

(For JSPS Fellow)

Form B-5

Date (日付)
30/07/2014

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): Jan Barta (ID No. P 12 750)
- Participating school (学校名): Suwa Seiryō Senior High School
- Date (実施日時): 22/07/2014
- Lecture title (講演題目): Chemiluminescence and Bioluminescence
化学発光と生物発光
- Lecture summary (講演概要):

My science dialogue presentation was divided into three parts. In the first part I introduced the Czech Republic and showed our location in the European Union. I described our economical and social statuses in comparison with the Japan by some general global indicators e.g. global index rankings, credit ratings. Next, I introduced our Universities, famous scientist, sportsmen, presidential candidates and our daily habits. In the second part of presentation I explained basic principles of luminescence by the Jablonski diagram and differences between fluorescence and phosphorescence. A chemiluminescence phenomenon was introduced with popular luminol illumination example. For a more detailed explanation of a chemiluminescence I prepared dark room chemical experiment based on peroxyoxalate method. Firstly, I described all the necessary chemical compounds and chemo-physical principles using the energy diagram representation. The chemiluminescence experiment was done in the dark scientific classroom to intensify glowing effects. For particular experiment I used seven different fluorophores in order to cover as much part of visible light spectrum as possible. During an experiment I described all steps and asked student with quick questions about the principle of luminescence. All students were very interested in all experiments, because of its nice colorful glowing effects. Different colors of emitted light were explained by differences between chemical structures of fluorophores. After an experiment I revise all principle of applied chemicals and principles. The last part of a presentation was focused on bioluminescence. Thus, I explained origin of bioluminescence and describe living organism that can illuminate. I used the visible light penetration diagram into the open Ocean to help students to understand why the most frequent colors of marine

bioluminescent organisms are green and blue. Next, I described chemical background of luciferin oxidation by oxygen in the presence of the enzyme (*luciferase*). I mentioned chemical differences of six main classes of luciferins and showed particular examples from nature. Using RCSB Protein Data Bank web page¹ I performed demonstration of a ligand extraction from a crystal structure of the thermostable Japanese Firefly *luciferase* complexed with a modified DSLA luciferin.² Students saw modern application of ligand extraction from an active site of a protein and also different models representation of enzyme and ligand structures in the Spartan 14 software.³

References:

- [1] <http://www.rcsb.org/pdb/home/home.do> (22.07.2014)
[2] Nakatsu, T.; Ichiyama, S.; Hiratake, J.; Saldanha, A.; Kobashi, N.; Sakata, K.; Kato, H. *Nature* **2006**, *440*, 372–376.
[3] Spartan 14, Parallel Suite for Mac, Wavefunction, Inc.

- Language used (使用言語): English

- Lecture format (講演形式):

◆Lecture time (講演時間) 100 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))

computer presentation with projector, digital camera with polarising filter, chemical experiments in an appropriate class-room with chemical equipments and chemicals disposal options, web connection

◆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 of laboratory technician lady (Tamami Sakurai Sense) from the Suwa Seiryō High School with solution preparation. I provided Japanese explanation of difficult vocabulary entries for easier understanding.

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

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

Experiments conducted in the dark scientific classroom.

- 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。):