

成果報告

山田コンファレンスLXIII 第3回光誘起相転移現象に関する国際会議

The 3rd International Conference on Photo-induced Phase Transitions and Cooperative Phenomena(PIPT3)

2008年11月11日～15日 大阪市立大学学術情報総合センタービル

東京工業大学 フロンティア研究センター 腰原伸也

山田科学振興財団のご援助のもと、「第63回山田コンファレンス／第3回光誘起相転移現象に関する国際会議」を、2008年11月11日から15日の5日間、大阪市立大学学術情報総合センタービル10Fの大ホールを会場として開催した。好天に恵まれ、会場ホールと隣接の休息室からは常に南大阪とその周辺を一望する開放的雰囲気の中で熱心な議論が行われた。会議は60件の口頭発表と60件のポスター発表で構成され、約130名の参加者（海外参加者が40名）という、主催者の予想を大きく上回るものとなった。海外からの参加者には、欧米の主要な量子ビーム施設の現場責任者、統括者が多く、国内外の一流の物質科学分野研究者との間で新たな多くの研究交流の芽を生み出すきっかけとなったという感想が閉会直後から多数電子メールで寄せられ、学際的な研究者達が適切な規模と集中的な討議を行うという山田コンファレンスの理念の重要性を改めて認識している。

Opening Address



腰原組織委員長

Good morning ladies and gentlemen. It is my great pleasure and honor to announce the opening of 63th Yamada Conference and PIPT3 as a chair. On behalf of organizing committee, I cordially show my special thanks to Yamada Science Foundation. We also thanks to JST and G-COE program of Tokyo Tech. for their collaborations.

As for the aim of this conference, I would like to shortly make a comment. In the field of solid state optics, problems related to cooperative dynamics phenomena, triggered by photo-excitation, have attracted considerable interest, especially those regarding photo-induced phase transition (PIPT) phenomena. In the past 30 years, experimental and theoretical PIPT studies and related studies involving dielectric materials (photo-ferroelectrics), excitonic systems, diluted magnetic semiconductors, amorphous semiconductors, and liquid crystals have been conducted. In addition, the development of ultrafast laser technology in the 1980s opened up the possibility, including that for a non-thermal melting process, for the ultrafast control of materials. These pioneering works have led to a new field involving the photo-control of the electronic and structural phases of materials by virtue of the internal cooperative interactions in condensed matters.

Research in a new field requires close collaboration among researchers in experimental

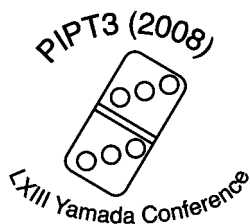
technology and materials science, supported by international cooperation. The last 20 years have resulted in the best collaboration involving optical science, ultrafast laser technology, and materials science. To survey the scope of this developing field, the 1st and 2nd International Conferences on PIPT were organized in 2001 by Professor Keiichiro Nasu in Tsukuba, Japan, and in 2005 by Professors Herve Cailleau and Tadeusz Luty in Rennes, France.

It is very timely, and happy and great honor to us, that Yamada Science Foundation supported us to open 3rd PIPT conference in 2008 as Yamada Conference LXIII, here in Osaka from 11th to 15th of November 2008. During this conference, both experimental and theoretical perspectives will be subjected to intensive discussions, especially on the following topical problems:

1. Photo-induced, structural phase transitions: their dynamics and precursor phenomena, including new investigative methods, such as time-resolved X-ray techniques.
2. Photo-induced magnetic, dielectric, and electronic phase transitions and their dynamics in organic and inorganic materials.
3. Strongly collective and nonlinear phenomena in photo-excited states, including excitons and cooperative photo-reactions in the condensed phase.

As the organizers, we strongly believe that this conference will be a valuable contribution toward the next step in this field of research, as it is innovative, interdisciplinary, and international in scope.

On behalf of all members of the organizing committee and all participants, I would like to express my sincere gratitude to the Yamada Science Foundation and to the executive members of the Foundation for selecting the field of PIPT for the Yamada Conference LXIII. Finally, I cordially thank all members of the organizing committee for their hospitality and support of this conference. I would like to hand the microphone to Professor Koda.



Shin-ya KOSHIHARA,
Chairman of the Organizing Committee of
the Yamada Conference LXIII and PIPT 3

Welcome Address



国府田評議員

Good morning, ladies, gentlemen, and dear friends.
My name is Takao Koda. As this conference gets underway, I am performing a dual role. In one, I represent the board of the Yamada Science Foundation, and, in the other, I am a long-standing member of the interdisciplinary fields related to photo-induced phase-transition phenomena.

Therefore, first, let me address you as “Distinguished guests, ladies, and gentlemen” and express our cordial welcome on behalf of the Yamada Foundation. It is my great honor to extend this warm welcome to all of you

on behalf of the chairman of the board, Prof. Yasusada Yamada, who is regrettably unable today to attend this important conference.

In the next tutorial, Prof. Keiichiro Nasu will provide information about the history and scope of this conference. Therefore, I will offer a brief history and some background on the Yamada Science Foundation and make a few remarks about the traditional spirit of the Yamada Conference.

The Yamada Science Foundation was established in 1977 here in Osaka, 31 years ago. The founder was the late Mr. Kiro Yamada, who was born in 1894 in Osaka. He inherited the pharmacy company originally built by his father in 1899 in the center of Osaka. As the president of his company, Mr. Yamada provided outstanding leadership and activity to lead his company as it competes on the worldwide stage in the pharmaceutical field. In addition, he was very keen to contribute to the promotion of basic science from the civil sector. His strong intention to encourage the promotion of basic science in the civil sector is certainly reflected in the traditional spirit of Osaka, which has nourished its own culture for a long time on the basis of its liberal citizenship. This was done even during the feudalistic regimes of the Middle Ages in Japan.

Mr. Kiro Yamada, as a citizen of Osaka, was strongly convinced that basic science is an essential part of the civilization and culture on a worldwide scale. With this idea and these wishes, he made a considerable effort along with generous donations of his private funds and finally succeeded in the establishment of the Yamada Science Foundation in 1977. Last year, we celebrated 30th years memorial for the Yamada Science Foundation.

Since the Foundation was established, various sponsorship programs have been developed, including grants to individual scientists and financial support of international conferences. In all of these programs, the emphasis has been on the encouragement of challenging activities, particularly with regard to those exploring new regions of science in the interdisciplinary fields bridging physics, chemistry, biology, and medicine.

The same is also true for the Yamada Conference, which started in 1978. Therefore, at this conference, we will celebrate our 30th year here in the birthplace of Yamada Science Foundation. I should mention one thing on the traditional spirit of Yamada Conference. Our motto of the Conference is represented by triple alphabet I's. The first is, of course, "International;" the second is "Interdisciplinary;" and, lastly, but not less important, is "Innovative." I am strongly convinced that each of these three mottoes will be substantiated at the end of this Conference.

Now, dear colleagues and friends, I would like to switch to my second role and comment as a participant of this event. Looking back my personal research life, I recall that something happened, about thirty years ago, with respect to our research subject. In the early 80th of the last Century, we turned round the target of our spectroscopic studies on solids, from inorganic crystals which had been so familiar to us so far, to much more unfamiliar world of organic solids. I must say this change was substantially encouraged by a number of theoretical works by Prof. Yutaka Toyozawa and his colleagues. In addition, at that time, I became aware of the impressive words of Sir Nevil Mott, well-known in solid-state physics as the author of the classical text, *Electronic Processes in Ionic Crystals*, published in 1948, and more widely by the key word of 'Mott transition'. In 1982, Mott wrote a preface to a book titled *Electronic Processes in Organic Crystals* written by Pope and Swenberg. He wrote as follows:

The electronic processes in organic crystals are quite important. The reasons for this are many, but certainly the most important is that new things are to

be found, which is rarely the case in the well-explored field of inorganic crystals, and perhaps the distant dream of a new technology and one possible application to the understanding of such biological processes as do involve electronic motion.

These words sounded to me like an oracle at that time. What I am anticipating most from this conference are fascinating reports of research that will prove substantially that Mott was right, i.e., works that will bridge the divide between inorganic and organic substances and explore our subject from an interdisciplinary approach through international collaboration among physicists, chemists, and biologists.

To conclude my welcome address, I would like to quote a Haiku, which, as you know, is a short traditional type of Japanese poem. This one, written by Basho, a well-known Haiku poet of the 17th Century, reads in its original Japanese: “Kusa-iro-iro, ono-ono Hana-no Tegara-kana,” and is translated in a somewhat lengthier version in English as follows: “Oh, how many of them there are, in the fields! But each flower in its own way. In this, is the highest achievement of a flower!” You will be able to understand the meaning. Each presentation at this conference represents Basho’s “flower” at its peak and could be considered as an interdisciplinary blossom in physics, chemistry, or biology, just as professor Mott predicted nearly 30 years ago.

Finally, let me express our cordial thanks to Prof. Shin-ya Koshihara and all members of the organizing committee for their devotion to the organization of this memorable conference. Thank you very much for your kind attention.

Takao Koda
In place of Director General
Yamada Science Foundation

この「光誘起相転移とその前駆現象」に関する国際会議は、2001年のつくば（日本）、2005年のレンヌ（フランス）に続く3回目で、光励起下という非平衡状態におかれた物質が生み出す新規秩序やその前駆現象を実験と理論の両面から解明することを目的とするものである。具体的な準備活動の状況は以下の通りである。

- 1：2005年 8月 フランスで開催された第二回会議での、次回日本で開催との意向を受け、腰原を中心に小川哲生（阪大 教授）、田中耕一郎（京大 教授）、橋本秀樹（大阪市大 教授）の4名で開催準備委員会を設置。山田科学振興財団に、山田コンファレンスとしての開催に向けて応募することを決定。
- 2：2006年 5月 財団より援助の決定通知をいただき、会場を大阪市大メディアセンター大ホールに設定する等本格的準備に着手。
- 3：2006年 7月 ホームページ開設に向け、契約先等の選定に着手。
- 4：2007年 4月 ホームページ契約先と論文集出版元を選定。
- 5：2007年 7月 ホームページ、参加登録事務代行、出版契約先決定。
- 6：2007年 8月 ホームページ公開、予備登録開始。プログラム国内・国際委員会メンバーを決定し、具体的な編成作業に着手。
- 7：2008年 4月 プログラム主要講演者決定、公開。

- 8：2008年 6月 一般講演申し込み締め切り、最終プログラム編成。
 9：2008年 10月 講演者旅費の最終算出を含め事務手続きを大学側（法人化後の大学の勤務規定の変更により、本会議の経理は予算を全て一旦大学に寄付し、全て大学が寄付金経理として管理と実際の支出認可を実行）と最終調整。
 10：2008年 11月 会議開催。
 11：2008年 12月 論文集査読終了。
 12：2009年 1月 論文集最終原稿確定、出版元（IOP）に引き渡し。
 13：2009年 2月 電子出版校正、3月初めに論文集電子出版
 14：2009年 3月 論文集印刷版 校正 4月出版、参加者に郵送予定

本会議の参加者数と発表件数からも明らかなように、参加者のほとんど全員が発表（口頭、ポスター）を行うという形となっていて、それもこの会議が非平衡状態の物質科学という新しい分野と、様々な量子ビームを活用した極限計測技術という若々しい二つの分野の接点に関わっていることを反映している。このことを意識して、会議初日と2日目に、この融合的分野の全体像の展望、超高速の動的構造観測という新技術の応用、ソフトマターへの展開という三つの主題で、那須圭一郎氏（高エネ研教授：第1回の会議議長）、A. キャバレリ氏（オックスフォード大教授、自由電子レーザーマックス・プランク研ディレクター）、吉川研一氏（京都大教授）がそれぞれプレナリー講演を行った。那須氏は日本始発の研究である凝縮系の光誘起相転移の創成と発展の歴史を励起子系の光物性との関連も踏まえ展望し、キャバレリ氏は超短パルス量子ビーム技術がもたらす新たな可能性を具体例によって解説した。吉川氏は、ソフトマターの非平衡統計物理学の視点から光励起下での非平衡現象の特徴を興味深い実例を用いて示したが、その内容はこれまでもっぱら強相関系物質に関心を集中してきた光誘起相転移現象の研究者たちにとっては極めて刺激的で印象深いものであった。

「光誘起相転移とその前駆現象」に関する内外の研究は、この10年間で飛躍的な進歩を遂げた。第1回会議では、現象そのものの検証が中心課題であったが、第2回では超高速分光技術の利用が提案され、それに伴って対象となる物質が大きく拡大した。今回の会議では、物質面で無機有機半導体、金属酸化物、有機電荷移動錯体結晶から生体分子（光機能タンパク質）などが次々と登場し、測定技術面でも、SR光、レーザー、テラヘルツ波などを組み合わせたps-fs時間域での動的構造解析技術が進展し、さらに硬軟X線や電子線の回折像を動画像として可視化する技術が固体や分子の光誘起現象の解明に適用された様々な例が報告された。学際的な物質科学と極限構造解析技術とが融合した新分野の創成に立ち会っているという実感を参加者全員が共有できたと感じている。それと同時に、これらの多彩な現象を統一的に記述する新たな理論的枠組みの構築が、将来の重要な課題として、参加者一同に認識されたと考えている。

好天に恵まれ、大阪周辺を一望する大阪市大学術情報総合センターの最上階から、国内外の研究者とともに、新しい基礎科学分野の現状と将来を展望する知的興奮と開放感とを満喫できた5日間であったことを、参加者、企画者一同心よりの喜びとしている。このような意義深い会議を開催する機会を与えて頂いた山田科学振興財団と関係者の皆様に心よりお礼を申し上げる。

山田コンファレンスLXIII 組織委員

腰原伸也	(東京工業大学)	委員長
小川哲生	(大阪大学)	副委員長
田中耕一郎	(京都大学)	副委員長
橋本秀樹	(大阪市立大学)	副委員長

