(様式5)

# 二国間交流事業 セミナー報告書

2021年11月16日

独立行政法人日本学術振興会理事長 殿

[代表者所属機関·部局] Tokyo Institute of Technology, Earth-Life Science Institute [職·氏名] Specially Appointed Assistant Professor, Tony Z. Jia [課題番号] JPJSBP220207201

- 1. 事業名 相手国:PR China(振興会対応機関:CAS)とのセミナー
- 2. セミナー名

(和文)電気化学を新機軸とした,深海底における生命の起源と進化の再検討

(英文) Geoelectrochemistry: The driver for life in deep oceanic environments

- 3. 開催期間 <u>2021年08月23日~2021年08月25日</u>(3日間)
- 4. 開 催 地(都市名)
  - Online
- 5. 相手国側セミナー代表者(所属・職名・氏名【全て英文】)

Institute of Deep-Sea Science and Engineering, Chinese Academy of Sciences,

Laboratory of Extraterrestrial Ocean Systems, Researcher, LAU VETTER Maggie Chui Yim

- 6. 委託費総額(返還額を除く) <u>1,139,896 円</u>
- 7. セミナー参加者数(代表者を含む)

	参加者数	うち、本委託費で渡航費または 日本滞在費を負担した場合*
日本側参加者等	17名	0名
相手国側参加者等	33 名	0名

参加者リスト(様式 B2)の合計人数を記入してください。該当がない箇所は「0」または「-」を記入してください。 \*日本開催の場合は相手国側参加者等の日本での滞在等、相手国開催の場合は日本側参加者等の渡航費を 本委託費で負担した場合となります。

#### 8. セミナーの概要・成果

(1) セミナー概要(セミナーの目的・実施状況等。第三国からの参加者(基調・招待講演者等)が含まれる場合はその役割とセミナーへの効果を記載して下さい。関連行事(レセプション、見学(エクスカーション)その他会合(別経費の場合はその旨を明記。)などがあれば、それも記載してください。各費目における増減が委託費総額の50%に相当する額を超える変更があった場合には、その変更理由と費目の内訳を変更しても研究交流計画の遂行に支障がなかった理由を記載してください。)

The field of astrobiology is very interdisciplinary and requires the collaboration of biologists, biochemists, planetary scientists, and researchers in many more fields. Recently it has been proposed that electrochemical and electrobiological processes, some of which are catalysed by geological minerals in the deep sea, may have been important for the origin of life on Earth. In particular, electrochemistry drives chemical and biochemical reactions and processes, such as how electrolithoautotrophic (electricity consuming) microbes grow in electrochemical conditions. Research led by the Nakamura and McGlynn Labs of Tokyo Institute of Technology (all members of this seminar) found that electrical currents are generated in deep-sea hydrothermal vents passing through geological structures like mineral surfaces, suggesting that biochemical processes important to the origin of life could have been catalysed directly by geoelectrocatalysts, which could have been abundant on early Earth especially in the deep sea. Rather than just a biochemical mechanism, the significance of electrobiological and electrochemical processes can be linked to the initial emergence of life on Earth.

Thus, to determine the best way to simulate primitive geoelectrocatalysis in the lab and the field to understand the emergence of the first biologies, the scientific collaborators organised a joint seminar to deepen the crossover between deep-sea biology, geochemistry, electrochemistry, origins of life, and astrobiology. Using the unique skills of deep-sea biologists, the organisers sought to discuss these novel electro-based processes in the context of deep-sea life, i.e., life which has not been subjected to frequent evolutionary cycles as surface life has. In addition, prebiotic chemists and planetary scientists also joined the discussion to frame the prebiotically plausible chemical inventory and repertoire on early Earth and constrain the potential of such processes on a planetary scale.

The symposium covered the following key points:

1. Modern geoelectrochemical organic syntheses and electrobiological processes.

2. Current knowledge of deep-sea biochemistries/geologies and discussion on electrobiological and geoelectrochemical processes in deep-sea organisms and geological formations, respectively.

3. How to simulate possible ancient geoelectrochemical, geobiological, and chemical processes in the lab in the context of origins of life.

4. Connection between ancient geochemistry/geobiology to extraterrestrial geologies to discuss future astrobiological life detection missions on other planetary bodies.

Due to COVID-19 pandemic, the symposium (seminar) was held online. Because no travel costs were needed for the online nature of the meeting, all costs were diverted to computer equipment to facilitate the successful implementation

of the online meeting. Thanks to the equipment, we successfully held a very fruitful seminar online with plenty of discussion, so the change of expenditure caused no problem. Additionally, Dr. Henry Sun of Desert Research Institute (USA) gave a presentation.

## (2) 学術的価値(本セミナーにより得られた新たな知見や概念の展開等、学術的成果)

Organisers worked on archiving and documenting the outcome of the symposium via cataloguing the prompts, discussion outcomes, some of the presentations, and slides. These have been made available to all participants. We also worked with ELSI PR to prepare a news article reporting on the seminar.

## (3) 相手国との交流(両国の研究者が協力してセミナーを開催することによって得られた成果)

The online symposium featured speakers from China, Japan and the USA (Dr. Henry Sun of Desert Research Institute gave a presentation) and also heavily focused on discussions as well, which were directed effectively by speakers providing prompts reflecting critical questions from their expertise areas as key questions to the participants. This gave all participants a taste of true international meetings and collaboration held 100% in English.

## (4) 社会的貢献(社会の基盤となる文化の継承と発展、社会生活の質の改善、現代的諸問題の克服と解決 に資する等の社会的貢献はどのようにあったか)

The online nature of the meeting allowed recording of some presentations; based on the decisions of each presenter, these videos may be released publicly. Additionally, we have shown that two research institutes in countries which may not politically get along can have fruitful scientific collaboration. We hope that science diplomacy between researchers in China and Japan (perhaps even catalyzed by Japanese and international researchers in China and Chinese and international researchers in Japan) can be a way forward to bring these two countries closer together.

### (5) 若手研究者養成への貢献(若手研究者養成への取り組み、成果)

It helped expose young researchers in both countries to international collaborations and researchers; we also conducted the meeting 100% in English, which gave experience to young researchers in attending English meetings. Now they will be ready for future international meetings and workshops. Additionally, all of the meeting organizers were early-career researchers, and we believe that there is ample room and energy for expansion and bilateral collaborations in the future, not just between researchers in Japan and China, but around greater Asia as well.

## (6) 将来発展可能性(本セミナーを実施したことにより、今後どのような発展の可能性が認められるか)

We hope to follow up by holding an in-person meeting in 1-5 years in China or Japan (after the governments remove the overly harsh entry restrictions), joint proposals for further exchanges or a joint training school in astrobiology.

## (7) その他(上記(2)~(6) 以外に得られた成果(論文発表等含む)があれば記述してください)

We successfully held a very fruitful seminar online with plenty of discussion. This is the future of online meetings, and we have shown a successful platform/process for other meetings to follow. Additionally, the organizational efforts from

the Japan side were undertaken by non-Japanese researchers. This shows that there is ample space for foreign researchers in the Japanese research environment, despite various language barriers instituted in the Japanese research environment and the JSPS system. We hope to inspire other international researchers in Japan to pursue their passions and accomplish their research goals irrespective of these systematic barriers which may impede their success.