山田シンポジウム援助一覧表

組織委員長	集　会　名	会　期	開催地
高輝度光科学研究センター 大阪大学名誉教授 江尻宏泰	Yamada Symposium 1 Neutrinos and Dark Matter in Nuclear Physics 03	2003 6/9～6/14	奈良市

1件　援助金 8,800,000 円

成果報告

山田シンポジウム 1：Neutrinos and Dark Matter in Nuclear Physics

2003年 6 月 9 日～ 6 月14日　於　奈良新公会堂 & 奈良ホテル

組織委員長　高輝度光科学研究センター・大阪大学名誉教授　江　尻　宏　泰

第 1 回山田シンポジウム、Neutrinos and Dark Matter in Nuclear Physics の概要と特徴を記す。詳細は Circular (1), Proceedings (2), Web site (3)に公開してある。

1．山田財団 25 周年にあたりスタートした新しいシンポジウム。 将来への学問の発展に重点をおき、現在発展しつつある興味ある基礎科学の現状と将来への展望を、将来性を担う若い研究者を含む最先端の研究者と討論。2002 年 2 － 5 月の理事会・評議会で決まり、YS1 として行われた。

2．主題は原子核物理に於けるニュートリノとダークマター（暗黒物質）で、現在研究が発展しつつあり、新しい（標準理論を超える）素粒子宇宙像の確立につながる重要テーマ。素粒子、宇宙、原子核の分野にまたがる広い分野から各界の最先端の研究者と討論。

3．二重ベータ崩壊研究やダークマター研究の最新の研究、将来に向けてのニュートリノ質量研究、超新星とニュートリノなどで、世界で初めての研究発表がなされ、レベルの高い最先端の研究とこれからの研究の展望が議論された。

4．シンポジウムの組織での特徴は 19 カ国から 22 人（内 2 人は YSF 評議委員）の顕著な研究者が International Advisors として協力し、その内 12 人が参加発表し、多くが若い研究者を推薦してくれた。

5．シンポジウムの規模は 14 カ国 69 人（内 70%は海外）の研究者と 15 人の国内からの大学院学生の 84 人が参加者。いずれも最先端の活発な研究者で、学生、PDクラス、若い研究者が6割程度で、十分な討論と交流ができた。他に同伴者 8 人。

6．日程は 5 日半で、3 日半は奈良公園内の奈良新公会堂、1 日は奈良ホテル、1 日は大塔コスモ観測所見学と大塔センターで行った。期間中の 3 日目の午後は Free（但し夕方の Session あり）とし、自由な討論の時間とした。ポスターセッションを1つつくった。時間にゆとりを持たせ、自由討論と交流が十分に行われた。

7．シンポジウムの最終日はパネル討論として研究の最前線の現在と展望についての 3 人の Leading Scientists の話があった。最後に特別セッションとして小柴氏にニュートリノ天文学のこれまでとこれからについて話をしていただいた。本シンポジウムのハイライトで、極めて迫力あり、示唆に富む話であった。

8．本シンポジウムの President に山田安定財団理事長になっていただき、開会、IACとの会食、晩餐会等で、理事長がシンポジウムの理念、山田科学振興財団の方針、基礎科学の考え方等を話された。これ

らの話に多くの参加者が大変感銘を受けた事を表明していた。また大塔村、北村村長の生の挨拶（代筆、代読でない！）にも多くの参加者が「地方には優れた Statesman がいると」感心した。

9．YS1-NDM03 が大変 Enjoyable で Productive であったことにより、同様な趣旨で続けて行く事になった。次回（第二回 NDM）は NDM06 をパリで 2006 年に行う。NDM06 の責任者（Prof. S. Jullian）と私は 2 月中旬東京で打ち合わせを行った。

10. シンポジウム後に半日、二重ベータ崩壊によるニュートリノ国際協力ネットワークの会が持たれた (4)。この他にも共同研究など活発な議論が行なわれた。

11. 会の組織運営等は全て Electric（ポスター以外）に行い Circular, Proceedings 等も Website で行なった。

Website のサーバーや事務局は大阪大学理学部、岸本一能町研究室（旧江尻研究室）が協力。特に Scientific Secretary 小川氏が奮闘。YS 委員（山田、井口、江尻、金森、芝、永井の各先生）と河場専務理事が適宜アドバイス協力。

(1) YS1-NDM03 Circular http://ndm03.phys.sci.osaka-u.ac.jp/
(2) YS1-NDM03 Proceedings http://ndm03.phys.sci.osaka-u.ac.jp/proc/index.htm
(3) Yamada web site http://www.yamadazaidan.jp/seika4_1.html
(4) International Statement of Double Beta Decays http://www.rcnp.osaka-u.ac.jp/~ejiri/DBD-Lett

Opening Address

Good morning ladies and gentlemen.

This is the first Yamada Symposium on Neutrinos and Dark Matter in Nuclear Physics, YS1-NDM03. On behalf of the organization committee of YS1-NDM03, we would like to welcome you to this symposium at Nara.

We are very grateful to all of you, particularly those coming far from abroad, for joining this symposium. We are very pleased to have here many distinguished and active physicists working for neutrinos and dark matter (DM) in nuclear physics and for related subjects.

YS1-NDM03 is the 1st symposium of a new series of symposia started on the occasion of the 25th anniversary of Yamada Science Foundation (YSF).

The purpose of the Yamada Symposium is to discuss science frontiers and perspectives of currently developing subjects together with young researchers. The ideas of the new symposium will be given later by the YSF director general, Prof. Y. Yamada.

Neutrinos and dark matter are current interesting subjects of nuclear and astroparticle physics. Experimental and theoretical studies of them open new physics in the 21st centuries.

In fact recent studies of neutrino oscillations provide evidences for physics beyond the standard electro-weak theory. Neutrinos and dark matter are studied in nuclei as micro-laboratories, where nuclear responses for neutrinos and dark matter are crucial. Neutrino nuclear interactions play important roles in astro-nuclear processes.

The present symposium NDM03 aims at discussions on research frontiers and perspectives of neutrinos and dark matter in nuclear physics. NDM03 includes 15 scientific sessions in 5 days, and one session and visit to Oto Cosmo Observatory, the Underground Laboratory of Osaka University, in one day.

The subjects discussed in the present symposium are (1) neutrino mass by beta and double beta decays and neutrinos, (2) solar and supernova neutrinos and neutrinos in astrophysics, (3) neutrino nuclear interactions and physics of neutrino beams, (4) dark matter and cosmology, and dark matter scattering from nuclei, and (5) related subjects.

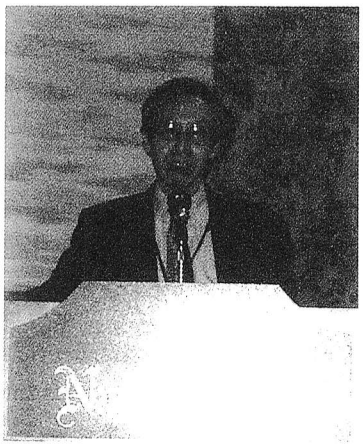
We, on behalf of the NDM03 organization committee, would like to express our cordial thanks to YSF and the director general of YSF, Prof. Y. Yamada, for the generous supports, and all IAC (International Advisor Committee Members) for valuable suggestions. We are indebted much to Physics Dept. Nuclear Physics Laboratory and RCNP, Osaka University for their collaborations. Many thanks are due to Nara Prefecture and Nara city, Oto Village, and Nara Convention bureau for their supports and helps.

We do hope you all enjoy physics discussions in YS1-NDM03. Nara was the first modern capital in Japan, started at 710. So please enjoy Japanese cultures in Nara as well in the free afternoon times of June 10th, 11th, and in 13th.

Thank you for your attention.

Hiro Ejiri
Chair person of YS1-NDM03

Welcome Address



Ladies and gentlemen,

On behalf of The Yamada Science Foundation, I would like to extend our hearty welcome to all of you,who are participating in the first Yamada Symposium on Neutrinos and Dark Matter in Nuclear Physics, particularly to those who have come a long way to Japan from various places all over the world.

Yamada Science Foundation was founded in 1977 at Osaka, Japan. It develops its activities by giving supports to the outstanding research projects in the basic natural sciences, especially in the interdisciplinary domains that bridges between the well established research fields such as physics, chemistry, and biology. The Foundation also provides travel funds for the scientists to visit or to go out of Japan in order to carry out international collaborative projects. It also holds conferences and workshops etc..

As a private organization, we have the policy that the axis of our activities should be oriented in the direction orthogonal to the large scale activities carried out by the government. Recently, the governments of most of the advanced countries, including Japan, seem to recognize the importance of basic natural sciences, and tend to invest a large amount of money. The underlying idea would be that it is useful for the future economical development of the country through advanced technological applications. This is in some sense legitimate because the source of the investment is the public money.

Therefore the interests of the investment should be returned to the taxpayers in the form of the promotion of standard of living of the nation.

However, from the view point of pure promotion of basic sciences, such the pragmatic stance is not totally acceptable, because science is a part of the culture of human being which is valuable by itself. In other words, science has its own internal motivation of development irrespective of whether it is useful for something else or not. It is this internal motivation that our Foundation is willing to give support, although the amount of money is rather modest.

Last year, 2002, was 25 years since it was founded in 1977. In celebration of quarter century anniversary, we decided to start a new activity: that is organization of a series of international symposia called Yamada Symposium. Yamada Symposium provides a forum of discussions among the scientists belonging to different generations as well as different nationalities. We put emphasis on different generations. Why? Because the achievements of culture should be measured in the time scale of centuries rather than decades.

We envisage the following scheme of Yamada Symposium: The scientists who are the most active members of the present generation and the scientists who are expected to be most active in the next generation in a selected research field are invited to get together. The former presents the present status and the perspective view of the research field, while the latter receive the messages and, through hot discussions, would pick up some hints of the way for him to proceed. By this way, Yamada Symposia would function as the driving mechanism to drive the science in the proper direction guided by the internal motivation.

After some discussions as for the subject of the first Yamada Symposium, Professor Ejiri, a member of the Advisory Board of our Foundation, proposed 'Neutrinos and Dark Matter in Nuclear Physics' which was unanimously agreed upon, and we are here today.

I hope all of you would enjoy this symposium and also relax some time staying in this attractive city of Nara, the ancient capital of Japan. Thank you.

Yasusada Yamada
Director general & YS president
Yamada Science Foundation

Summary of the YS1-NDM03

The first Yamada Symposium on Neutrinos and Dark Matter in Nuclear Physics (YS1-NDM03) was held at the Nara district in June 9-14, 2003. The Yamada Science Foundation (YSF) has started a new program of the Yamada Symposium on the occasion of it's 25th anniversary. YS1-NDM03 is the first symposium of the new series of the Yamada Symposium. This is a brief summary of the YS1-NDM03 symposium.

The purpose of the Yamada Symposium is to discuss research frontiers and perspectives on currently developing subjects together with younger researchers, who will play major roles in research activities in future.

The symposium includes reviews on science frontiers and future perspectives, presentations of recent research works and forums on new science frontiers and perspectives. The symposium encourages hot discussions as well.

The present symposium NDM03 aims at discussions on research frontiers and perspectives of neutrinos and dark matter in nuclei. Active scientists of around 85 from 15 countries participated in NDM03. They include many young and promising scientists. International advisory committee was composed by 22 leading scientists from 17 countries.

The symposium was held at the Nara new public hall in June 10th, 11th, 13th, and 14th, at the Nara hotel in June 9th and at the Fureai Kohryu Hall Oto village in the afternoon of June 12th. All participants visited the Oto Cosmo Observatory, the underground laboratory of Osaka University. Here experimental studies of neutrinos and dark matter are under progress.

The subjects discussed in YS1-NDM03 are 1) neutrino mass by beta and double beta decays and neutrinos. 2) solar and supernova neutrinos and neutrinos in astrophysics, 3) neutrino nuclear interactions and physics of neutrino beams, 4) dark matter and cosmology and dark matter studies by nuclear scatterings, and 5) related subjects.

The scientific sessions consist of an opening session, 14 sessions, a special session, and a poster session. Scientific subjects discussed are given in the section 2

It was our great pleasure that Prof. M. Koshiba gave an impressive and instructive talk in the special session on the neutrino astrophysics, for which the Novel prize was awarded to Prof. Koshiba in 2002..

An informal meeting on double beta decays was held in the afternoon of June 13 to discuss International collaboration for future $\beta\beta$ decay experiments. This is based on our agreement as given in the international statement, http://www.rcnp.osaka-u.ac.jp/~ejiri/DBD-Lett

Social programs include the welcome party in 17－19 June 8th at the Nara New public Hall, the reception in 19:30－21 June 9th at Nara hotel, the barbecue party in 17:15－19 June 12th at Hoshino-kuni Oto, the Koto and Shakuhachi concert and the banquet in 19:30－22 June 13th. The three afternoons in June 10th, 11th, and 13th were free for discussions and visiting temples and shrines in Nara Park. All international advisors were invited by the YSF director Prof. Y. Yamada to a dinner at Kikusui rou in the evening of June 11th. These social programs and the ample free discussion times, together with the visit to the Oto underground laboratory, were very effective for further lively discussions.

We are very pleased to hear from most participants during and/or after the symposium how they all have enjoyed much nice talks and active discussions through YS1-NDM03. Many of them were impressed by the new type of the physics symposium, and by the idea of YS as presented by Prof. Y. Yamada in the opening session.

Accordingly we have agreed to continue this type of the symposium on neutrinos and dark matter in nuclear physics, next one being NDM06 in Paris to be organized by Prof. S. Jullian and the Orsay group.

The outline of the symposium is found in the YS1-NDM03 circular given in the web site, http://ndm03.phys.sci.osaka-u.ac.jp/

Ⅱ. Scientific subjects of NDM03

Neutrinos and dark matter are current subjects of nuclear particle and astro physics. Experimental and theoretical studies of them are now opening new fields of physics in the 21 st centuries. Recent studies of neutrino oscillations provide evidences for physics beyond the standard electro-weak theory.

Neutrinos and dark matter are studied in nuclei, which are well isolated systems of nucleons in quantum states. Nuclear responses for neutrinos and dark matter are crucial for studies of them in nuclei. Neutrino nuclear interactions play important roles in astro nuclear processes.

The scientific sessions consists of 15 plenary sessions and one poster session. The plenary sessions are as follows.

I. Neutrino masses and nuclear β and ββ decays.
II. Double beta decays and neutrinos
III. Double beta decay experiments, future I
IV. Double beta decay experiments, future II
V. Solar ν's, ν oscillations, and ν interactions.
VI. Solar ν experiments and perspectives.
VII. Solar ν productions and nuclear interactions with DM
VIII. Supernova ν's and Astrophysics
IX. Physics with low energy ν's, and ν nuclear interactions.
X. Accelerator-based ν physics
XI. Underground laboratories.
XII. DM and cosmology
XIII. DM experiments
XIV. Future DM experiments
XV. Perspectives of ν's and DM in nuclear physics
XV Special Session

In the scientific sessions 54 invited papers were presented, and 13 contributions were displayed in the poster session.

Many interesting works and original views of the perspectives on neutrinos and dark matter in nuclear physics were presented.

The first results on the double beta decay experiments with sub eV mass sensitivity were reported by NEMO and CUORECINO groups. New projects on the double beta decays with even higher 30 meV sensitivity were presented by Majorana, MOON, EXO and other groups, and Katrin group showed the progress of t-beta experiment. These experimental works, together with new theoretical methods on nuclear matrix elements presented by several nuclear theory groups, are promising for studies of the neutrino masses. New results and progresses of the neutrino oscillations by SK, SNO, KamLAND, FNAL and others are quite impressive to establish the neutrino mass differences and the mixing parameters.

High precision studies of dark matter and theoretical studies of dark matter and cosmology were discussed by several groups. These works are important for new physics beyond the standard theory and for understanding our universe. Theoretical and experimental works on supernova neutrinos and the explosion processes were presented by several groups.

Perspectives and futures of neutrino and DM studies were extensively discussed. The last session (session XV) is a forum on the perspectives by leading physicists.

One of highlights was obviously the talk presented by Prof. M. Koshiba in the special session.
Prof. Koshiba discussed how the neutrino astrophysics was developed by him and his Kamioka/SK group and will be further studied by younger generation scientists.

Unique features of the present symposium are 1) new and original works on current subjects on neutrino, dark matter and related subjects in nuclear physics, 2) emphasis on interdisciplinary fields of particle nuclear and astro physics, 3) active discussions among distinguished leading physicists and young promising physicists, and 4) discussions on perspectives and futures of research frontiers.

Invited papers presented in these sessions and short contributions presented in the poster sessions are given in the YS1-NDM03 proceedings. This was published in the web site,
http://ndm03.phys.sci.osaka-u.ac.jp/proc/index.htm

The present symposium was supported by the Yamada Science Foundation (YSF). We would like to express our hearty gratitude to Prof. Y. Yamada, the director general and the YSF for the generous support for YS1-NDM03, and to Dr T. Kawaba and the YSF staff for the corporation. We would like to thank all international advisors and all local organizers for valuable suggestions and symposium organization and all YS committee members for kind suggestions.

Many thanks are also due to Physics, OULNS and RCNP, Osaka University for various kinds of supports including the NDM network and other technical supports. We appreciate supports and corporation by Mr T. Kitamura, Mayor of Oto village, Nara prefecture and Nara convention bureau. In fact many of the participants were impressed by the excellent speech by Mr T. Kitamura and his understanding of and support for the basic science.

Special thanks are due to Dr. I. Ogawa (Physics Osaka Univ.), YS1-NDM03 scientific secretary for all nice and hard works for YS1-NDM03.

Links

YS1-NDM03 circular	http://ndm03.phys.sci.osaka-u.ac.jp/
YS1-NDM03 Proceedings	http://ndm03.phys.sci.osaka-u.ac.jp/proc/index.htm
International Statement of Double Beta Decays	http://www.rcnp.osaka-u.ac.jp/~ejiri/DBD-Lett