in the Northern Lau Basin) ¹
- RV Sonne cruise **SO263** (Magmatic evolution of island arc and back-arc crust and implications for hydrothermal venting: the rifted North Tonga Arc) ^{5,7,8}
- RV Sonne cruise(s) **INDEX2019** (fall 2019) ^{1,2,9}
- RV Pelagia cruise **INDEX2018** (geological mapping along the Central Indian Ridge and the SEIR as part of Germanys exploration efforts in their license area) ^{1,9}
- RV Polarstern cruise **PS115** (Deployment of Ocean Bottom Seismometers at eastern Gakkel Ridge in 2018; recovery will be in late 2019) ³
- **IODP Expedition 376** Brothers Arc Flux (Drilling into Brothers volcano in the Kermadec Arc, 3D study of an active hydrothermal system) ^{1,8}
- RV Pelagia expedition **SaltAx** (Aug-Sept 2018, Red Sea Rift, bathymetry and shallow seismics (sparker) of submarine salt glaciers and salt-volcanism interaction) ¹
- RV Meteor expedition **M152-2** (Jan-Feb 2019, central eastern Atlantic, seismic investigations at the Bathymetrists Seamounts and Sierra Leone Rise) ^{1,10}
- RV Thomas G. Thompson cruise **TN365** (21.02.2019 – 31.03.2019) to the SWIR near Marion Rise (plume-related, or ancient subduction-zone influenced lithosphere with lower density); Leg 2 is scheduled for FS Sonne, from 6 March to 12 April 2020. ¹²

- ICDP Oman Drilling Project: Logging of core CM1 and CM2 onboard DV Chikyu ¹²
- Ongoing fieldwork in the **Oman Ophiolite** as part of the IODP/ICDP Oman drilling projects ^{11,12}

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Conferences (talks/posters), Workshops, Outreach Activities

Outreach:

- GEOMAR News 01/2019: Report on SO267 ARCHIMEDES-I ¹
- Senckenberg News 02/2018: Report on VEMA-Transit of RV Sonne ⁶
- Presence at Kieler Woche 2018 & 2019 ¹
- Contribution to the new permanent exhibition “The Deep Sea” at Senckenberg Museum of Natural History, Frankfurt ¹

Conferences:

- Session “InterRidge: Multidisciplinary research at oceanic ridges” at the GeoBonn 2018, co-organized by Philipp Brandl, Wolfgang Bach and Jürgen Koepke. 2.-6.9.2018 ^{1,3,7,8,11,12}
- AIMS Aachen International Mining Symposium, 13.-24. June 2019, Aachen, Germany. Public keynote. ¹
- 15th International Congress of the Geological Society of Greece, 22.-24. May 2019, Athens, Greece. ¹
- EGU General Assembly 2019, 07-12 April 2019, Wien, Austria. ¹
- 47th Underwater Mining Conference, 10-12 September 2018, Bergen, Norway. ¹
- Resources for Future Generations RFG 2018, 17-21 June 2018, Vancouver, Canada. Public keynote. ¹
- Gordon Research Conference on Ocean Biogeochemistry, July 2018, Hongkong, China. ^{5,8}
- 3Clusters Conference, October 2018, Berlin, Germany. ^{1,5,8}
- Goldschmidt Conference, August 2018, Barcelona, Spain. ^{1,5,7,8}
- AGU fall meeting 2018 ¹²

Japan National Update 2019

Kyoko Okino

The InterRidge-Japan program continues efforts to promote ridge-related studies in Japan and to maintain our community. The outline of the ongoing project and other activities are described below.

Domestic Situation

We are forced to get along without an umbrella project supporting InterRidge-Japan activity, and ridge-related studies are performed using individual project funding. Total ship-time for proposal-based cruises is decreasing in these years. The usage of AUV, ROV or HOV is also highly competitive. Long-term plan (2019-2021) for R/V Hakuho-maru was discussed in late 2017 and proposals for Scotia Sea, Central Indian Ridge and Philippine Sea backarc basins were accepted.

Domestic Meeting

We had a business meeting on May 26, 2019, at a Japan Geoscience Union Meeting 2019, R/V Hakuho-maru where we shared information on a budget of the IR, cruises, international affairs, and discuss the InterRidge-Japan annual activity plan. The membership fee payment is shared by JAMSTEC and The University of Tokyo in 2019.

We had the privilege of hosting this year's Steering Committee in the University of Tokyo. Some InterRidge-Japan members enjoyed dinner with IR chairs and committee members and deepened a friendship.

An InterRidge-Japan symposium will be held on November 25-26, 2019, at Atmosphere and Ocean Research Institute, University of Tokyo. We have a plan to organize the special session on “A new perspective of oceanic crust – from Oman drilling and seagoing studies”.

Finished and ongoing cruises FY2018-2019

Three cruises to study oceanic core complexes and fracture zones in the Philippine Sea was conducted in 2018 and 2019 using R/V Yokosuka, HOV Shinkai6500 and R/V Hakuho-maru. R/V Mirai visited the Chile Ridge and ridge subduction area in early 2019. The detailed analysis of core samples drilled in the Oman Ophiolite was done on drilling ship Chikyu in 2017 and 2018 under the IODP-ICDP joint project “Chikyu-Oman”.

From October 2019, R/V Hakuho-maru will begin a voyage around the world. The ship will cross the Pacific, turn the southern tip of South America, visit the Southern Ocean, and cross the Indian Ocean. The rock sampling along the long oceanic transform, the South Sandwich Transform, is planned. Deep-tow magnetic survey across the EPR and SEIR is also in preparation along transit line.

Russia National Update 2019

Agenda of Russian-Ridge'2019 Workshop and main results obtained by Russian scientists during 2017-2019 by Sergei Syliantev

Mid-Ocean Ridge processes

Geodynamic

Indicators of intensity of geodynamic processes along the Atlantic-Arctic Ridge System have been developed in Geological Institute of Russian Academy of Sciences (RAS). It was possible after comparison of seismicity and heat flow parameters (S.Yu. Sokolov, E.Moroz, and K.Dobrolyubova – Geological Institute of the RAS, Moscow (GIN RAS)).

New data on rifting and sea-floor spreading between India and Antarctica were obtained after revision of all available geophysical data (including recently derived in Russian Antarctic Expeditions) on the East Antarctic margin between 30E and 90E and published information on crustal structure of the eastern India margin. These data give much better understanding of break-up history of East Gondwana. The rifted Antarctic continental margin shows variable crustal characteristics. Off Enderby Land, it is 300-400 km wide and includes a 100-km-wide continent-ocean transition zone consisting mostly of exhumed mantle. The Princess Elizabeth Land and the Wilhelm II Land margins are narrower and range in width from 50 to 200 km. The sea-floor spreading started in the eastern part of studied region at about 130 Ma. Off Enderby Land, early oceanic opening was compensated by mantle exhumation. The pole of rotation was located close to westernmost India Peninsula and Sri-Lanka. The sea-floor spreading off Enderby Land started at about 120 Ma and the ocean formed during Cretaceous normal Superchron (G.Leitchenkov, Yu.Guseva -VNIIOkeangeologia).

The features of the tectonic structure of the Gulf of Aden, which includes three different provinces: eastern, central and western, are studied. The results showed that the morphostructural segmentation of the spreading axis in the Gulf of Aden region depends on the degree of warming and thickness of the lithosphere associated with different distance from the Afar plume and local thermal anomalies, the oblique of the spreading axis and the existence of structural inhomogeneity associated with Mesozoic grabens on the pre-

broken basement (*E.Dubinin, A.Grokholsky -Lomonosov Moscow State University, Earth Science Museum*).

Geochemistry and petrology

First data on the content and the isotope composition of N₂, CO₂, He, and Ar in chilled glasses of the Mid-Atlantic Ridge (16°15' – 17°18') have been obtained and interpreted in context of interaction of hydrothermal and magmatic systems (*A.Buikin, A.Verhovsky, S.Silantyev – Vernadsky Institute of RAS; The Open University, Milton Keynes, UK*).

The role of sulfide in the behavior of sulfur and chalcophile elements in the evolution of MOR magmas using the example of the Bouvet Triple Junction region (South Atlantic), Reykjanes Ridge and Iceland was estimated (*T.Shishkina, M.Portnyagin, N.Migdisova, N.Sushevskaya, D.Kuzmin, A.Sobolev – Vernadsky Institute of RAS; Institute of Geology and Mineralogy of Siberian Branch of RAS; University Grenoble Alpes, Institute Science de la Terre*).

Hydrothermalism in the MOR

Features of fluid-sediment interaction in the MAR hydrothermal fields were established in many areas of observations. The hydrothermal fields examined are situated at the borders of the MAR rift valley, from 13° (Semenov hydrothermal field) till 20°08' N (Peterburgskoe hydrothermal field) at the depth from ~ 2400 to 4200 m. Ore bodies in sediments represent scattered groups of hydrothermal sulfide (sulfides of Fe, Cu-Fe, Zn) and ferrous hydroxides. The carried out research lead to the conclusion that the formation of sulfide ores of the hydrothermal-metasomatic type and ore-bearing sediments in studied area of MAR passed under the influence of hydrothermal solutions of the diffuse type, soaking through to biogenic carbonate siltstone from substrate rocks (*I.Gablina - GIN RAS, Moscow*).

The features of the distribution of the Mercury thermoforms in ore-body sediments form MOR have been studied. Total mercury is a good indicator of sulfide ores and its thermoforms are sensitive indicators of geochemical conditions in ore-bearing sedimentary thickness. Character of distribution of total mercury and its thermoforms in the hydrothermal sedimentary layer of the upper zone of a sulfide hill located within the Juan de Fuca ridge in the northern branch of the East Pacific Rise has been established. It can be concluded that the use thermoforms of mercury is very promising for the diagnosis of geochemical conditions in the zones of ore formation (*L.Luchsheva, Yu. Konovalov, I. Gablina - GIN RAS, Moscow*).

MOR Islands and Seamounts

An attempt to clarify the origin of basalts composed of Shatsky Rise (North Pacific) was made by international team of Russian and German scientists. This study has been aimed to reconcile the origin of the Shatsky Rise using systematics of chalcophile (Cu, Ag, Au, Se) and siderophile (Pt, Ir) elements in volcanic glasses. 48 volcanic glass samples from three IODP sites on Shatsky Rise (U1346, U1347A, and U1350A) have been studied. The glasses were analysed by LA-ICP-MS using specially designed analytical protocol. The data show that all Shatsky Rise glasses are enriched in Cu (112-375 ppm), Ag (40-80

ppb), Au (0.6-9.5 ppb) and Pt (0.5-22 ppb) compared to typical MORB. Low-MgO glasses from the oldest Tamu Massif (U1347A site) are extremely enriched in chalcophile and highly siderophile elements ($>10\times$ MORB), whereas primitive glasses from Ori (U1350A) and Shirshov (U1346) massifs are less enriched but still plot outside the typical MORB range (e.g. Jenner and O'Neill, 2012). The most primitive (MgO~8.2 wt%) glasses from Ori Massif have Cu and Au contents similar to some Reykjanes Ridge glasses (Atlantic), which are strongly influenced by the Icelandic mantle plume (Webber et al., 2013). It was concluded that Shatsky Rise magmas were formed by mantle plume melting, which is responsible for the elevated concentrations of chalcophile and highly siderophile elements due to deeper depths and higher degrees of melting compared to MORB (*M.Portnyagin, R.Almeev, D.Garbe-Schonberg - Vernadsky Institute of Geochemistry and Analytical Chemistry, Moscow, Russia; GEOMAR Helmholtz Center for Ocean Research Kiel, Kiel, Germany; Leibniz Universität Hannover, Institut für Mineralogie, Hannover, Germany; Christian-Albrecht University Kiel, Kiel, Germany*).

Back-Arc Basins

New data on plutonic and metamorphic rocks composed of Shirshov Rise (Western Bering Sea) dredged during Cruise 249 of the German R/V *Sonne* was obtained. Petrologic and geochemical data allow interpret studied rocks as members of a mafic-ultramafic assemblage typical of cumulate portions of ophiolite complexes and back-arc spreading centers. Rocks from the plutonic complexes of the Shirshov Rise display mineralogical evidence of metamorphism within a broad temperature range: from the high-temperature amphibolite facies to the greenschist facies. Relations between the index mineral assemblages indicate that the metamorphic history of plutonic complexes in Shirshov Rise proceeded along a retrograde path. Hornblende schists accompanying the plutonic rocks of the Shirshov Rise are petrographically close to high-temperature in subophiolitic metamorphic aureoles. It could be propose that mafic-ultramafic assemblage of Shirshov Rise originated in Back-Arc Spreading Center and later was undergone to metamorphic event in/and near subduction zone.Cruise SO249 of R/V *Sonne* was carried out within the framework of the BERING project with the financial support of the Ministry Education and Science of Germany (*S.Silantyev, M.Portnyagin, I.Kubrakova, N.Gryaznova –Vernadsky Institute; GEOMAR Helmholtz Center for Ocean Research Kiel, Kiel, Germany*).

6 Status of Membership and Steering Committee members

Declarations of membership level in 2020:

China – principal member

France – principal member

Norway – principal member

Canada – regular member

Germany – regular member

India – regular member

Japan – regular member

Korea – regular/principal member

Italy and UK – to be confirmed

7 Working Group Updates (waiting for the texts from other WGs)

Update Report from the Working Group on Seamounts and Islands

Neil Mitchell

The Seamounts and Islands working group (WG) has got off to a slow start, though now is getting ready for its first workshop. Three of us (Christoph Beier, Rui Quartau and myself) have effectively formed a management team, though other WG members have contributed to the following. Although we have not had a formal meeting yet, some of us have been able to get together in two sessions of the European Geoscience Union on volcanic islands (Azores) and we have had email discussions.

Our first attempt to set a date for the workshop ran into problems of diverse schedules, so we have instead set dates of 19-21 September 2019 that were far enough in advance that people could plan around it. A number of announcements have been publicised through the InterRidge office, through our group mailing list and via social media. Our deadline for abstracts has been set as 30 June 2019. We will be compiling them into a PDF in July to circulate amongst the attendees. A major outcome of the workshop will be a public report on priorities for future research on these areas. The precise format of that report and where it will be published will be left to the workshop attendees to decide.

As part of the preparation, we have applied to the SCOR successfully for modest (\$5k) funding for developing-country early career scientists to attend the workshop. With the help of WG member Katrin Linse and an external developing-country scientist Diva Amon, we agreed to fund three scientists from Nigeria, China and Brazil to attend. We are currently working out travel arrangements for them.

One of us (NM) has had two Skype conversations with Jim Costopulos of the Global Seamounts Project (GSP), one involving WG member Christian Mohn. The GSP aims to raise funding from private sources to support a series of cruises to a number of seamount sites in the three major ocean basins, primarily with ecological objectives. Their sites will not necessarily be located near mid-ocean ridges, but there is a chance that some will be. We have discussed the possibility of the GSP providing free berths and lab space for InterRidge WG members and junior researchers to join the cruises if they are funded and perhaps even some free science time. Their intention is to hire commercial vessels with swath mapping and ROV capabilities. With input from the WG, we have also given Jim a few ideas for geological reasons to be interested in seamounts (these were generic ideas rather than favouring particular sites). We are hoping that one or more GSP members will be able to attend the September workshop and have had an enquiry from one member from New Zealand concerning this.

A number of us from the WG participated in a NOAA workshop intended to set priorities for their ASPIRE programme in the Atlantic. The Mid-Atlantic Ridge near the Azores was selected but work has been deferred by a year due to the earlier US government shut down. In summer 2020, WG members and anyone outside the group will be able to

participate remotely (telepresence) in ROV dives and mapping cruises, with choices of sites selected by NOAA scientists. Although the precise details are unclear, it may be possible to access samples from the cruises. Digital data will become freely available shortly after each cruise.

Plans for work beyond the September workshop will be left for the attendees at the workshop to discuss, with input from the WG members unable to attend. Interaction with the GSP depends of course on their success in obtaining funding. At the moment, we can see overlapping interests between researchers in different subject areas that could lead to joint work in the future, which may be done within the WG umbrella.

Update Report from the Working Group on Seafloor Massive Sulfides Resources along Mid-Ocean Ridges

Chunhui Tao

Brief description

Working Group (WG) on Seafloor Massive Sulfides (SMS) Resources along Mid-Ocean Ridges (MOR) was established in December 2018 with focus on improving the international cooperation of scientists in the field of SMS research in the MOR, and jointly solving the genesis, mechanism and characteristics of the SMS in the MOR, especially the slow and ultra-slow spreading MOR. The Steering Committee of this new WG is composed by fourteen well-known experts in this field from worldwide. Among them, Researcher Chunhui Tao from the Second Institute of Oceanography, Ministry of Natural Resources of China, Professor Georgy Cherkashov from the Russian All-Russian Institute of Marine Geology and Professor Maurice Tivey of the Woods Hole Oceanographic Institute of the United States serve as Co-Chairs.

Workshop plan

After almost half-year's collaborative and in-depth discussion, the Steering Committee has consistently agreed to hold the 1st Workshop on hydrothermal ore-forming processes at Hangzhou, China from September 19-21, 2019.

The overall theme of the Workshop is "*Hydrothermal ore-forming processes and the fate of SMS deposits along slow and ultraslow spreading MOR*". This Workshop aims to understand several key scientific questions related to hydrothermal circulation mechanisms and the geological factors that contribute to the formation, distribution and preservation of SMS deposits along different spreading MOR. The WG hopes to capture the known/unknown BIG questions on SMS formation and preservation in the geologic record and identify future ways to address them through this Workshop.

Projects related

2018-2021: Project of the hydrothermal circle system study along ultra-slow spreading MOR, funded by the National Key R&D Program of China.

2020-2024: Project of ULTRA on SMS deposits at ultramafic hosted systems to reduce the environmental risks of future mining by making exploration for deep-seafloor mineral deposits much more effective which funded by the Natural Environmental Research Council (NREC).

New round SWIR Cruise is ongoing

New round of SWIR Cruise operated by the Second Institute of Oceanography, MNR of China is ongoing now (Dayang 52B Cruise, from May to July, 2019). This Cruise is carrying out precision investigation at several hydrothermal anomaly zones for the final resources evaluation of China contract area.

8 Validation of IR Fellowships and Cruise Bursaries Applications

Applications for IR Fellowships were sent for evaluation to 3-5 experts in the field of the application. Up to 2 reviews for each proposal were received before the Steering Committee meeting. The anonymous evaluations were presented to the Steering Committee during the meeting and each application was discussed individually before taking the final decision. The Steering Committee has accepted two applications for funding and recommended to announce the second round of call for applications in 2019. Details are provided in the table below:

Nb	Title of proposal	Level	Countries
	Sulfide differentiation and enrichment in metals in		

The applications for Cruise Bursaries of Dominik Palgan and Gabriella Alodia have been accepted by the Office as matching all the selection criteria. After the discussion at the meeting, the Steering Committee has endorsed the choice made by the Office.

9 Budget 2018 and 2019

The budget of InterRidge for 2019 has been introduced by the Coordinator and are summarized in the tables below.

InterRidge Budget	
Expense	
Salary	

The presentation has been followed by the general discussion concerning the budget management. The adjusted funding plan has been accepted unanimously by the Steering Committee members.

10 InterRidge – ISA, participation at ISA 25th Session

Since 2012, InterRidge has been granted observer status at the ISA, allowing InterRidge to be present at public meetings of the Assembly and by invitation, to make oral statements on issues of concern, although it will not be able to participate in decision-making. This increases our links with the International Seabed Authority (ISA) and will strengthen our ability to engage with developing countries, which remains one of InterRidge's main challenges. Below is the summary of the InterRidge participation at the first part of the 25th annual session of the ISA:

InterRidge was represented by its co-Chair Jérôme Dymont at the first part (25 February – 1 March) of the 25th session of the ISA held in Kingston (Jamaica). The Council of the ISA met to continue its examination of the Draft regulations for exploitation of mineral resources in the Area. Documents prepared by the Secretariat addressed several crucial points such as the Financial model, Standards and guidelines, Decision making processes, Precautionary approach, Inspection mechanisms, the Regional Environmental Management Plans (REMPs), and their Independent assessment. On the latest point, InterRidge was satisfied to note that the Authority considers the involvement of independent scientific experts and expressed its interest in helping it to access the international scientific community in its diversity. InterRidge hosts and maintains a list of many scientists who may be happy to provide independent expertise on topics related to solid earth sciences, oceanography, ecology and biology.

During the second part of the 25th session, InterRidge representative has been asked to obtain more information on the database available at the ISA and provide more detailed report to the Steering Committee on this subject, prior to setting up a new collaboration.

11 InterRidge – SCOR, International Indian Ocean Expedition and related projects

The 2018 Scientific Committee on Oceanic Research (SCOR) Annual Meeting was held in Plymouth (UK) on 4-6 September 2018. InterRidge, being a SCOR-affiliated program, has been represented by its coordinator. The meeting was an opportunity to review all SCOR activities, approve new working groups, discuss on budget, elections and other activities for 2019, and vote on SCOR Constitution.

12 InterRidge Theoretical Institute 2019

The InterRidge Theoretical Institute (IRTI) will build on this momentum and aims at strengthening the cohesion and visibility of the international community working on MOR and ABA, while promoting the transfer of knowledge toward other research fields. It is now time to bring together our ideas, concepts, expertise and know-how in an effort 1) to fill the remaining gaps and develop the basic science critically needed to answer the questions raised by the global imprint of human activities on the ocean and 2) to ensure that new players have access to suitable and scientifically-robust information.

This IRTI will offer the opportunity to share emerging issues, new technologies, interdisciplinary challenges (including capacity building and methods/tools sharing across disciplines). It will be made of two parts, a set of lectures in the first two days and a workshop in the following two days.

The lectures, targeted to young scientists, will address cross methodological and theoretical advancement on key issues while the workshop sessions will be organized on a series of emerging themes or transversal hot topics in biology and geology around hydrothermalism as the main theme. The Theoretical Institute will be organized in Banyuls-sur-Mer (France) on 18-22 November 2019.

Scope

New research foci have emerged in the last decade regarding hydrothermal systems. Addressing links between tectonic complexities and magmatic-hydrothermal processes, characterizing hydrothermal contributions to global ocean budgets (e.g. heat, carbon, iron) and associated ecosystem functions, stability and resilience in a wider deep-sea context have inspired a growing number of studies. In parallel, methodological and knowledge needs to support biodiversity inventory, mineral resource exploration, conservation plans and environmental impact assessments have risen. These new challenges emphasized significant gaps in our knowledge of hydrothermal systems and how they interact with other ocean components. While major geological, biological and ecological processes have been elucidated, the temporal dynamics and long-range interactions are still unconstrained for the vast majority of highly diverse hydrothermal settings. A substantial effort, bridging different basic science fields, is still needed to build an integrated vision of hydrothermal processes over space and time, on which quantitative approaches and predictive models should be based.

Through its 4th Theoretical Institute, InterRidge aims at fostering this momentum, by identifying most critical fundamental research questions and by offering the opportunity to share knowledge on emerging issues, new technologies, interdisciplinary challenges including capacity building and methods/tools sharing across disciplines. Bringing together ideas, concepts, expertise and know-how will help developing strategies to fill remaining gaps, and promoting the transfer of knowledge to address questions related to the human global footprint on the ocean. Since 1992, InterRidge is committed to support the advancement of fundamental knowledge, promoting international and cross-disciplinary exchanges and developing synergies with other disciplines and across thematic fields. The Theoretical Institute will contribute setting the scene for its upcoming 4th decade plan and ensure that the growing community of scientists interested in vent systems has access to suitable basic information, while strengthening international collaboration in Mid-Ocean Ridges and Arc & Back-Arc systems research.

Organization

The event will start on Monday morning and end on Friday noon. Like previous Theoretical Institutes, the first 1.5 days will be devoted to a series of lectures, followed by four thematic workshop sessions, each of them being introduced by keynote talks (Tuesday afternoon to Wednesday morning). A poster session on Wednesday afternoon will offer young scientists the opportunity to present their work. The following 1.5 days will be dedicated to writing sessions in small groups and final synthesis.

Lectures are targeting young scientists and should be accessible to an audience gathering different disciplinary backgrounds. They will be open to all participants. International experts will present the advancement of knowledge on key themes in relation to methodological and theoretical progresses at the forefront of current research. The selected topics are:

Lecture 1. Hydrothermal vent geodiversity: seafloor and sub-seafloor processes

Lecture 2. Vent microbiomes with combined NGS and experimental approaches

Lecture 3. Ecosystem dynamics: repeated observation and time-series

Lecture 4. Connectivity and larval dispersal: metapopulation approach

Lecture 5. Hydrothermal vent mineralization

Lecture 6. Aging oceanic crust and seafloor alteration

Workshop sessions will be successively planned on a series of transversal hot topics. Keynotes will present the state of the art from geoscience and ecology-biology perspectives, with a specific attention to processes driving the spatial and temporal variability and will be complemented by short talks to initiate discussions around emerging themes (the proposed list should be considered as a starting point).

1) Export of vent-derived chemicals: from near-vent reactivity to long-range transport

Themes: Chemical, biological and ecological drivers of metal export and bioavailability in the water column, biogeochemical processes and metabolic diversity in hydrothermal plumes, hydrothermal sources and sinks of organic carbon.

2) Chemosynthetic carbon: drivers of productivity at active and inactive vents

Themes: Functional flexibility of vent symbioses in response to geochemical heterogeneity, seafloor and subseafloor microbial growth and community dynamics, species adaptation to stressor combination arising from habitat fluctuations, chemical energy transfer at vent field scale and export of chemosynthetic organic matter to peripheral areas and water column.

3) Massive Sulfide deposition, alteration and biological diversity

Themes: Seafloor and subseafloor mineralization processes and time-scales, sulfide deposit formation and alteration and related geomicrobiological processes, diversity and turnover of deep-sea fauna at inactive vents.

4) Basin-scale hydrothermalism and related processes from ridges to subduction zones

Themes: Geophysical evidence of pervasive and/or rejuvenated hydrothermalism, links between tectonic complexities in subduction zones with magmatic-hydrothermal systems in arc and back-arc environments, regional connectivity and larval dispersal of vent invertebrates, biogeography and evolution of hydrothermal vent biological lineages. Hydrothermal heat fluxes contribution to ocean budget.

13 Bid for next InterRidge Office 2020 – 2022

Because of no bid received by the Office before the deadline fixed on 13 May 2019, the bids are expected before 7 September 2019. Two countries have expressed their intention to take over for 2020 – 2022.

14 Discussion: What are the next big projects for InterRidge? How to attract/keep member countries, communities, individual scientists?

15 List of actions

- (1) National Updates – written versions
- (2) Reports from Working Groups
- (3) Send InterRidge Report to SCOR
- (4) ISA session – get more information on database and provide a report
- (5) Fellowships and Cruise Bursaries – send the decisions, prepare payments, organize the second call for applications, apply new rules, make the previous awardees more visible
- (6) SCOR – participate to the annual meeting, digital atlas IIOE-2
- (7) Improve the visibility of InterRidge on internet (lifting of the website) and in social media (Twitter)
- (8) Organize the Theoretical Institute in November 2019
- (9) Finalize the bid for the next InterRidge Office
- (10) Next big projects for InterRidge? Attract/keep member countries, communities, individual scientists

16 Meeting adjourns

Jérôme Dymont and local organizers thanked for the attendance of the Steering Committee members and declared the meeting adjourn.

APPENDIX I

InterRidge Chairs and Coordinators – Past and Present

InterRidge Chairs:

Jérôme Dymont, co-chair (France)	2016 –
Nadine Le Bris, co-chair (France)	2016 –
John Chen, chair (China)	2013 – 2015
Jiabiao Li, co-chair (China)	2013 – 2015
Bramley Murton, chair (UK)	2010 – 2012
Jon Copley, co-chair (UK)	2010 – 2012
Jian Lin, chair (USA)	2007 – 2009
Chris German, co-chair (USA)	2007 – 2009
Colin Devey, chair (Germany)	2004 – 2006
Kensaku Tamaki, chair (Japan)	2000 – 2003
Mathilde Cannat, chair (France)	1997 – 1999
Roger Searle, chair (UK)	1994 – 1996
John Delaney, co-chair (USA)	1991 – 1993
H. David Needham, co-chair (France)	1991 – 1993

InterRidge Coordinators:

Kamil Szafrński	Apr 2017 –
Zengxi Ge	Jan 2013 – Dec 2015
Debbie Milton	Jan 2010 – Dec 2012
Stace Beaulieu	Oct 2007 – Dec 2009
Rhian Waller	Jan – Oct 2007
Sabine Lange	July – Dec 2006
Valérie Epplé	May – July 2006
Kristen Kusek (Education & Outreach)	Mar 2004 – Dec 2007
Katja Freitag	Mar 2004 – May 2006
Agnieszka M. Adamczewska	Nov 1999 – Mar 2004
Cara Wilson	Mar 1997 – Nov 1999
Ruth Williams (acting)	Oct 1996 – Mar 1997
Heather Sloan	Oct 1993 – Oct 1996
Trileigh Stroh	1991 – Oct 1993

