

(For JSPS Fellow)

Form B-5

Date (日付)

30/1/2012 (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): Johannes Schmude (ID No. P10778)

- Participating school (学校名): TSURU Highschool, Yamanashi

- Date (実施日時): 27/1/2012 (Date/Month/Year: 日/月/年)

- Lecture title (講演題目): (in English) A problem in particle physics

(in Japanese) No japanese title

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

The aim of the lecture was to introduce students to an ongoing problem in modern elementary particle physics: The breakdown of perturbative quantumchromodynamics at low energies. Since it is virtually impossible for high school students to get a full understanding of this issue, the idea was to develop the concept of perturbative expansions and a first order effect through allegory. The allegory chosen was that of calculating orbits in the solar system using Newtonian mechanics. Here, it is strictly speaking not possible to obtain an analytic result for the orbit of the earth if one wants to take into account the gravitational interaction of all the bodies in the universe. However, as the students intuitively understand, one obtains a very good approximation by just considering the earth-sun system, which can be improved upon by adding the effect of the moon and planets such as Jupiter and Saturn. During the lecture, this allegory was used to develop the idea of isolating first order effects and arranging the various forces in a sort of perturbative expansion. Having finished the discussion of a solar system with considerations when such expansions break down (the example of a system with two major stars of similar mass), the lecture proceeded introducing particle physics and particle theory by examining bubble chamber photographs. Proceeding to QCD, Feynman diagrams were introduced as a tool for perturbative calculations in QCD. Power-counting for the coupling constant lead to the perturbative expansion. We closed with some very rough remarks of lattice QCD and gauge/string duality as modern attempts to address nonperturbative problems in QCD.

- Language used (使用言語): English, with japanese annotations on the slides and japanese

summaries of parts of the talk by Prof. Shigeki Sugimoto

- Lecture format (講演形式):

Lecture time (講演時間) 70 min (分), Q&A time (質疑応答時間) 20 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))

Projector; blackboard

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))

I was accompanied by Prof. Shigeki Sugimoto, who provided interpretation where necessary

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

Prof. Shigeki Sugimoto (特任教授・杉本茂樹)

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

No further information

- 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。):

とても楽しい時間を過ごすことができました。