

NEWSLETTER

Vol 2 Issue 2

October | 2017

From the Editor's desk

Greetings and warm welcome to the 2nd issue of ISAJ Newsletter for 2017!

The current issue consists of three articles, covering a wide range of topics and the event report on 7th Annual ISAJ Symposium held on December 15th, 2016 at Embassy of India Tokyo.

Research update section in this issue emphasizes upon the key findings of the research on “gel shifting” mechanism in histidine-rich proteins. Author has focused on the factors deterring gel-shifting and assimilating the novel physico-chemical facets of histidine-rich Hpn protein.

According to Google trend, Big-data and Internet of Things (IoT) are highly searched scientific words along with climate-change on the internet in 2016. Upon realizing the growing interest on IoT, I have written an article on the same under Research Spotlight section. In this article, I briefly outline the broader scope and challenges of this new emerging technological revolution.

7th Annual ISAJ Symposium on “Science and Technology for Sustainability” was organized in cooperation with JSPS-DST Asian Academic Seminar 2016 on December 15th, 2016 at Embassy of India Tokyo. We present here a belated event report on the symposium.

Finally, in this issue under section “From the Pen of Young Mind,” we present you an inspiring story of a young researcher, who was introduced to research as a school student by attending the India's National Science Day symposium organized by the ISAJ in 2012. She has penned her inspirational story on how she came a long way from a curious school girl in the audience to become graduate student presenting a poster on her research work at the 7th ISAJ Symposium.

We believe that you will find the content of this issue interesting and informative. We look forward to your comments and suggestions/ ideas for further improvement of the newsletter.

Announcement

We call for contribution to a “**Special issue on Climate Change**” of our newsletter. We would like to focus on mainstreaming of the climate change study and aim at offering an overview of research efforts made by our readers/community members in this regard.

We would appreciate if you could let us know if you are interested in contributing an article at your convenience, not later than November 15th, 2017.

Please, send us the theme of your article and a date of your convenience by email to isaj.newsletter@gmail.com

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News and Notes

Our upcoming event

8th Annual ISAJ Symposium

“Bridging Nature and Technology”
on

December 6th, 2017 (Wednesday)

at

Hongo Campus of the University of Tokyo
(Chemistry West Building Auditorium, Deptt. of Chemistry)

Deadline for abstract submission:

November 10th, 2017 (Friday)

For further details, please visit:
www.isaj.org

Understanding novel physico-chemical facets of histidine-rich Hpn protein

Sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE) is a universally used method for determining molecular weight (MW) of protein in biochemistry and molecular biology research. Migration of protein on SDS-PAGE that does not correlate with formula MW, termed “gel shifting” appears to be common for histidine-rich proteins but not yet studied in detail. The study of “gel shifting” anomaly is vital because of the common use of SDS-PAGE technique, and also for the reason that anomalous migration is reported not only in histidine-rich proteins but also in several membrane proteins being studied as a potential drug targets in human diseases.

We investigated the “gel shifting” mechanism in histidine-rich proteins using Hpn, a Ni²⁺-binding protein cloned from *Helicobacter pylori* strain SS1 (Shelake et al. 2017). Hpn is a 60-amino-acid, cytoplasmic, histidine-rich (46.7%), Ni²⁺-binding protein (Fig. 1A). Previous studies of Hpn showed that the Hpn binds to average five Ni²⁺ ions in a pH-dependant manner and forms multimers. Metal-binding to Hpn is a reversible process and shown “gel shifting” behavior i.e. inconsistent migration on SDS-PAGE.

Our study demonstrated two important factors determining “gel shifting” of Hpn, polyacrylamide gel percentage and metal binding. Higher polyacrylamide concentrations resulted in faster Hpn migration. Irrespective of the gel percentage, Ni²⁺-Hpn complex migrated 3-4 kDa faster than apo-Hpn, phenomenon termed “metal gel-shift” demonstrating an intimate link between Ni²⁺ binding and anomalous SDS-PAGE migration (Fig. 1B). Furthermore, matrix assisted laser desorption/ionization-time of flight- mass spectrometry (MALDI-TOF-MS) analysis of Ni²⁺-treated Hpn revealed that monomeric Hpn bound up to six Ni²⁺ ions non-cooperatively, and equilibrium between protein-metal species was reliant on Ni²⁺

availability (Fig. 2).

Protein-surfactant interactions are central to the detergent industry, and hence further research of Hpn-SDS-metal ion interactions may help to explore novel insights into the mechanism of SDS-resistance, especially kinetics of obdurate Hpn-metal complexes. Also, considering Ni²⁺-binding properties of Hpn, such a robust protein can be employed as a potential candidate for Ni²⁺ remediation. In brief, present study reveals a novel mechanism of “metal gel-shift” responsible for shifts in electrophoretic gel mobility of Ni²⁺-treated Hpn on SDS-PAGE signifying metal-induced conformational changes.



Dr. Rahul M Shelake

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Currently working as a Postdoc Researcher in biological chemistry lab affiliated to Proteo-Science Center, Ehime University, Matsuyama, Japan. His academic background is multidisciplinary with BSc in Agriculture (MAU, Parbhani, India), masters in Biotechnology (TNAU, Coimbatore, India) and PhD in Molecular Biology (Ehime University, Matsuyama, Japan). PhD project was focused on identifying the factors that enhance the bioremediation of heavy metals by engineered cyanobacterial proteins.

His postdoc project is funded by University Research Grant and the aim is to investigate metal-binding proteins and develop systems for bioremediation of toxic metal ions.

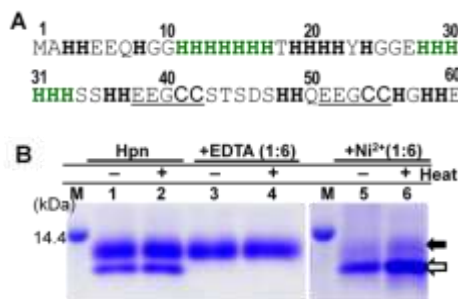


Fig. 1 A. Amino acid sequence of Hpn. B. Confirmation of “Metal gel-shift” mechanism.

References:

- Shelake RM *et al*, PLoS ONE 12(2): e0172182.doi:10.1371/journal.pone.0172182, 2017.

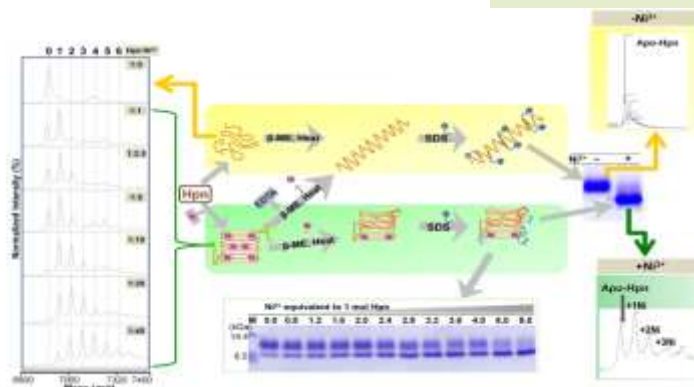


Fig. 2 Experimental evidence for the “metal gel-shift and an insight into the distribution of metal-binding sites in Hpn is provided.

The Internet of Things: A potential blockbuster vision



Dr. Mahendra Kr. Pal

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Currently working at Hyogo Earthquake Engineering Research Center (nicknamed as E-Defense) as Research Fellow. He has obtained his doctorate from the University of Tokyo. He has completed his bachelor and master degree from BIET Jhansi and IIT Hyderabad, respectively. His research interests comprise of solid computational mechanics and seismic response analysis of civil structures.

He has co-convended the annual ISAJ Symposium of previous two years. He is also the editor of this newsletter.

The time is not far off when our cars will interact with each other and avoid the collision, our mobile phone will lock down our country house remotely, and many such other scientific fantasies depicted in various sci-fi movies will become a reality. Soon, we will be living in a world of interconnected devices equipped with sensors, miniaturized power suppliers, and web addresses. This massive unfolding and growing trend in the tech sector is often referred to as the Internet of Things (IoT). In fact, the IoT devices promise to slash waste and would let us transcend time and space and give us a greater awareness of the world around.

Term “the internet of things” was coined in 1999 and has been known as pervasive computing, ubicomp, and ambient intelligence, lately. The understanding of the concept of IoT has evolved with time; in 2016, the seamless data flow within and among various networks such as LAN, WAN, and VWAN is an operational definition of IoT. The debate is still open. Moreover, most of the techies are interested and trying to explore the possibilities and challenges that IoT would create for individuals, societies, businesses; in particular, the manufacturing sectors and service sectors, and governments. With the given rapid growth of IoT, we are approaching fast to a new era, which will utilize environment as its interface.

Tech giants such as Cisco Systems and General Electric (GE) have estimated that opportunities in this tech sector will worth around \$225 billion by 2020. However, the pace of adaptation of consumers will be deciding the widening of the gap between those who buy into IoT and who do not buy, in the upcoming transformational change in the market.

The recent survey by EVS Data Corporation (EDC); published in Global Development Survey Vol 1, shows some fascinating developments. The major highlights are as

- 45% of developers say that IoT development is critical to their overall digital strategy.
- 27.4% of all developers are developing their apps in the cloud (Cloud enables IoT by providing economical database storage, along with better security and reliability) today.
- Big data analytics developers are investing most of their time in creating IoT.
- 41% emphasis on the significant importance of cognitive computing and Artificial Intelligence (AI) to their macroscopic digital strategies.

Interestingly, many governments around the world are investing in smart city innovation and development, which will achieve little unless residents also chip in and ensure their contribution in almost all areas; be it abiding traffic rules, or paying all dues within allotted time frame. Sure, this is hard, but definitely not impossible if residents are determined.

This fascinating conceptual space will introduce a sense of insecurity of assets, risk, and threats to the company and personal goals. Therefore, the new notion of privacy will be required to superintend these inevitable risks and threats. Policymakers need to understand the granularity of planning and maintain the delicate balance between openness and secrecy that will build a trust in citizens to have privacy and security. Furthermore, no one industry can utilize all potentials of this exponentially growing technical evolution and thereby it does and will encourage more and more interdisciplinary research and innovations.

Event Report



Event Theme

India-Japan Symposium on Progresses in Science and Technology for Sustainability

Date

December 15th, 2016

Venue

Main Auditorium, Embassy of India Tokyo

Organizer(s)

Indian Scientists' Association in Japan (ISAJ)
(In cooperation with JSPS-DST Asia Academic Seminar 2016)

Convener: Dr. Kedar Mahapatra ; **Co-conveners:** Dr. PK Hashim, Dr. Mahendra Kr. Pal

Summary: A highlight of the symposium was the participation of some prominent visiting Indian scientists and academics and an extended poster session with the presentations by young researchers visiting from India, and their interactions with researchers working in Japan.

The 7th annual symposium entitled “India-Japan symposium on Progress in Science and Technology for Sustainability,” was organized by Indian Scientists’ Association in Japan (ISAJ), in corporation with **JSPS-DST Asia Academic Seminar 2016** on 15th December 2016 at Main Auditorium, Embassy of India Tokyo, Japan. The symposium covered the wide spectrum of topics from science and technology with the focus on innovative interdisciplinary solutions to the sustainability challenges. Along with inaugural session, the program comprised of three plenary sessions, one oral presentation session for the postdocs and young faculty working at various Japanese universities, one short oral presentation session of the selected posters, one extended poster session exclusively for the visiting young researchers from India, one general poster presentation session, and a panel discussion.

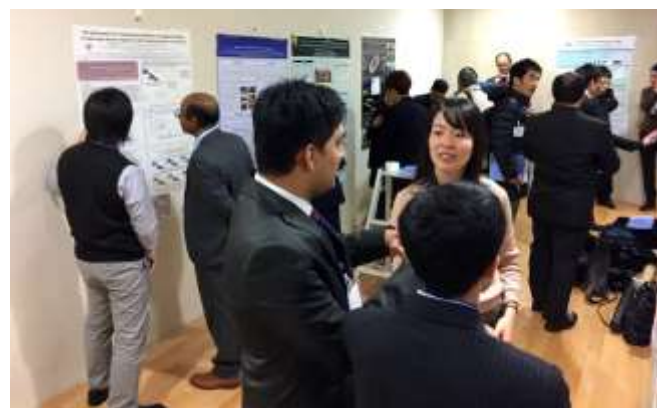
Symposium was commenced by lighting the lamp and welcome address by Dr. Sunil Kaul, Chairman ISAJ. The inaugural address was delivered by H.E. Mr. Sujan R. Chinoy, the Ambassador of India to Japan, after the opening remark by Dr. Purnima Rupal, Counsellor (S&T), Embassy of India, Tokyo. The keynote address was delivered by Dr. Yoshihisa Shirayama, Executive Director, JAMSTEC. Eight plenary talks were delivered by the distinguished scientists from Japan and the visiting Indian scientists. Under the 2016 JSPS-DST Asian Academic Seminar, twenty Indian scientists participated in the event. Besides the plenary talks, fourteen oral presentations and thirty-two poster presentations were made at the symposium. The event provided with a unique opportunity for visiting Indian researchers as well as for 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 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?” moderated by Dr. Swadhin Behera. The technical program of the symposium came to an end with the presentation of Best Poster Presentation Awards to R. Aggarwal (United Nations University, Tokyo), Wataru Tasaki, (University of Tsukuba), and Pramila Kumari, (Jichi Medical University) and the closing remarks by the conveners. A colorful cultural program was presented with the performance of Odissi, one of the classical dance forms of India by the Japanese dancer Ms. Mayumi Fukushima and Group.

ISAJ gratefully acknowledges the generous support and assistance by the Embassy of India and other patrons in organizing this symposium. ISAJ extend its sincere thanks and gratitude to EcoCycle Corporation, Air India, Incredible India and Forecast Ocean Plus (FOP) for sponsoring the event.



Poster session and interaction among researchers during 7th annual ISAJ symposium

A stepping stone towards my future endeavor

The year 2012 was very special for me. As a High School student of India International School in Japan (IISJ), I had the opportunity attending the National Science Day symposium organized by the ISAJ, to mark 60 years of the diplomatic relationship between India and Japan at Indian Embassy auditorium. There were many scientific presentations by scientists from India and Japan. I witnessed some excellent presentations and posters, where scientists were discussing on use of cutting edge technology in the field of Life Science to help humankind. Especially, talks on “Nano Science and Technology” and “Nanomaterials for Healthcare and Medical Diagnostics” intrigued my curiosity in the field of research. I then decided to pursue my higher studies in the field of Life Science. I dreamt then that one day I would be here in such an event as a participant.

After completing my schooling, I finished my undergraduate degree in Microbiology from the University of Delhi and started pursuing my master's degree in Life Sciences at the University of Tsukuba as it is the world famous for research and innovation. Tsukuba is known as the Science City and has several top research institutes. Fortunately, I have the privilege to undertake my master level research in the field of Life Sciences Innovation under the eminent guidance of Prof. Renu Wadhwa at Tsukuba University and Dr. Sunil Kaul at the National Institute of Advanced Industrial Science and Technology (AIST) in Tsukuba.

A few weeks after joining the DBT-AIST International Laboratory for Advanced Biomedicine (DAILAB) at AIST in Tsukuba, I came to know about the 7th Annual ISAJ symposium to be held at the Indian Embassy, Tokyo. I was very excited when asked to present a scientific poster in the event. On the day of the symposium, I told Dr. Sunil Kaul about the memory of attending a similar event organized by ISAJ, in the year 2012 as a school student. He was pleasantly surprised as he too was there in the symposium. I was working with Dr. Kaul for more than two months by then, but until that day we didn't realize that we had met five years ago at a similar event.

Wow, now after five years I am here at a similar event at the same place, as a participant presenting a poster. Indeed, it was a dream come true moment for me!! The feeling of participation in such a glorious event is very different from that of attending as a member of the audience. I now had better and deeper understanding of the subjects being discussed at the symposium. I found the topics like “Understanding of feeding regulation toward treatment of Diabetes and obesity” and “Ribosome-mediated site-specific incorporation of dipeptides and dipeptidomimetics into proteins” to be fascinating and informative.

I now have a big dream to contribute to humanity through my research work in the field of cancer treatment in the future.



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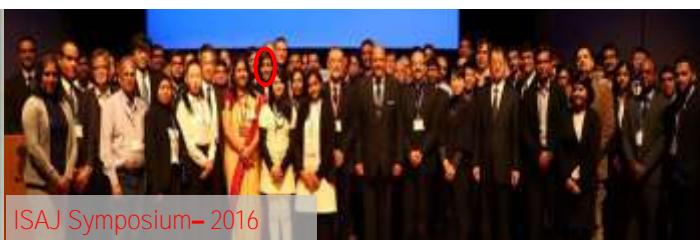
Currently, pursuing her graduate degree in Life Science Innovation at Tsukuba University under the supervision of Dr. Renu Wadawa and Dr. Sunil Kaul. She has obtained her bachelor's degree in Microbiology from Delhi University.

The theme of her graduate thesis is the molecular mechanisms of the anti-cancer properties of some plant carotenoids.

She is an active student member of ISAJ and has participated the 7th Annual ISAJ symposium.



ISAJ Symposium-2012



ISAJ Symposium-2016

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