

様式 A-1
(FY2025)

2025 年 7 月 17 日

サイエンス・ダイアログ 実施報告書

1. 学校名: 東京都立科学技術高校
2. 講師氏名: Paul Fabian MENCZEL
3. 講義補助者氏名: なし
4. 実施日時: 2025 年 7 月 17 日 (木) 10:30 ~ 12:00
5. 参加生徒: 1 年生 65 人、 年生 人、 年生 人 (合計 65 人)
備考: (例: 理数科の生徒) 創造理数科と科学技術科の生徒
6. 講義題目: 冷蔵庫はどこまで小さくできるか?
7. 講義概要: 日マルコフ開放量子系の熱力学
8. 講義形式:
☒ 対面 ・ ☐ オンライン (どちらか選択ください。)
1) 講義時間 60 分 質疑応答時間 10 分

2) 講義方法 (例: プロジェクター使用による講義、実験・実習の有無など)
プロジェクター使用による講義

3) 事前学習
☒ 有 ・ ☐ 無 (どちらか選択ください。)
使用教材: 講師提案のキーワードを事前に配布
9. その他特筆すべき事項:

Form B-2
(FY2025)
Must be typed

Date (日付)
18/07/2025 (Date/Month/Year: 日/月/年)

Activity Report -Science Dialogue Program-
(サイエンス・ダイアログ 実施報告書)

- Fellow's name (講師氏名): Paul Menczel (ID No. P23328)
- Name and title of the lecture assistant (講義補助者の職・氏名)
No lecture assistant
- Participating school (学校名): Tokyo Metropolitan High School of Science and Technology
- Date (実施日時): 27/07/2025 (Date/Month/Year: 日/月/年)
- Lecture title (講義題目):
How small can we make a refrigerator?
- Lecture format (講義形式):
◆☒ Onsite ・ ☐ Online (Please choose one.)(対面 ・ オンライン)((どちらか選択ください。))
◆Lecture time (講義時間) 60 min (分), Q&A time (質疑応答時間) 30 min (分)
◆Lecture style (ex.: used projector, conducted experiments)
(講義方法 (例: プロジェクター使用による講義、実験・実習の有無など))
Powerpoint presentation including two short videos
- Lecture summary (講義概要): Please summarize your lecture within 200-500 words.

In this presentation, I offered the students a window into my life as a scientist and into the world of quantum physics. I started with a personal introduction, sharing my background, hobbies, and the academic path that brought me from my undergraduate studies in Germany to my current position as a JSPS fellow at RIKEN.

Next, I tried to give an honest look at what it's like to be a researcher. I described my daily work as a theoretical physicist, which involves math and programming rather than lab experiments. I also discussed both the advantages, such as having much freedom, and the challenges, such as job instability, that come with this career.

After this, I moved to the main part of the presentation, where I tried to serve as a guide to the strange world of quantum physics. I introduced ideas like particle-wave duality, quantum tunneling, and superposition in a simple, accessible way, connecting them to real-world technologies like

MRI and quantum computers. This part of the presentation included two short videos (5-7 minutes each) about the double-slit effect and about quantum computers.

Finally, I tied everything together by giving a brief look into my own specialized field of quantum thermodynamics. My research explores whether we can use quantum effects to build better thermodynamic machines on the microscopic scale. My goal is to understand the fundamental rules that govern these machines, to see if they can overcome the limitations of our everyday, large-scale technology. I concluded by expressing my gratitude for the opportunity to do this work in Japan, a world leader in this exciting field.

◆Other noteworthy information（その他特筆すべき事項）:

My presentation contained Japanese subtitles throughout, to help those students who might be struggling with understanding the English language.

- Impressions and comments from the lecture assistant（講義補助者の方から、本プログラムに対する意見・感想等がありましたら、お願いいたします。）:

