

# NEWSLETTER

An Initiative of ISAJ

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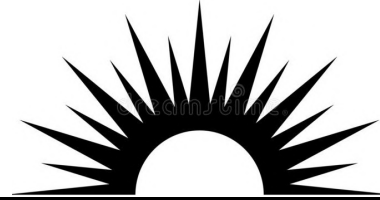
### Event Report

10th ISAJ Annual Symposium-2019

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10th ISAJ Annual Symposium-2019





Greetings and a warm welcome to the first issue of ISAJ Newsletter for 2020!

We take this opportunity to wish you a healthy life and hope that you are taking all necessary precautions amid COVID-19 pandemic.

It is our pleasure to inform you that the ISAJ newsletter has marked its 5th anniversary this year. On behalf of the ISAJ, we, the editorial team of the newsletter, would like to sincerely thank you all our readers for your support and cooperation, which has been instrumental in pursuing our goal to keep the ISAJ community informed of the ISAJ activities and to offer substantial information on the achievements of its community members. In this special issue, we present an activity report, "Journey So Far," dealing with all ten annual symposia, which the ISAJ organized so far since its formation in 2009, to provide the historical perspective. We also present our conversation with Dr. Alok Singh, Vice Chairman, ISAJ, to understand his perspective on the organization's evolution and potential for future growth.

In this issue, we present you two articles describing the study on low-temperature plasma assisted one-step synthesis and potential avenues of collaboration between Start-Up India and Society-5.0 Japan. This issue also contains a report and pictures of our 10th annual symposium held last year.

In the article on study on low-temperature plasma assisted one-step synthesis process for Graphene based nanocomposites, author has briefly described synthesis process of composite of Tin oxide nano-particles (SNp) and Graphene nano-sheets (GNs) under atmospheric pressure at room temperature. Uniformly distribution of SNp attached to both sides of GNs is further confirmed using transmission electron microscopy observations. Facile and low-cost synthesis route can be easily used to fabricate devices for gas-sensing and lithium-ion battery applications.

Under the section Idea Brewing, the author has outlined some of the challenges and possible solutions towards achieving convergence between India's flagship programs "Digital India" "Start-Up India" and Japan's "Society 5.0". With India-Japan Digital Partnership (IJDP), there is a huge scope for S&T/ICT cooperation. Action items towards unleashing the full potential of bilateral collaboration were negotiated on both legal and technology fronts. Outlined ideas were presented at Brainstorming Session about the future S&T partnership initiatives between India and Japan under Augmenting Writing Skills for Articulating Research (AWSAR) at Embassy of India, Tokyo, held on January 22nd, 2020.

ISAJ has successfully organized its 10th annual symposium on December 9th, 2019, at Osaka University Hall, Toyonaka Campus, Osaka. The symposium theme was "Interdisciplinary Science and Technology Innovations for Sustainable Society," and the event was attended by about 60 people, including 18 invited speakers and 15 poster-presenters. We present an overview of the annual symposium in the Event Report section of this issue. ISAJ also commemorated its 10th Anniversary on this occasion.

We hope you would find the current issue of our Newsletter interesting. We look forward to receiving your feedback. Any suggestions/ideas for improving the upcoming newsletters are also welcome.

Editorial Team

# Journey So Far: Annual ISAJ Symposia

Formally inaugurated in 2009, ISAJ is now over ten years old and held its 10th annual symposium on science and technology last year. On reaching this milestone, it is time to look back on those ten years. In this article, first, the important features of the symposium are explained, and then the 10-year journey is described, followed by a pictorial depiction of the timeline of the event.

## Features, evolution and milestones:

The annual symposium has been the most important annual event of ISAJ. Prominent professors and scientists from all disciplines of science and technology are invited to talk about the current state of knowledge, and young researchers present their recent work in oral as well as poster sessions. Participation is open to Indian and Japanese researchers, as well as of any other nationality working in Japan. This symposium is on par with any other scientific conference of international standards. It is treated as such by the institutions of the presenters.

Participation is invited for poster and short presentations from Indian researchers and their colleagues (of any nationality) in Japan. A keynote lecture is held in the inaugural session by a prominent speaker in a field matching the main theme of that year's symposium. Renowned experts in various fields are invited for plenary and invited talks. The poster session is the liveliest part of the symposium, showcasing the latest research by young researchers in Japan. There are awards for the best poster presentations.

Abstracts of all the presentations are published in an abstracts book distributed to all the participants (and made available for download from the ISAJ website). It makes an important document of a cross-section of the latest research in various science and technology-related fields, being carried out by Indian researchers and their colleagues in Japan.

Every year, the symposiums have had the full support of the Embassy and inaugurated by the Ambassador of India. It has been addressed by heads of prominent government agencies in Japan, such as JSPS, JST, and MEXT, as well as ministers from India.



Mr. Pruthivraj Chavan, the then S&T Minister Indian Government, lightening the lamp at 1st ISAJ Annual Symposium

## Timeline

**The 1st symposium in 2010**, “India - Japan Symposium on Emerging Technologies” was convened by Dr. Sunil Kaul, and co-convened by Dr. Kedar Mahapatra had four plenary sessions based on themes Earth science and space technology, Information and Communication Technology, Biotechnology and Agriculture, and Energy and Materials.

This symposium was inaugurated by Science and Technology and Earth Sciences Minister of India Hon. Shri. Prithviraj Chavan in the presence of H. E. Mr. Hemant Krishan Singh, the then Ambassador of India to Japan. 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 science and technology's status and prospects of collaboration between India and Japan.

**INDIA - JAPAN SYMPOSIUM ON EMERGING TECHNOLOGIES**

Organized by Indian Scientists Association in Japan (ISAJ)  
Supported by the Embassy of India, Tokyo

**ISAJ**

**DATE 7 OCTOBER 2010**  
INDIAN EMBASSY AUDITORIUM, TOKYO

*"With an aim to share state-of-the-art scientific information between Indian and Japanese professionals, to foster the growing importance of India-Japan partnership in science and technology and to build the future of Japan-India scientific and technological collaborations."*

**INFORMATION AND COMMUNICATION TECHNOLOGY**  
**BIOTECHNOLOGY AND AGRICULTURE**  
**ENERGY AND MATERIALS**  
**EARTH SCIENCES AND SPACE TECHNOLOGY**

**CALL FOR ABSTRACTS**  
Abstract submission  
**deadline July 31, 2010**  
Abstract for poster presentations should be submitted to  
**Dr. Sunil Kaul by e-mail at [s-kaul@aisj.go.jp](mailto:s-kaul@aisj.go.jp)**  
A few of the abstracts will be selected for  
5-minutes short oral presentations in addition to the poster presentations.

**Plenary speakers:**  
Pankajakshan Thadathil, Science Counselor, Embassy of India, Tokyo  
Norio Shiratori, Tohoku University  
Goutam Chakraborty, Iwate Prefectural University  
Glenn Mansfield Keeni, Cyber Solutions Inc., Sendai  
Osamu Ito, Japan International Research Center for Agricultural Sciences  
G. Subbarao, Japan International Research Center for Agricultural Sciences  
Kaneaki Tsuzaki, National Institute for Materials Science, Tsukuba  
Alok Singh, National Institute for Materials Science, Tsukuba  
Toshio Yamagata, School of Science, University of Tokyo  
Swadhin Behera, Research Institute for Global Change, JAMSTEC, Yokohama

**Convener:**  
Sunil Kaul,  
**Co-convener:**  
Kedar Mahapatra

**Organizing Committee:**  
Anirban Bandyopadhyay,  
Goutam Chakraborty,  
Michael Chandoy,  
R. Gopalan,  
Ruby Pawankar,  
Alok Singh,  
Guntur Subbarao

Please refer ISAJ webpage: <http://www.isaj.org/> for further details about the organization and updates about the symposium.

Announcement poster for the 1st ISAJ Annual Symposium

The 2nd symposium was held in 2011, "India- Japan Symposium on Global Challenges in Health and Environment" and dedicated to the 2011 Great Tohoku Earthquake and Tsunami victims. The symposium was convened by Prof. Ruby Pawankar and co-convened by Dr. Swadhin Behera. 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 U.N. agenda on non-communicable diseases was held. The impact of natural disasters on the environment and the impact of the environment on health were discussed. The symposium was inaugurated by H.E. Shri Alok Prasad, Ambassador of India to Japan. Prof. Kiyoshi Kurokawa, former head of Japan Science Council, delivered the keynote lecture, and congratulatory messages from senior Ministers, Govt. of India, were read. There were 10 plenary lectures, 9 oral presentations, over 51 poster presentations followed by a panel discussion to identify the scope for enhancing Indo-Japan collaborations.

The theme of the 3rd symposium, 2012, was chosen to be more general, "Frontiers in Science & Technology: Successes & Emerging Challenges", to accommodate all disciplines of science and technology. It was convened by Dr. Sunil Kaul and co-convened by Dr. Alok Singh. *This year marked 60 years*

*of diplomatic relations between India and Japan*, and therefore the scope of the symposium was expanded, and *the duration of the symposium was increased to two days*. The plenary sessions were on themes of (Day 1) Life sciences, Earth sciences, Accelerator related sciences, and (Day 2) Materials Science, and Space Technology. *To celebrate the 60 years of India-Japan relations, more dignitaries were invited to address the opening session*. They included Science Council of Japan President Dr. Takashi Onishi, JSPS President Dr. Yuichiro Anzai, National Institute for Materials Science President, Dr. Sukekatsu Ushioda, United Nations University Vice-Rector Dr. Govindan Parayil, the University of Electro-Communications Tokyo Prof. Yasuhiro Iwasawa, and Health and Global Policy Institute Chairman Dr. Kiyoshi Kurosawa. Apart from 4 keynote addresses, 12 plenary lectures, and 6 invited lectures, 4 oral and 31 poster presentations were made. A panel discussion, “Bridging the gaps in India-Japan scientific collaborations: the role of ISAJ”, was also organized. This initiative was supported by H.E. Ms. Deepa Gopalan Wadhwa, Ambassador and S&T counselor Dr. Chadaram Sivaji.

**The 4th symposium, 2013**, was on the theme of “Emerging Materials for Health, Environment, and Safety”, convened by Dr. Alok Singh and co-convened by Dr. Baiju G. Nair. 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 lecture was presented via the web by Shri K. Vijay Raghavan Secretary, Department of Biotechnology, Government of India. In addition to this, Dr. Neelam Ramaiah of 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 “The Role of Indian scientists in Japan in bridging the Science & Technology between India and Japan.”

**The 5th symposium, 2014**, was on the theme “Advances in Natural Sciences & Technologies” and convened by Dr. Sunil Kaul and co-convened by Dr. Neeraj Kumar. 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. There were 3 plenary lectures, 8 invited lectures, and 29 posters 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 P.I.s.

**The 6th symposium, 2015**, had a more general and all-inclusive theme “Recent Advances in Science and Technology,” convened by Dr. Swadhin Behera and Dr. Mahendra Kumar Pal. JST President Dr. Michinari Hamaguchi addressed the symposium. JAMSTEC President Dr. Asahiko Taira delivered the Keynote address. *From this symposium, the Plenary sessions were not on particular themes, but were multidisciplinary, given the multidisciplinary nature of the symposium, so that all the participants could listen to all the topics. This could also foster more inter-disciplinary collaborations*. Apart from 2 plenary lectures, 2 invited/ guest lectures, there were 12 oral presentations, and 41 posters were presented by the young scholars.

**The 7th symposium, 2016**, was themed “Science and Technology for Sustainability,” convened by Dr. Kedar Mahapatra and co-convened by Dr. PK Hashim and Dr. Mahendra Kumar Pal. *This symposium was jointly organized with the JSPS-DST Asia Academic Seminar 2016* coordinated by Prof. Atsushi Suzuki of Yokohama National University. Due to this cooperation, *under the JSPS-DST Asian Academic Seminar, 20 Indian scientists participated in the event from top institutions IITs, IISc, IACS, IISER, and NCL*. Besides the plenary talks, 14 oral presentations and 32 poster presentations were made at the symposium. The event provided a unique opportunity for the visiting senior professors and scientists (along with the accompanying graduate students) and researchers working in Japan to interact and exchange their views. As a major component of the symposium, a short oral presentation of selected posters by Indian graduate students studying in Japanese universities was

also arranged. All the posters were categorized under three categories, namely Energy and Environment, Engineering and Material Sciences and Life Sciences, and Biotechnology. As the last component of the symposium, there was a panel discussion on “What can be the next big thing to facilitate India-Japan Scientific collaboration?” This was followed by an Odissi Dance performance by the Japanese dancer Ms. Mayumi Fukushima and Group.

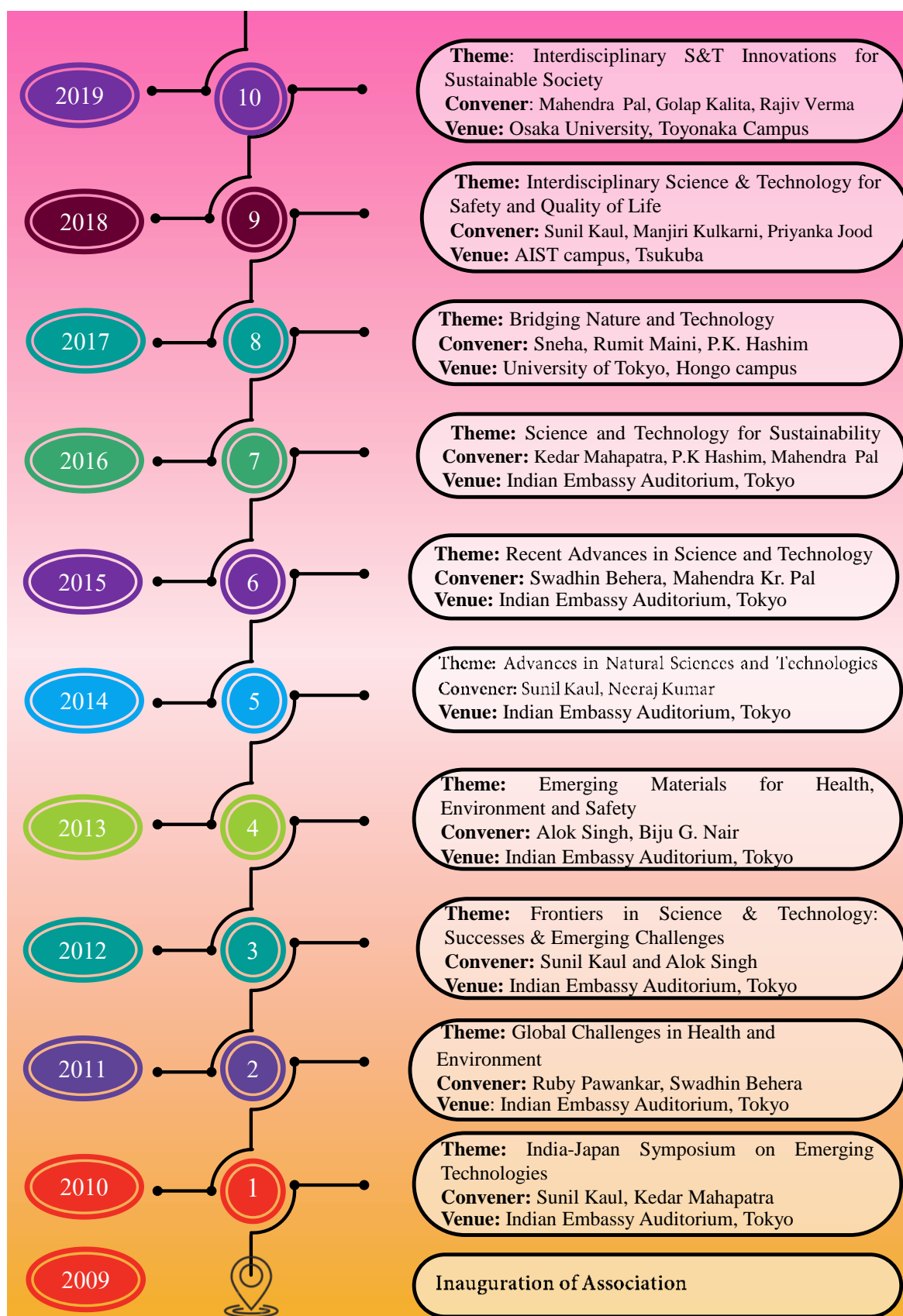
While all the seven symposiums until 2016 were held at the main auditorium of the Indian Embassy in Tokyo with the full support of the Embassy, located in Kudanshita, one of the most beautiful and important localities of Tokyo, it was felt that the venue could be moved to a university/institute campus to get more participation from younger researchers and young faculty members engaged in cutting-edge research. Therefore, for **the 8th symposium in 2017, the venue was chosen to be the University of Tokyo, Hongo campus**. The first time, all organizing team members were young, with Ms. Sneha as the convener and Drs. Rumit Maini and P.K. Hashim as co-conveners. The symposium theme was “Bridging Nature and Technology.” **All sessions were multidisciplinary**. The scientific presentations consisted of the keynote address by Prof. Toshihiko Koseki, Executive Vice President, University of Tokyo, and a special talk by Mr. Mitsuhiro Nemoto about the Sakura Science Plan on behalf of Japan Science and Technology Agency. 37 abstracts were presented from disciplines like Chemistry, Biotechnology, Civil engineering, Agriculture and environmental biology, material sciences, etc. There were 2 invited talks sessions, 1 young scientist presentation session, 1 poster presentation session, and 2 intermediate poster sessions along with the opening and closing sessions.

In 2018, **for the first time, the symposium was organized outside Tokyo in the Science City of Tsukuba** (which also happens to be the official headquarter of ISAJ), where a large number of research institutes and a national university Tsukuba University are located. Tsukuba city hosts a large community of Indian young researchers. **The 9th symposium** was themed “Interdisciplinary Science & Technology for Safety and Quality of Life,” convened by Dr. Sunil Kaul and co-convened by young scientists Drs. Manjiri Kulkarni and Priyanka Jood. A special address was delivered by Charge d’affaires of Embassy of India in Japan, Mr. Raj Kumar Srivastava, who happens to hold a Master’s degree in structural engineering from IIT Kanpur. The symposium was attended by about 100 participants from a broad range of disciplines, and it included 16 invited talks and 44 poster presentations. They included prominent scholars, young researchers, and graduate students, coming as far as from Kyoto and Sendai in Japan, and representing academia, industry, and national laboratories. They also represented several nationalities. Some of the young Indian researchers represented the laboratory of a 2018 Nobel Laureate in medicine, Prof. Tasuku Honjo (Kyoto University).

In another first, **the 10th symposium, in 2019**, titled “India - Japan Symposium on Interdisciplinary S&T Innovations for Sustainable Society,” **was held in the Kansai region in Osaka. Kansai region**, spanning three large cities Osaka, Kyoto, and Kobe, has a very large community of Indian students and researchers. Many had been coming to Tokyo to participate in the ISAJ symposium in the previous years, but many more could not. In this very first symposium in Osaka, the participation was relatively modest, due to lesser awareness among the universities. There was overwhelming support from the Embassy in Tokyo and the Consulate in Osaka. H.E. India’s Ambassador to Japan, Mr. Sanjay Kumar Verma, came down from Tokyo to attend it and extended financial support. H.E. B. Shyam, Consul General of India, Osaka-Kobe, made his kind presence.

In the future, we hope to organize the symposium in Kanto (Tokyo) region as well as in Kansai every year. However, this year we have been intervened by COVID-19 pandemic. The consequent change in the way we work and live comes as an opportunity to organize this year’s symposium on the web, which will remove physical distances.

# Timeline of the ISAJ Annual Symposium



# A Conversation with Dr. Alok Singh, Vice Chairman, ISAJ



**Designation, Affiliation:** Chief Researcher, Research Center for Structural Materials, National Institute for Materials Science (NIMS), Tsukuba, Japan

**Email:** quasi.sci@gmail.com

**Brief Bio:** Dr. Singh specializes in study of materials by transmission electron microscopy (crystal structure, crystallography, microstructure and deformation structures, interface structures). He is a well known expert of magnesium technology and light metals, complex alloys (quasicrystals), and structure-property relationship.

Dr. Singh is a painter and a mountain lover.

## Would you please tell us briefly about your long research career?

My basic education is in metallurgical engineering (now materials engineering). I went to three different premier institutes in India (IITK, IISc,..), which had different education systems. I worked at Indira Gandhi Center for Atomic Research for many years and then moved to the National Research Institute for Metals (now NIMS).

## Would you please tell us something about the formation of ISAJ?

In 2008, the then S&T counselor Dr. Pankajakshan took the initiative to form this association and invited some of us living in and around Tokyo for brainstorming sessions at his home many times. In those sessions, ISAJ was conceived, structured, and formally inaugurated by Prof. Chidambaram, Principal Scientific Adviser to Government of India on January 19, 2009, and later registered as a Non-Profit Organization (NPO) in Japan in 2010. Through deliberations in Executive Body Meetings, we had come up with our by-laws, organizational structure, and official logo/seal.

We have an Executive Body (EB), which consists of many senior 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.

Some of our founding members of EB had a shared vision and were associated with earlier on. There were tremendous contributions from all of them through all these years. In the meanwhile, some of the EB Members have moved on.

## Last year at the occasion of the 10th ISAJ annual symposium, we celebrated ISAJ's 10th Anniversary. What thoughts and emotions come to mind when you think about that?

All these years are a wonderful memory now. The various times and situations, various people we worked with while organizing the annual symposium, such as various ambassadors and other embassy staff, as well as government officials from both the countries.



I suppose we have come a long way, learning, correcting our course, and changing with the situation. Since this is a science symposium not associated with any professional society, we had to learn as we went. For the scientific content, four or five of us who were well established in our carriers, organized sessions in the beginning. We were fortunate to have excellent support from the embassy of India and all ambassadors. We still needed to have monetary support for organizing; we learned to raise sponsorships through various means. We also learned how to minimize our expenses (such as for hiring poster boards), while still keeping some attractive features such as a boxed lunch!

We made contact and were honored by many academics in Japan by their talks in the symposium. The symposiums were participated by not only Indian researchers but also their Japanese colleagues as well as those from all over the world. We all enjoyed moments together, not only through scientific presentations, but over symposium lunch and teas, and the most exciting of them all, the poster sessions.

We then took the symposium to various places where large numbers of Indian researchers work – University of Tokyo campus, Tsukuba Science City, and Osaka (Kansai region). Many of the young researchers volunteered as organizers in previous years. In one year, we held the symposium for two days (2012, the year of the 60th Anniversary of India-Japan diplomatic relations).

**What was the Vision of ISAJ at the time when the idea to establish an association was conceived? How have Executive team met them or even surpassed those visions?**

This is a very complex question. We envisaged chapters in all major centers of Japan, which would act as networks for Indian researchers and assist them in any kind of problem. There are indeed some good examples; for instance, during the Tohoku Earthquake-Tsunami-Nuclear disaster in 2011, people were stuck inside Sendai city for weeks. It included some young Indian researchers, with one newly born baby, with no water or foods. They got the word out, we coordinated with the embassy, and they rescued them (without diplomatic support it would have been impossible at that time).

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, we have organized ten annual symposia so far since 2010.

Apart from the annual symposium, the Tsukuba Chapter of ISAJ organized about fifteen interactive lectures, and there were several seminars/meetings held 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 provided with the opportunity for our young researchers to interact with them.

**What were some significant challenges ISAJ have had to overcome and how did executive team get past them?**

There were two major issues which did not make us go as conceived.

- **Financial Constraints:** We had conceived the association to be membership subscription-based. It did not work out that way. Our association did not fit into a professional society (which people feel obliged to join) or an alumni association (to which people attached emotionally). People think it's worth donating 5,000 yen for a religious festival (which will go ahead anyway) rather than 2,000 to our association. (I believe that it is our Indian mindset).

Running an NPO costs money towards the annual renewal of the registration, and in paying taxes every year, so we need money even if we do not organize anything through the financial year. For the

first several years we the executive members contributed 50,000 Yen each by becoming life members, which made us survive during a critical period. There were no new permanent members to keep the chapters running. Almost all of our members are here for a short time as students or post-docs who have to move on. It is challenging to pass on the office to the next generation every two years or so. We did hold activities such as monthly seminars in Tsukuba. But volunteers moved on, creating a vacuum.

- **Participation-related Constraints:** We also realized that our community members could not participate in our symposium just by their own motivation. They need the permission of their supervisors and institutions to present their scientific research results in a conference. Therefore, we started approaching university professors and research institute researchers directly. I think that awareness of our symposium also elevated the prestige of our community. We invited many of these supervisors to present their research at our symposium (some of them came in fact to express their own appreciation for their Indian associates as their graduate students and junior researchers).

### **What do you see as the biggest accomplishment of ISAJ since its inception in 2009?**

I think that our symposium is our biggest showcase, where our community comes together to show what research we are doing in Japan. We are all working in very diverse fields and with various educational backgrounds. That makes a significant impact on government agencies and educational communities, and that also elevates our prestige as a community. I am sure that it all works to the benefit of our society in subtle (and even direct) ways. The way each of us as an individual is perceived as an active and coherent society.

### **What is the best part of running/working for ISAJ and what excites you the most?**

I think the best part of working with ISAJ is the interaction with our community members, especially getting to know the younger people who are coming with the passion for carrying out research work in Japan, and possibly take them to a career. It is also heartening to see opportunities opening up for them. Opportunities have grown manifold when more and diverse talents are required in Japan, and it is good to see young Indians taking them up, or to think that they have learned and carried a new (work) culture when returning back to India.

### **What kind of advice(s) would you like to give to your youngsters?**

I would advise them to follow their passion and dreams and take life as it comes, because the new world offers many more opportunities for all kinds of talents, and also because future (which comes much faster now than ever) trends are now difficult to predict.

I also advise them to immerse themselves in the culture of Japan. I think that is the most rewarding opportunity. I advise them also to examine critically the work culture, the ethical values, the governance, place of religion in the society, how to conduct ourselves during a disaster, etc.

**Where do you expect ISAJ to go in the next 10 years? In what ways do you expect it to grow?**

Future needs are difficult to predict. Some 20 years ago, any foreigner coming new to Japan was in a severe culture shock for at least six months. These days anyone coming to Japan knows very well what to expect! So, a lot of things that you prepare to become irrelevant. What is essential is to keep our society together and showcase its talents to the world.

For this reason, I hope that our symposium will keep happening. This year we had planned to hold it in both places Kanto as well as Kansai. Unfortunately, this year we have been intervened by the COVID-19 pandemic; thus, we are now planning to organize this year's symposium in the form of a webinar.

Lastly, I hope that a younger generation will take things from our hands and take them to newer heights.



Dr. Singh with Nobel Laureate Prof Dan Shechtman

# Study on Low-Temperature Plasma Assisted One Step Synthesis Process for Graphene Based Nanocomposites



**Dr. Ranjit R. Borude**

Affiliation: Nagoya

University, Nagoya

Email:

borude.ranjit@gmail.com

Currently, working as a Asst. Professor at Center for Low Temperature Plasma Sciences of Nagoya University, Nagoya. Prior to this he has obtained his doctoral degree from Department of Electrical Engineering, Nagoya University in March 2019.

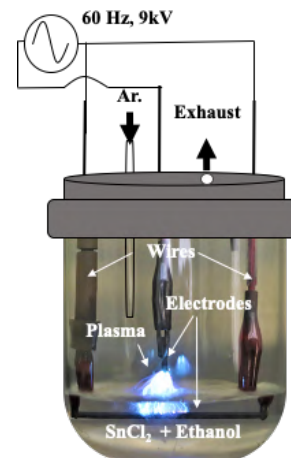
Dr. Ranjit has expertise on low-temperature plasma process and is currently exploring low-temperature pulse power plasma for fuel reformation and hydrogen generation for clean energy application. he carries motivation to contribute for sustainable development of society through clean energy creation.

For a long while, the focus of nanoscience has been gradually shifting from the synthesis of individual structures and materials. Unlike most traditional materials, which are locked into global or local thermodynamic minima, dynamic nanomaterials of the future should be displaced from equilibrium. In this quest, we focused on the non-equilibrium fields of chemical synthesis for the unique advantage of nanomaterials involving composites, which are potentially much more rapid, and also the more versatile mode of multiple components.

Tin oxide ( $\text{SnO}_2$ ) nanoparticles (SNp) are widely used as a prominent material for gas sensing and an electrode for lithium-ion batteries but has issues with the high-temperature requirement for gas sensing and pulverization, resulting in poor cycling performance in lithium-ion battery applications. The incorporation of graphene nanosheets (GNs) with  $\text{SnO}_2$  overcomes these issues because the high specific area of graphene acts as an additional accessible area for gas adsorption in gas-sensing applications and as electrolyte ions in battery applications; graphene also acts as a barrier to avoid the aggregation of  $\text{SnO}_2$ ; collectively, the SNp/GNs composite shows superior properties for gas sensing and lithium-ion battery applications.

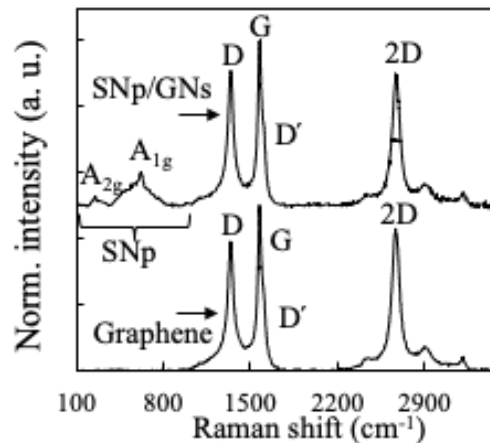
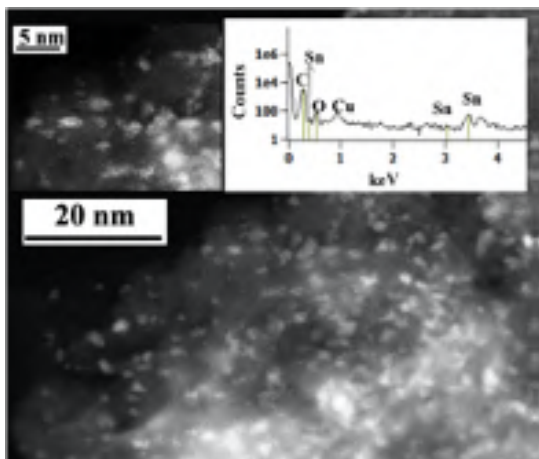
Though, SNp/GNs composite proved applicability for various ap-

plications, it issued on easy, low-cost synthesis process. In a case of SNp/GNs composite synthesis, main focus has been GNs synthesis. Traditional GNs synthesis methods (e.g. CVD, epitaxial growth) need a low pressure and high temperature to yield the high-quality GNs. Thus, require high cost and rate of GNs formation is also slow. The most common method for GNs synthesis is modified Hummer's method, it offers high yield but generates low-quality GNs. For the composite formation, multistep processing has to carry out to bind SNp to GNs which collectively increases the cost, needs multiple precursors and time.



Experimental Setup

The in-liquid plasma nanomaterial synthesis method is based on the non-equilibrium chemistry offered by the plasma-liquid interaction. This technique can be used to synthesize several nanomaterials. Recently, our research group has developed a novel synthesis method for high-quality graphene employing



Low magnification STEM, ESD analysis(inset) Raman analysis spectrum of composite and graphene

the in-liquid plasma material synthesis route at a high rate of synthesis using alcohol as the only precursor, reducing process complexity.

In order to avoid multistep processing, the use of in-liquid plasma method for graphene synthesis was extended for one-step SNp/GNs composite fabrication. by employing in-liquid plasma in a solution of tin chloride in ethanol as only precursor. The process parameters were optimized with series of experiments and by post analysis of failed experiments for successful generation of plasma, formation of SNp & GNs and uniform distribution of SNp on GNs. The experimental apparatus and choice of electrodes and alcohol precursor were based on the preceding studies related to the synthesis rate and crystallinity of GNs by the liquid-phase plasma synthesis method.

#### Key-findings:

- Composite of SNp and GNs was realized by

using single-step in-liquid plasma synthesis method under atmospheric pressure at a room temperature using single precursor.

- Transmission electron microscopy (TEM) observations clarified uniformly distributed 2 to 3 nm-sized SNp attached on the both sides of GNs.
- Chemical analysis using Fourier transformed infrared spectroscopy (FTIR) and X-ray photoelectron spectroscopy (XPS) represented that functional groups such as carboxyl and hydroxyl were starting points to form composites.

The size and distribution of nanoparticles synthesized by in-liquid plasma can be controlled by the concentration of the precursors. The developed synthesis route is facile and low-cost and can be used easily to fabricate devices for gas-sensing and lithium-ion battery applications.

# “Digital India” - “Start-Up India” and Japan’s “Society 5.0”



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Currently working as Researcher at KIOXIA Corporation, formally known as Toshiba Memory Corporation, Institute of Memory Technology R&D Center since 2017. Prior to this, he has worked at the Center of Semiconductor R&D Dept, Toshiba Corporation. He is currently working on the reliability challenges of memory storage devices. Teja has obtained his doctorate degree from Osaka University in 2020. He has obtained his master degree from JNTU College of Engineering, Pulivendula, India in 2010 and IIT, Hyderabad, India, in 2012, respectively. His research interest are mixed-signal circuit design, digital design approaches, ML strategies for NVMe storage devices.

## Introduction

Society 5.0 is a human-centered society that achieves both economic development and the solution of social issues through highly integrated system of cyber space (virtual space) and physical space (real space). It is proposed in the 5th Science and Technology Basic Plan of the Government of Japan. In order for Society 5.0 to integrate cyber space and physical space, it is necessary to further develop technologies cultivated in the information society, such as networks, sensor technologies, and AI. Its range includes not only manufacturing, but also economic growth, the formation of healthy longevity, and social transformation.

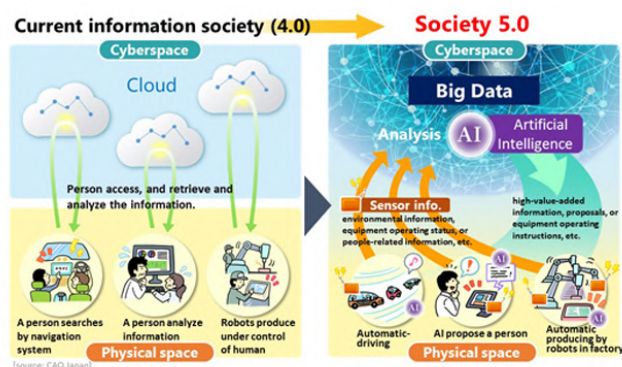
The elements of the Society 5.0 are: IoT sensors, Big Data, Artificial Intelligence (AI), Robotics (Automation). There is a huge potential from Digital India perspective to develop solutions to the above mentioned elements of the Society 5.0. With a visible synergy for enhancing cooperation, the full potential is yet to be unleashed, let’s look into some of the challenges.

## Challenges

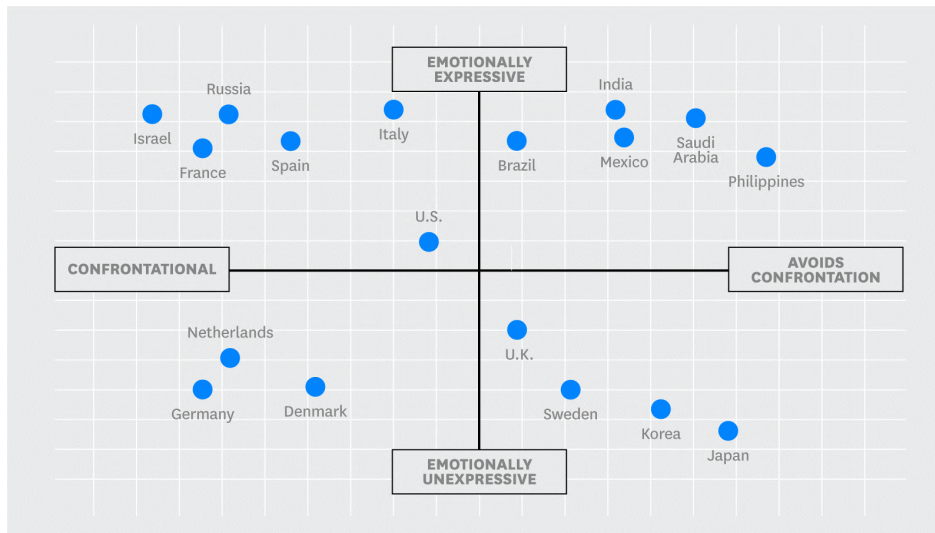
### Negotiation Front

First, let’s understand from where we located in the cultural map by Erin meyer. India locates in an emotionally expressive and avoids confrontation, whereas Japan is emotionally unexpressive and avoid confrontation. The challenge here being Indian expression and Japanese in expressiveness makes it difficult to have a successful negotiation.

**Solution** We Indians need to be upfront and confront softly about being global leader in providing Software solutions capitalizing on the huge availability of technical manpower which is one of the best solutions for Japans ageing population and Human resource challenge. With strides in economic development India is no longer an outsourcing destination or an offshore development choice, it has grown into a business solution partner to test emerging technologies and foster experimental studies in evolving IoT, AI, big data, and autonomous driving sectors.



Elements of Society 5.0



Cultural map by Erin Meyer

## Legal Front

After a successful negotiation to kick off a project to sign an NDA (Non-Disclosure Agreement). This is a big challenge which has to be addressed at policy making level. The NDA in Japan complies to control laws of U.S. Export regulations whereas Indian counterparts cannot reasonably be expected to acquire the knowledge. Any disputes, controversies of the agreement in Japan are settled according to the rules of the international chamber of commerce, where in Indian counterparts are not vested with authority to subject itself to laws of any country than India. So, to overcome this there has been an effort by Indian companies to establish the business windows in Japan (apart from successful TCS Japan) but then again joint projects at same cost, the Japanese industries prefer to go with SMEs as they have to adhere to the government policy of Big companies should have some projects assigned to the subsidiaries.

**Solution** Similarly to the Bilateral Patent Prosecution Highway (PPH) programme between India and Japan, there has to be a solution to make a special policy for the export control regulations understanding between India and Japan so that the successful negotiations will be taken up as projects. At the same time involving the Japanese entities like JICA and JETRO having them involved as an intermediate body for a non-NDA projects.

## Technology Front

The recent BUDGET also emphasizing on the manufacturing in India will hopefully bring back the Modified Special Incentive Package Scheme (M-SIPS) to attract global investments where in Japan which is still at the forefront of hardware development due to spirit of Japanese monozukuri technological prowess will make India the best destination. If the government has the plan to introduce the scheme let the Japanese companies know well in advance at least 1-2 years ahead. Let's look into each element of Society 5.0 and possible potential fields where India and Japan can get together.

## Big-Data

A tech extensive Japan society utilizes sensors in all the forms through which data is collected. One of the challenge being the clauses of NDA and with the issues of data-sharing for analytics.

**Solutions** With AWS (Amazon Web services), GCP (Google Cloud Platform), companies are able to acquire a secure cloud storage which makes it easier to share the data. Hence utilizing these platforms Indians can propose different efficient data mining, data formatting algorithms for Japanese industries.

## AI

The buzzword around the world, which has an algorithm part and processing part which attributes to the computing. AI models developed mainly in west and India are ways to make software better.

Japanese companies tend to look into AI models as a way to improve hardware.

**Solutions** Addressing software (India) and hardware (Japan) seamless integration. One segment being NLP (Natural Language Processing) where the collaboration on NLP algorithms which are relevant to 26 recognized Indian languages can also be plugged into for the Japanese language.

### **Automation (Smart Factory)**

A manufacturing centered economy in Japan is marching towards the smart factory which would make automation extensive practices to be involved into the operations management manuals.

**Solutions** With Make in India focusing on the manufacturing in India: amalgamation of Japanese Just-In-Time and 'Kaizen' principles with Indian 'Jugaad' would result in innovation.

### **Human Resource Exchanges**

Till date across the world the Indian talent keeps coming to rescue the biggest of the named industries, it is a matter of time we hear Indian names in the Japan Business space. Apart from Tier-I universities (IITs), there has to be an effort in spreading awareness about Tier-II universities for talent acquisition. Tier-II talent actually compliments with the Japanese corporate culture mindset. JICA undertaking many projects across the world has praised the FRIENDSHIP project which connotes to Future

Researchers at IITH to Enhance Network Development with Scholarship of Japan, in terms of the value added by the FRIENDSHIP scholars.

On the other side there is a big need to educate students and professionals in India about different opportunities in Japan. Have to applaud the TITP program by the government but hoping for many more to come. Some of the noticeable advantages being: working at R&D of the company allow you to write patents in early career, work experience makes your profile stand ahead in the MBA application of Ivy league schools, learn the Ho-Ren-So, PDCA cycle, and Kaizen principles at work which is unique and adventurous with a huge language barrier to break. Indian Jugaad and Japans meticulously detail oriented mindset would foster innovation which would address the issues of the world.

### **Conclusion**

There is a huge potential untapped within the India-Japan space. With collective brainstorming and knowledge sharing especially the process we can make strides to make great collaborations.

**Acknowledgement** Thanks Embassy of India Japan for the leadership and creating opportunities for young professionals for their ideas. I take this opportunity to acknowledge everyone involved in this journey for making me understand the challenges and gaps. I also would like to thank my parents, colleagues and friends for having insightful discussions and letting me challenge and initiate different ideas.





## 10th ISAJ Annual Symposium-2019

**Conveners:** Dr. Mahendra Kr. Pal, Dr. Golap Kalita,  
Dr. Rajiv Kr. Verma

The 10th annual ISAJ Symposium “Interdisciplinary Science and Technology Innovations for Sustainable Society” was held on December 9th, 2019, at Osaka University Hall, Toyonaka Campus, Osaka University Osaka. The symposium also commemorated the 10th Anniversary of the Indian Scientists Association in Japan (ISAJ). Dr. Sunil Kaul, Chairman, ISAJ, welcomed all the attendees and briefly spoke about the ten years-long journey of ISAJ commemorating our 10th Anniversary.

The symposium was inaugurated by H.E. Mr. Sanjay Kumar Verma, Ambassador of India to Japan, and H.E. B. Shyam, Consul General of India (CGI), Osaka-Kobe and delivered the inaugural address and the special address, respectively. The Ambassador stressed the importance of sustainable science and technology innovations and the current state of India-Japan collaboration in the fields of S&T. The CGI briefly outlined the ongoing funding schemes and opportunities of the government of India, targeting the Indian diaspora. The inaugural session was closed to end with a vote of thanks from Dr. Kedarnath Mahapatra, General Secretary of ISAJ.

The morning session of the symposium was dedicated to young researchers and students, which included a three-minute thesis challenge and poster-presentations. Young researchers and students studying a wide range of topics of emerging areas of science and technology, specifically of interdisciplinary nature, presented their recent breakthrough innovations aimed towards a sustainable society. To establish the main themes of the symposium and to the benefit of young researchers and students, a keynote session and plenary sessions were organized. The symposium also accommodated two

invited speakers’ sessions. Thus, there were two keynote lectures, four plenary talks, and eight invited lectures delivered by prominent research scholars about the progress in their fields of expertise, such as in natural sciences (physics, chemistry, and biology), life sciences, engineering, energy, and environment. Lively discussion after each talk and during breaks facilitated networking and exchange of ideas among participants. There were 15 poster presentations. A high-level of discussions and interaction took place during this session, in which H.E. Mr. Sanjay Kumar Verma, Ambassador of India to Japan, and H.E. B. Shyam, Consul General of India, Osaka-Kobe, interacted with students.

Organizing the 10th ISAJ annual symposium outside Tokyo was a rewarding experience, and Osaka University made an excellent choice of venue due to its location, accessibility, and academic campus, which houses several interdisciplinary academic departments. Symposium was attended by about 60 participants majoring in a broad spectrum of science and technology. Participants included prominent academicians, established research scholars, young researchers, and students representing academia, industry, and national laboratories. Participants came from various parts of Japan as far as Sendai, Ishikawa, Kyushu, and many other places.

Symposium finally concluded with a vote of thanks by Dr. Rajiv Kumar Verma and the felicitation of awardees. Dr. Kedarnath Mahapatra presented three awards to 1) Ms. Madhu Malini (Kyoto University) for the best presentation 2) Trishit Banerjee (Tohoku University) for the best poster 3) Mr. Alok Kumar (Kyoto University) and Mr. Nikesh Narang (Osaka University) for the three-minute thesis challenge.

# 10th ISAJ Annual Symposium-2019



Inauguration Ceremony



Participants of Symposium



H.E. Mr. Sanjay Kumar Verma,  
Ambassador of India to Japan



H.E. Mr. B. Shyam,  
Consul General of India, Osaka-Kobe



Prof. Hiroshi Sugiyama, Kyoto University  
Keynote Spekaers



Prof. Kazuhiko Nakatani, Osaka University

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## About ISAJ

The Indian Scientists' Association in Japan ( ISAJ) is a Japanese non-profit organization (NPO) aimed at networking and promoting Science and Technology cooperation between India and Japan.

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