

(For JSPS Fellow)

Form B-5

Date (日付)

12/6/2013 (Date/Month/Year: 日/月/
年)**Activity Report -Science Dialogue Program-**

(サイエンス・ダイアログ事業 実施報告書)

- Fellow's name (講師氏名): Fabian Furrer (ID No. P12793)
- Participating school (学校名): Tsuru Highschool, Yamanashi
- Date (実施日時): 7/6/2013 (Date/Month/Year: 日/月/年)
- Lecture title (講演題目): (in English) The Power of Quantum Information Theory
(in Japanese)

- Lecture summary (講演概要): Please summary your lecture 200-500 words.

In my lecture, I presented to the students my research field of quantum information theory which explores the possible applications of quantum systems in information theoretic tasks. Quantum systems are atomic or sub-atomic systems and they behave in a different way as macroscopic systems which we experience in our daily life. My goal was to show that this different behavior is very useful in communicating and processing information. For that I presented the most advanced quantum information technology, namely, quantum cryptography in which quantum systems are sent to transfer secret messages.

I explained in simple terms that in quantum systems some properties cannot be accessed at the same time. From this property we derived the basic principle that every interaction with a quantum system induces a disturbance. I illustrated this phenomena in the case of the polarization of a photon. The polarization degree of photons has been explained with some basic experiments with polarization filters.

I then discussed in more details the value of cryptography in our society and the problem that a potential quantum computer could hack the standard protocols used at the moment. As a solution of this problem, I presented a way to send secret messages by using quantum systems, namely, the polarization carried by single photons. The security is provided by the basic principle that every interaction with a quantum system induces a disturbance which I explained before. I explained in detail how such protocols work.

We finished our lecture with some interesting questions of the students.

- Language used (使用言語): english

- Lecture format (講演形式):

◆Lecture time (講演時間) 60 min (分), Q&A time (質疑応答時間) 15 min (分)

◆Lecture style (ex.: used projector, conducted experiments)

(講演方法 (例: プロジェクター使用による講演、実験・実習の有無など))

Power point presentation, conducted small experiments with polarization filters

◆Interpretation (ex.: Assistance by accompanied person, provided Japanese explanation by yourself) (通訳 (例: 同行者によるサポート、講師本人による日本語説明))

Assistance by accompanied person

◆Name and title of accompanied person (同行者 職・氏名)

Jisho Miyazaki, Master student

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

- Impressions and opinions from accompanied person (同行者の方から、本事業に対する意見・感想等がありましたら、お願いいたします。):