

Fellowship ID : BR190203

独立行政法人日本学術振興会理事長 殿

To: President, Japan Society for the Promotion of Science

研究活動報告書

Research Report

1. 受入研究者 / Host researcher

受入研究機関・部局・職
Name of Host Institution, Department and
Title

WASEDA UNIVERSITY, FACULTY OF SCIENCE AND
ENGINEERING, DEPARTMENT OF MATHEMATICS

受入研究者氏名
Host Researcher's Name

PROF. MARTIN GUEST

2. 外国人招へい研究者 / Fellow

所属研究機関・部局・職
Name of Institution, Department and Title

UNIVERSITY OF STRASBOURG INSTITUTE OF ADVANCED
STUDY (USIAS)

外国人招へい研究者氏名
Fellow's Printed Name

PROF. FLORENT SCHAFFHAUSER

3. 採用期間 / Fellowship Period

2020 年 01 月 16 日 ~ 2020 年 01 月 31 日

4. 研究課題 / Research Theme

RIEMANN-HILBERT CORRESPONDENCE, BEYOND THE REGULAR SINGULAR CASE

5. 研究活動報告 / Research Report

(1) 研究活動の概要 / Summary of Research Results and Activities

The goal of this research visit was to revisit the Riemann-Hilbert correspondence between holomorphic vector bundles with connection and representations of the fundamental group of a Riemann surface, starting with the so-called *regular singular* case, where the connection is allowed to have *logarithmic* singularities. This is classically understood using representations of the fundamental group of a punctured Riemann surface and our goal was to enrich the notion of fundamental group in this setting, in order to:

1. Make the correspondence more geometric,
2. Later generalise this enriched picture to the *irregular* singular case, where the connection is allowed to have poles of higher order.

This is also motivated by the analogy with the logarithmic Riemann-Hilbert correspondence developed by A. Ogus in the arithmetic setting.

(注) 採用期間終了後3ヶ月以内に、電子メールで提出

(Note) Submit the form by email within 3 months after the expiration of fellowship.

To make progress on this topic, the Host and the Fellow held daily discussion meetings at Waseda University (except when the Fellow was away for conference-related purposes) and went over C. Sabbah's book *Isomonodromic deformations and Frobenius manifolds*, where the Riemann-Hilbert correspondence is presented from a sheaf-theoretic point of view. This of course goes much further than the regular singular case but, during the two weeks that the visit lasted, the Fellow and the Host focused solely on the latter. And as a result, they obtained a geometric understanding of the Levelt normal form, which is a fundamental result in the theory of linear Ordinary Differential Equations.

At the end of the first week of the visit, Prof. Martin GUEST and Prof. Yasushi HOMMA organized a one-day workshop¹ at Waseda University, where JSPS Fellow Florent SCHAFFHAUSER gave two talks on the non-Abelian Hodge correspondence for orbifold fundamental groups. The other two talks were given by Prof. Takahiko YOSHIDA, from Meiji University. The audience was composed of experienced researchers as well as graduate students, which prompted new interactions between the speakers and the audience, in particular young researchers. Prof. N. Kawazumi (University of Tokyo) and Prof. T. Kalman (Tokyo Institute of Technology) also attended the workshop, which provided a good opportunity to revitalise and strengthen research collaborations between the Fellow and the mathematical community in Japan.

The Fellow and the Host also received a visit from two JSPS Office Staff Members for a 1-hour interview, during which the importance of JSPS support for their ongoing collaboration was discussed. As a matter of fact, we hope to finalise our project during a subsequent 1-month visit from the Fellow to Waseda University, for which we will be applying later this year.

Finally, upon return to Strasbourg, the Fellow reported on his visit to Prof. Guest in front of members of USIAS and in particular introduced other JSPS Fellows to the Alumni Association and the BRIDGE Program, which should result in increased possibilities of mathematical collaboration between France and Japan.

(2) 研究キーワード / Keywords

Riemann-Hilbert correspondence, Logarithmic connections, Fundamental groups of algebraic curves.

(3) 主な研究発表 (雑誌論文、学会、集会、知的財産権等 / Main Research Publications

During his 2-week stay, the Fellow gave two talks at a workshop held at Waseda University, one at a national meeting in Shizuoka², and one at a local seminar at Osaka University:

1. In Shizuoka on 2020/01/21: *Higher Teichmüller spaces for orbifold fundamental groups*.
2. At Waseda on 2020/01/25: *An overview of the Non-Abelian Hodge Correspondence (after Hitchin, Donaldson, Corlette and Simpson)*.
3. At Waseda on 2020/01/25: *Hitchin components for orbifold fundamental groups*.
4. In Osaka on 2020/01/29: *Higher Teichmüller spaces for orbifold fundamental groups*.

(4) その他 / Remarks

During the short visits to Shizuoka and Osaka University, the Fellow interacted with Professors Y. Mitsumatsu, S. Baba, H. Kasuya and Y. Matsumoto. With Hisashi Kasuya, in particular, they discussed recent results of Biswas and Kasuya on the non-Abelian Hodge correspondence over a Sasakian manifold.

¹ <http://www.f.waseda.jp/martin/conf/2019modulispace.html>

² <https://sites.google.com/view/contsingdiff2020>

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