

NEWSLETTER

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Introduction to ISAJ

Background

The Indian Scientists Association in Japan (ISAJ) is a non-profit organization founded in 2008 to provide an organizational framework to promote greater interaction between Indian scientists/researchers working in Japan and the Japanese scientific community. ISAJ coordinates, delivers and provides a platform for networking and exchange of information, organizes scientific seminars and special lectures as well as the annual ISAJ scientific symposium for the development and strengthening of research networks. We are present all over Japan and work through our network of regional branches and by building partnerships with other scientific organizations that share our vision. We also provide information for the advantage of the ISAJ community on science and technology news, events, funding opportunities, and every nuance of research system in Japan through our homepage, online forum, social networking group, etc. We are launching the bimonthly ISAJ Newsletter as a part of such initiative. You have the opportunity to become a member of ISAJ, and thereby we can all build the ISAJ in the true spirit of a community for our collective benefit and also for the future of Japan-India scientific and technological collaboration.

Mission

- * To facilitate greater interaction between Indian scientists/researchers based in Japan, as well as Indian and Japanese researchers, for the development and strengthening of research networks
- * To help in building a bridge between Japanese and Indian research organizations to undertake collaborative research projects mutually beneficial to both the countries.
- * To organize scientific seminars and special lectures, symposia to disseminate information about the research activities carried out by the Indian researchers based in Japan and to promote communication between Indian and Japanese scientific community that would benefit India-Japan S&T collaboration.
- * To share the experience of culture and way of life in Japan for the advantage of young researchers in India who are planning to pursue their academic/research career in Japan.

From the Editor's desk

Greetings and warm welcome to the first issue of ISAJ Newsletter. We are very excited to present the bimonthly newsletter to our community. Our goal is to keep you informed of the ISAJ activities and to offer you substantial information about the achievements of our members in their respective fields of research. Besides, we would also present other community resources such as new information/news, book review, etc. This inaugural issue comprises "Introduction to ISAJ", "Historical Perspective", "New in Science", and "From the Pen of Young Mind". From the next issue onwards we are going to replace the first two sections by "Editors' Choice" and "Book Review". Considering the multidisciplinary nature of our community, we will always endeavor to maintain brevity and clarity while presenting the contents. Send us your ideas so we can help support each other and grow together! We sincerely hope you would find our endeavor interesting and informative.

In This Issue

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- Historical Perspectives
- New in Science
 - * Gravitational waves
- From the Pen of Young Mind
 - * Dengue: A Major Global Health Burden

News and Notes

6th ISAJ Symposium-2015

Best Poster awardees

Amrita Dudani,
Saitama University

"Synergistic action of motilin and ghrelin facilitates different responses in various parts of the Suncus stomach in vitro"

N. Fujita,
The University of Tokyo

"A novel long-period structure formed in a high-pressure synthesized Mg-Zn-Yb alloy"

Khateeb NOOR Ul Huda,
The University of Tokyo

"Numerical simulation of bubbly flows in an aeration tank with biochemical reactions"

Xin Ji,
National Institute for Material Science

"Effect of graded β phase stability on deformation behavior in a metastable β -Ti alloy"

Ambika Dudhate
The University of Tokyo

*"Functional analysis of defense related transcription factors in rice against sheath blight pathogen *Rhizoctonia solani*"*

Historical Perspectives

Journey so far

ISAJ was conceived and structured in 2008, formally inaugurated by Prof. Chidambaram, Principal Scientific Adviser to Government of India on January 19, 2009*, and registered as a Non Profit Organization (NPO) in Japan since 2010. Through deliberations in Executive Body Meetings, we have come up with our by-laws, organizational structure, and official logo/seal. We envisioned for having six chapters of ISAJ spreading all over Japan: Hokkaido, Sendai, Tsukuba, Tokyo, Kyoto, Kobe. We have now three operational chapters, and three other chapters are at different stages of development. We have an Executive Body, which consists of many reputed Indian scientists and young researchers working in Japanese research institutes and universities. Since the inception of ISAJ, Ambassador of India to Japan and Counsellor of Science & Technology, Embassy of India, Japan have been the honorary patron and honorary advisor respectively. We have organized six annual symposia at Tokyo, thirteen interactive lectures by the Tsukuba Chapter and several seminars/meetings by the Tokyo Chapter and other regional chapters. Apart from such regular events, we organize special lectures for high profile visiting scientists from India from time to time and interact with them.

Annual ISAJ Symposia

Since the primary objective of ISAJ is to generate opportunities for Indian and Japanese scientists to interact and exchange ideas and information on the advances in emerging areas of science and technology, it has been organizing its annual symposium since 2010 at the Embassy of India, Tokyo.

1st Symposium (Convener: Dr. Sunil Kaul, AIST **Co-convener:** Dr. Kedar Mahapatra, Tokai University)

The very first symposium titled “the India-Japan Symposium on Emerging Technologies” was held on October 7, 2010, and was inaugurated by Shri Prithviraj Chavan, India's the then Minister of State for S&T in the presence of H.E Shri Hemant Krishan Singh, Ambassador of India to Japan and Japanese dignitaries. In this symposium, 91 presentations were made including 11 plenary lectures, 1 Special Lecture, 14 oral presentations and 60 poster presentations, followed by a

panel discussion dealing with several issues relevant to the status and prospects of science and technology collaboration between India and Japan.

2nd Symposium (Convener: Prof. Ruby Pawankar, Nippon Medical School **Co-convener:** Dr. Swadhin Behera, JAM-STECC)

The second symposium titled “the India-Japan Symposium on Global Challenges in Health and Environment” was held on October 7, 2011, and dedicated to the victims of the 2011 Great Tohoku Earthquake and Tsunami. Apart from observing a moment of silence in commemoration of the disaster victims, a plenary session on Natural Disasters and Environment, and Global Health related to the UN agenda on non-communicable diseases was held. The impact of natural disasters on environment and impact of environment on health was discussed. The symposium was inaugurated by H.E Shri Alok Prasad, Ambassador of India to Japan. The Keynote lecture was delivered by Prof. Kurokawa, former head of Japan Science Council and congratulatory messages from senior Ministers, Govt. of India were read. There were 10 plenary lectures, 9 oral presentations, over 51 poster presentations and a panel discussion to identify the scope for enhancing Indo-Japan collaborations.

3rd Symposium (Convener: Dr. Sunil Kaul, AIST **Co-convener:** Dr. Alok Singh, NIMS)

The third symposium titled “the India-Japan Symposium on Frontiers in Science & Technology: Successes & Emerging Challenges” was held on September 20-21 2012. This two-day event was organized to commemorate the 60th anniversary of the establishment of diplomatic relations between Japan and



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Welcome Message

Indian Scientists Association in Japan (ISAJ), initiated in 2008, has a firm goal to generate and promote interactions among Indian scientists, and connect them with Japanese scientists and for a successful living in Japan. ISAJ has been greatly endorsed for conducting highly interactive and multidisciplinary regular seminars and symposia in diverse disciplines of science. This new initiative of bringing out Newsletter is a step-up to provide regular update on ISAJ activities and broaden its recognition, connectivity and outcomes in Japan and overseas. I believe that the introductory science columns are extremely useful not only for interactions but also for innovation. I, on behalf of ISAJ, welcome you all to contribute and enjoy this initiative.



6th ISAJ Symposium 2015

*Link to video clips of the inaugural ceremony of ISAJ: <https://www.youtube.com/user/InSciJap>

India. The symposium was inaugurated by H.E. Ms. Deepa Gopalan Wadhwa, Ambassador of India to Japan and addressed by Dr. Takashi Onishi, President, Science Council of Japan and Dr. Yuichiro Anzai, President, Japan Society for the Promotion of Science (JSPS). Apart from 4 keynote addresses, 12 plenary lectures and 6 invited lectures, 4 oral and 31 poster presentations were made at the symposium. A panel discussion titled "Bridging the gaps in India-Japan scientific collaborations: the role of ISAJ" was also organized.

4th Symposium (Convener: Dr. Alok Singh, NIMS Co-convener: Dr. Baiju G. Nair RIKEN)

The 4th symposium titled "the India-Japan Symposium on Emerging Materials for Health, Environment, and Safety" was held on October 11, 2013. It was inaugurated by H.E. Ms. Deepa Gopalan Wadhwa, Ambassador of India to Japan and the keynote address was delivered by Kenji Oeda, Executive Director, RIKEN. A special address was presented via the web by Shri K. Vijay Raghavan Secretary, Department of Biotechnology, Government of India. In addition to this, Dr. Neelam Ramaiah, Associate Prof. the University of Tokyo delivered a special talk on "Foreign Students in Japan". There were 12 plenary lectures, 11 short oral presentations and 35 poster presentations dealing with the session themes such as Materials for Health, Materials for Environment and Materials for Energy & Safety, followed by a panel discussion titled "The Role of Indian scientists in Japan in bridging the Science & Technology between India and Japan."

5th Symposium (Convener: Dr. Sunil Kaul, AIST Co-convener: Dr. Neeraj Kumar, AIST)

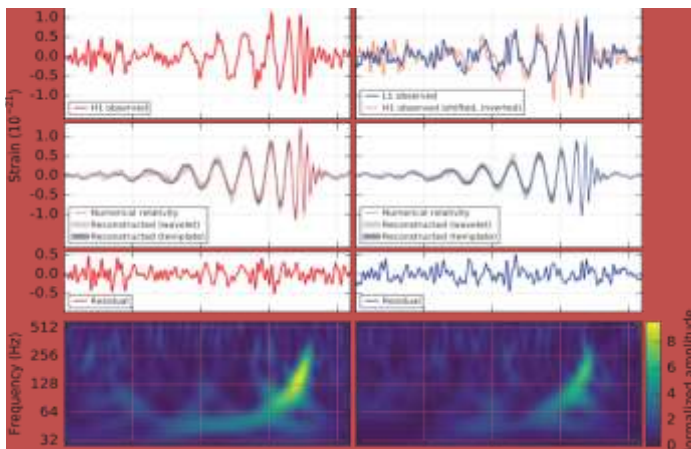
The fifth symposium titled "Advances in Natural Sciences & Technologies" was held on December 1, 2014. It was inaugurated by H.E. Ms. Deepa Gopalan Wadhwa, Ambassador of India to Japan and the keynote address was delivered by Dr. Noboru Yumoto, Vice-President & Director General, Life Science, AIST. 3 plenary lectures, 8 invited lectures, and 29 posters were presented at the symposium. Besides, to encourage the students/young researchers, Students and Young PI Sessions were organized for the first time by students and young PIs.

6th Symposium (Convener: Dr. Swadhin Behera, JAMSTEC Co-convener: Dr. Mahendra Kumar Pal, NIED)

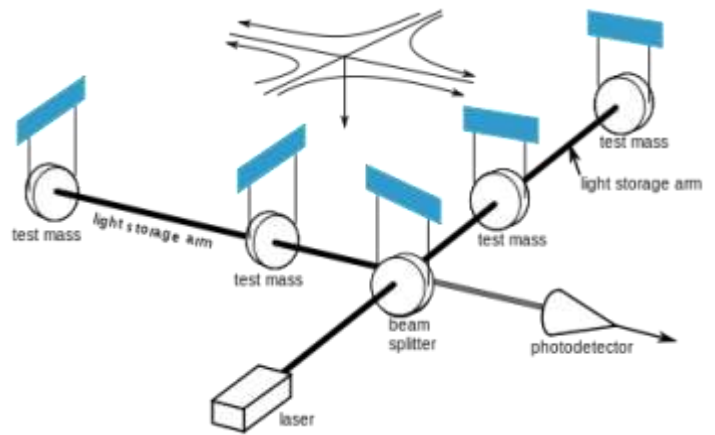
The sixth symposium titled "Recent Advances in Sciences & Technologies" was held on December 4, 2015. It was jointly inaugurated by Dr. Hamaguchi, President, JST, Dr. Iye, Executive Director, JSPS and Ms. Saiawi, First Secretary, Indian Embassy. The keynote address was delivered by Dr. Asahiko Taira, President, JAMSTEC. Apart from, 2 plenary lectures, 2 invited/guest lectures, there were 12 oral presentations and 41 posters presented by the young scholars.

ISAJ gratefully acknowledges the generous support and assistance by the Embassy of India and other patrons in organizing the important event annually.





The gravitational-wave event GW150914 observed by the LIGO Hanford (H1, left column panels) and Livingston (L1, right column panels) detectors¹, A schematic diagram of a laser interferometer.



Gravitational Waves

Mass carrying objects produce curvature in the space-time, causing an attractive force that we know as gravity. This curvature changes when these objects move around. In some specific circumstances, when these objects undergoes an accelerated motion, the changes in space-time curvature propagates in a form of waves known as “gravitational waves”. As the waves propagates, they produces compression and expansion in the space, resulting in change of distance between two objects or change in the shape of an object.

Existence of these waves were predicted by Albert Einstein in 1916 in his General Theory of Relativity. Examples of strongest source of gravitation waves are pair of neutron stars, orbiting pair of black holes, exploding supernova, pulsars etc. However, even the strongest of the gravitational waves are very weak when they reach earth and are not easily detected. First indirect confirmation of the gravitational waves came in 1974, when Russel Hulse and Joseph Taylor while studying a double neutron star system noticed an energy loss which could be explained by the energy radiated by the gravitational waves. Later in 1993, they received Nobel Prize for this discovery.

Direct observations eluded the researchers until 2015, when gravitational waves generated from a merger of two massive black holes were detected at the Laser Interferometer Gravitational-Wave Observatories (LIGO) in US. Energy equivalent to 3 solar masses were radiated in form of gravitational waves, which took nearly 1.3 billion years

to reach Earth. Each of the two LIGO observatories house an L shape detector with each arm 4 km long. Waves were detected by measuring the change in the length of these 4 km arm using laser interferometry. Synchronized detection of the same signal at two different locations (Louisiana and Washington State) ensured that the signal didn’t originate from any local noise.

In addition to the validation of the General Theory of Relativity, Gravitational waves has enormous implications for advancement in astrophysics. It opens up new spectrums for the discovery of objects, unobservable otherwise, similar to what waves such as radio waves, gamma rays etc. did to the optical spectrum. While the already existing gravitational wave detectors at LIGO US, VIRGO Italy, and GEO600 Germany, are being updated with more advanced instruments to increase their sensitivity, new detectors such as KAGRA Japan and LIGO India will join the network of detectors across the world. KAGRA, being setup in tunnels of Kamioka mine is expected to start operations in 2018. For LIGO-India, Government of India has given its preliminary approval. It will be setup by a joint collaboration between LIGO and INDIGO (Indian Initiative in Gravitational-wave Observations). With such a large network of detectors across the globe, source localization will greatly improve, revealing many wonders of the universe.

¹B. P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)

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Dr. Neeraj Kumar is an alumnus of Punjab University, Chandigarh (B.Sc.) and Tata Institute of Fundamental Research (TIFR), Mumbai (M.Sc. and Ph.D.). He did his doctoral research on “Superconductivity and Magnetism in FeAs based compounds”. Recently Dr. Neeraj was a postdoctoral researcher at AIST, Tsukuba and had worked there on the nanodevices. Currently, he is a postdoctoral researcher at Max Planck Institute of Micro-structural Physics, Germany and working on Spintronics. During his tenure in Japan, he was closely associated with ISAJ. He was the co-convenor of the 5th annual ISAJ Symposium held on December 1st, 2014

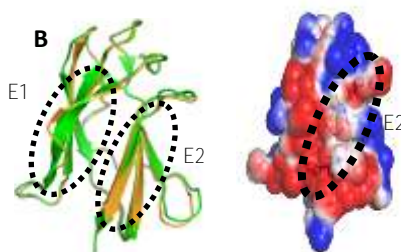
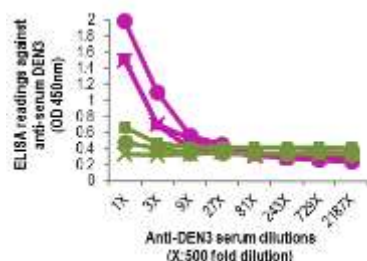
Dengue: A Major Global Health Burden

Dengue (DEN) viruses cause a wide spectrum of diseases from mild fever to the severe forms such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). Dengue causes ~100 million infections and thousands of deaths annually (Bhatt et al., 2013). Till date, there is no approved drug or vaccine available for this disease. Severity of this disease mainly increases due to cross-reaction among the four-dengue virus serotypes. Although, four serotypes (DEN1-DEN4) have 70-80% sequence similarity, little variations present in different serotypes are responsible for the sero-specific nature of individual serotype. For example, antibodies developed in body for primary infection weakly neutralize the different serotype from subsequent infection. This weakly associated antigen-antibody complex is then recognized by the cell surface receptors, which facilitate easy entry of virus in to the human body cell where it produces viral load, thereon increased severity. Envelope domain 3s (ED3) of virus envelope protein from four serotypes contain epitope residues / antibody binding sites that are distributed in two regions namely, epitope 1 (E1) and epitope 2 (E2) (Lisova et al., 2007).

In current research, I focused on two serotype's ED3s i.e., DEN3 ED3 and DEN4 ED3 and analyzed their interaction against polyclonal antibodies through mutational analysis. We mutated surface-exposed E1 and E2 residues from DEN3 ED3 on to DEN4 ED3 and vice-versa in order to study their sero-specific nature. All mutants were overexpressed in *E. coli* bacterial cells and checked for their thermo-stability using Circular Dichroism. Next, prepared polyclonal antibodies (antisera) by immunizing Swiss albino mice using highly purified dengue ED3 antigen where the antisera collected from supernatant of blood sample from mice heart. Furthermore, determined the interaction patterns of antigen-antibody by performing Enzyme Linked Immunosorbent Assay (ELISA) and structural analysis based on crystal structure as well as surface charges of antigen and antibody to

determine the sero-specificity.

Fig: A. ELISA interactions – pink: DEN3 ED3, green: DEN4 ED3



B. Crystal structure and surface charge representation of DEN ED3 – Blue: positive charge, Red: negative charge

Antisera gave highly sero-specific immune responses i.e., it gave highest interaction with the antigen against which it has been raised and very little interaction with other antigens. It is well known that not all protein domains are immunogenic and give highly sero-specific immune responses (Crill et al., 2001). This is the first study in which we found individual protein domain (ED3) of dengue gave highly sero-specific immune responses. ELISA indicated that E2 and E1 are responsible for sero-specificity in DEN3 ED3 and DEN4 ED3 serotypes. These results were further confirmed by crystallographic analysis of antigens.

Reference: Kulkarni MR, Islam MM, Numoto N, Elahi M, Mahib MR, Ito N, Kuroda Y. Structural and biophysical analysis of sero-specific immune responses using epitope grafted Dengue ED3 mutants. *Biochim Biophys Acta*. (2015), 1854 (10 Pt A): 1438-43.



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Manjiri Kulkarni has recently, completed her Ph.D. defense in Biotechnology from Tokyo University of Agriculture and Technology. She is all set to graduate on 25th March 2016. The theme of her doctoral research work is "Determination of the serospecificity of dengue envelope protein through immunization and protein X-ray crystallographic studies". She has performed a part of this research at Tokyo Medical and Dental University and Photon Factory, Tsukuba



Global distribution of dengue diseases (Red: Presence, Green: Absence)

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