



INTERNATIONAL SOCIETY FOR STRUCTURAL HEALTH MONITORING OF INTELLIGENT INFRASTRUCTURE

# ISHMII Membership Notes March 2013

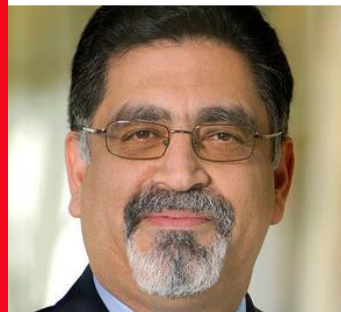
Vol. 3 Issue 3

## President's Letter

Dear Society Members and Colleagues,

This month, we are celebrating the accomplishments of one colleague and looking to the future by reviewing the research accomplishments of five graduate students.

### Vistasp Karbhari Becomes University President



The ISHMII leadership and staff extend their warmest congratulations to **Dr. Vistasp Karbhari**, a member of the ISHMII Council, on his appointment as President of the University of Texas Arlington (USA), which he assumes on June 1, 2013.

A Fellow of ASM International and the International Institute for FRP in Construction, Dr. Karbhari is the Provost and Executive Vice President for Academic Affairs at the University of Alabama in Huntsville (UAH). Dr. Karbhari earned his bachelor's and master's degrees from the University of Poona (now University of Pune), India, and his doctorate from the University of Delaware, USA. At UAH, he holds the position of professor in the departments of Mechanical and Aerospace Engineering and Civil and Environmental Engineering. Before joining UAH, Dr. Karbhari was a professor at the University of California – San Diego. An SHM expert, his research areas also include processing and mechanics of composites, deterioration science of polymers and composites, biomaterials, infrastructure renewal and multi-threat mitigation (including blast), sustainability, impact and damage mechanics and crash energy management, nondestructive assessment of materials and structures, wireless sensing, and damage prognosis.

A prolific author and researcher as well as educator and institution leader, he has authored or co-authored 200 refereed papers in scientific journals and over 260 papers published in conference proceedings. Dr. Karbhari also has 4 books, monographs, book chapters, and technical reports that he has authored, edited or co-edited or contributed to on his extensive resume. Dr. Karbhari has also received one patent and has been the principal investigator or Co-PI on over \$37M in research projects in addition to projects that contributed to the successful accomplishment of institutional objectives.

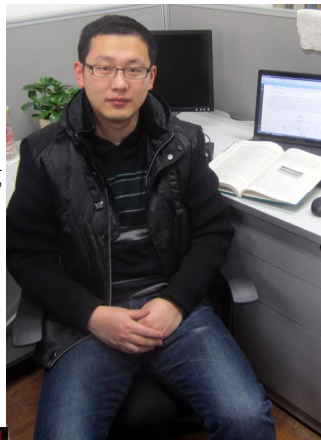
We are pleased to know that Vistasp Karbhari will be leading this well-recognized research campus as it faces the future.

### Meet the Future - Research Stories from Five Rising Scholars

The future of our profession is well-represented by the graduate students in our universities who apply a skilful mix of curiosity and knowledge to the most pressing technical and application issues related to CSHM and construction. Most are engineers, many in civil engineering. Still others are pursuing or have degrees in computer or electrical engineering, materials or even mechanical engineering. As students, they chase data in the field and work industriously in our labs to build our body of knowledge.

I am pleased to join with Professors Shi Bin, Doug Thomson, Asif Usmani, Su Taylor, and ZS Wu to introduce four Ph.D. students and one M.Sc. student around the world who are undertaking research in SHM. Each was nominated by a professor as a solid example of a young researcher whose work is impressive. We recognize the variety of experience they and their peers bring to their universities and our ISHMII community. In the future, we will profile additional students.

his Ph.D. research in distributed optical fiber engineering monitoring Bin and Wang Baojun of Geo-informatics, Nanjing part of a team receiving information the case of a major the evolution of a demonstration of optical geological disasters. He

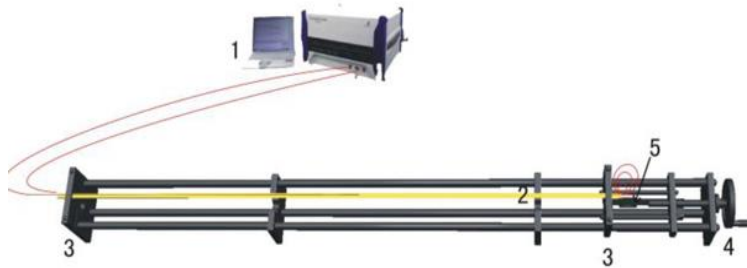


In China, **Yan Junfan** is conducting environmental geotechnical engineering, sensing technology and application and health diagnosis with Professors Shi the Department of Geo-engineering and University. Early in his career, Junfan is two patents. His research covers representation and state identification in engineering catastrophe that focuses on landslide and on the development and fiber sensing technology for monitoring is creating monitoring devices and conducting indoor model tests of the slope stability of the Three Gorges reservoir bank using distributed optical fiber sensing.



Through the Center for Engineering Monitoring with Opto-Electronic Sensing, Junfan has become well-informed on designing and characterizing the capabilities of monitoring equipment that merges the advantages of optical fiber sensing technology with BOTDA and FBG distributed optical fiber sensing technology. His recent study of the sensing performance

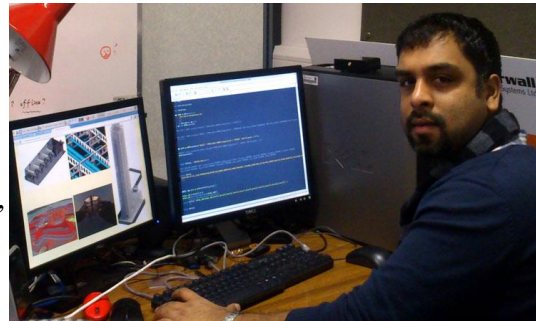
of a copper-based fiber optic sensing belt for distributed engineering monitoring produced successful results. The belt, designed and constructed by the research team, underwent a stretching calibration test and a three-points bending test on an I-beam to assess its measurement performance, with BOTDA and BOTDR used to measure the extension and bending strain.



*Stretching test for the copper-based fiber optic sensing belt showing 1.BOTDA device; 2. copper belt; 3. chucking; 4. wheel; 5. micrometer gauge*

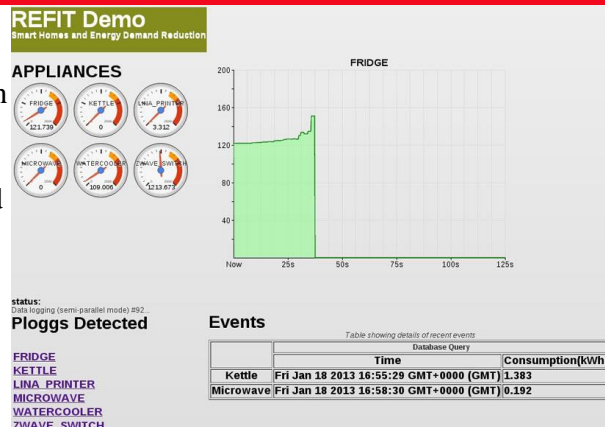
Junfan's findings demonstrated a good agreement between the measured data and the real strains. This confirmed that the copper-based fiber optic sensing belt can be used as a distributed fiber optic sensor in civil and geo-structural safety and health monitoring, and that it has a strong future with a wide number of potential applications. In addition, this test showed the belt's cost-effectiveness, a point of interest to engineers and managers.

At Scotland's University of Edinburgh, **Amar Seeam** is an unusual Ph.D. student. This is not just because he is earning his degree part-time, but because of the choice of his field – outside the world of massive civil structures. Supervised by Professors David Laurenson and Asif Usmani, Amar's extensive background emphasizes the assortment of academic and professional fields found among CSHM researchers, and holds an appointment as a Research Assistant in the



Department of Electronic and Electrical Engineering at the University of Strathclyde. A mechanical engineer with MSc degrees in Information Technology and in System Level Integration and a Royal Society of Edinburgh/Scottish Enterprise Fellow, Amar has participated as a Knowledge Transfer Partnership Associate with a modular construction company in Scotland. There, he completed a project in the integration of building management and structural health monitoring systems for modular buildings. Put together, Amar's interests naturally focus on computer networking, building information modelling, embedded sensors and systems, smart homes, energy, and structural health monitoring.

He is currently researching the use of building simulation as a dynamic control tool for reducing energy consumption when integrated with building management systems as part of his Ph.D. program, and also researching non-intrusive methods and disaggregation techniques for energy monitoring in buildings. Amar has researched the application of building information modelling as a tool that can be used for monitoring energy and structural health in terms of risk management and mitigation. Additionally, Amar is interested in developing low cost systems for monitoring and control using affordable micro-controller and embedded systems, and he has developed novel sensors for structural health monitoring using combined power and data transmission technologies. *Above: (Top) Amar Seeam applies building information modeling. (Left) Research results shown on the chart.*



In Northern Ireland, heritage together with a motivating force in the student at Queens Planning, Architecture is supervised by team's research is well-historic reference in its

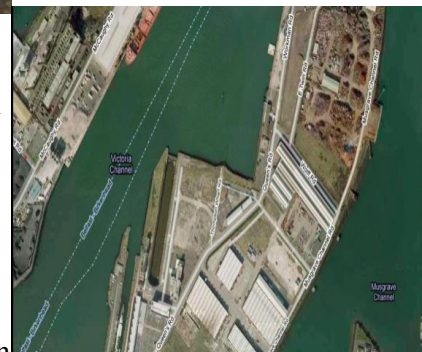
Thompson Dry Dock's closed in 2001, For the restoration, the a temporary cofferdam permanent concrete sea dewatered to allow the



the integrity of the engineering the safety of workers on site was research of **Myra Lydon**, a Ph.D. University Belfast, School of and Civil Engineering, where she Professor Su Taylor. Their recognized, in part, due to the name: Titanic Dry Dock.

1905 lock gate and dock were markedly unsafe due to corrosion. original lock gate was enclosed in to enable the construction of a defense wall and the dock was construction to proceed.

To do this, a support structure was required in the caisson chamber to transfer water pressure loads from the sheet piling to the dock walls without affecting the original lock gate structure. The real-time monitoring during the dewatering ensured the integrity of the transfer structure through the highest loading conditions. Myra calibrated and installed fiber Bragg strain sensors with temperature compensation on the support in order to monitor the change in strain. Optical sensors were used as they are corrosion resistant in a marine environment (particularly in the tidal zone), have temperature compensation at the same location and can function under water. This was significant as Myra carried out the monitoring in the 12 hour period before dewatering to record tidal data and continued monitoring during dewatering and for 12 hours





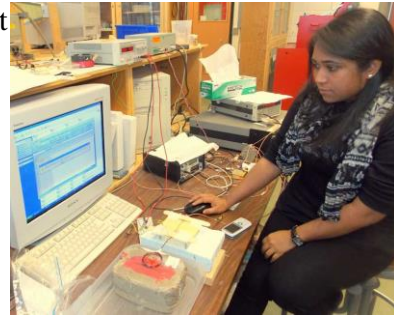
after the caisson was dried.



The results were interpreted to confirm whether it was safe to allow personnel to enter the chamber to work on the restoration of the Thompson Dry Dock. It was safe.

*Above: (Top) Myra Lydon monitors the interrogation system and data acquisition software for the corrosion resistant and temperature compensated fiber Bragg optical sensors in the tidal zone of the lock gate renovation. (Middle) General layout of the Thompson Dry Dock. (Left) The caisson after dewatering.*

In Canada, **Khalada Perveen** is an advanced M.Sc. student supervised by Professor Doug Thomson in the University of Manitoba, Department of Electrical and Computer Engineering. After earning her degree in electronics and communication engineering, Khalada served as a faculty member in the Department of Electrical and Electronic Engineering at Stamford University of Bangladesh. Her research describes the development and applications of a wireless corrosion potential sensor that is installed in a reinforced concrete structure to monitor the corrosion rate of the reinforcement



steel. Khalada recognizes the growing interest in structural health monitoring applications as corrosion is a major problem for civil infrastructure and a leading factor in infrastructure deterioration. Techniques such as half-cell potential can be used to periodically monitor corrosion, but are difficult to reliably interpret, and wired systems are expensive to install, with long-term reliability issues due to wire corrosion.



The sensor on which Khalada and the team is working is based on a coil resonator whose resonant frequency changes due to the corrosion potential applied across a parallel varactor diode. They monitor the corrosion potential externally using an inductively coupled coil. In these tests, a low cost coupled coil corrosion potential sensor is embedded in fresh and salt mixed mortar to replicate the new and built-in structure that will monitor

the corrosion behavior of reinforcement steel. Test results show that this sensor can accurately measure corrosion potentials with a resolution of less than 10 mV; it will detect corrosion at the initiation stage before observable corrosion has taken place. One of the important outcomes of this research is that the sensor is simple in design, inexpensive and passive, a desirable battery-less option for long-term corrosion monitoring that can be widely deployed for civil structure health monitoring. *Above: (Top) Khalada Perveen, a member of International Association of Engineers (IAENG). (Left) Monitoring devices with coil resonator.*

Finally, we return to China where Ph.D. candidate **Yongsheng Tang** is conducting research on the development of smart fiber-reinforced polymer (FRP) materials and structures that use distributed optical fiber sensing technology. A student in the Southeast University Department of Civil Engineering, Nanjing, Yongsheng is supervised by Professor ZS

Wu. Yongsheng proposed a new type of smart FRP material that is based on the distributed optical fiber sensing technology and a protocol for manufacturing.

The parameters of this material, including the least gage length and bond length, have been confirmed by experiments as successfully optimizing the long-gage optical sensors. The distributed optical fiber sensing core can be prepared with some package crafts. This includes braiding the fibers of material around the optical fiber to strengthen the final product, covering some tubes for making the long-gage sensor and controlling the pre-strain of the optical fiber. His research demonstrates how this can be accomplished with high precision.



Yongsheng has also investigated the strain and temperature sensing properties of the smart Basalt FRP rebar through experiments, such as linearity, repeatability, and precision, among other tests. In these experiments, he compared some key factors, such as the rebar size and fiber content, to illustrate their influence on the sensing performance of the embedded optical fiber. Meanwhile, he also investigated the elastic modulus and ultimate strength of the material. As part of his Ph.D. research Yongsheng has also developed a new damage detection method based on a macro-strain concept and verified its effectiveness experimentally. He has applied his method in a field test including applying it to the signal processing of some

bridges, including the Wayne Bridge, New Jersey, as part of the international bridge study program led by Rutgers University. *Above: Yongshen Tang, on the right, with a colleague while conducting a field test on the Wayne Bridge. (Left) Installing distributed long-gage sensors from a truck.*

For further information about these remarkable students and their research, please feel free to contact any of them, directly. [Yan Junfan](mailto:yjf880326@126.com) - yjf880326@126.com; [Amar Seeam](mailto:a.seeam@ed.ac.uk) - a.seeam@ed.ac.uk; [Myra Lydon](mailto:mlydon01@qub.ac.uk) - mlydon01@qub.ac.uk; [Khalada Perveen](mailto:khalada.perveen@cc.umanitoba.ca) - umpervvee@cc.umanitoba.ca; and [Yongsheng Tang](mailto:tys19821025@gmail.com) - tys19821025@gmail.com.

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As ISHMII members, we collaborate with colleagues in a variety of other societies and associations. Over the past few weeks, you have received notices of Calls for Papers from some, all issued by ISHMII. We are proud to partner with other organizations and encourage you and your students to submit abstracts.

ISHMII has two important meetings this year. I invite those of you whose work touches the life-span of bridges to attend CSHM-5, a workshop on the structural health monitoring and maintenance of short-& medium-span bridges, in Japan in October. Then, we gather for SHMII-6, our international Society Conference in December in Hong Kong, on December 9 to 11, 2013. I encourage you to make your plans to attend now.

The *Journal of Civil Structural Health Monitoring* welcomes your research submissions. *JCSHM* Volume 3, Issue 1 is available on-line. Members may log in through the [ISHMII.org](http://ISHMII.org) Web site to read the *Journal*. Non-members are invited to peruse the [JCSHM Index](#) and read abstracts. I hope it entices you to become an active member of ISHMII.

With warm wishes,

*Farhad Ansari*, President

[FAnsari@uic.edu](mailto:FAnsari@uic.edu)

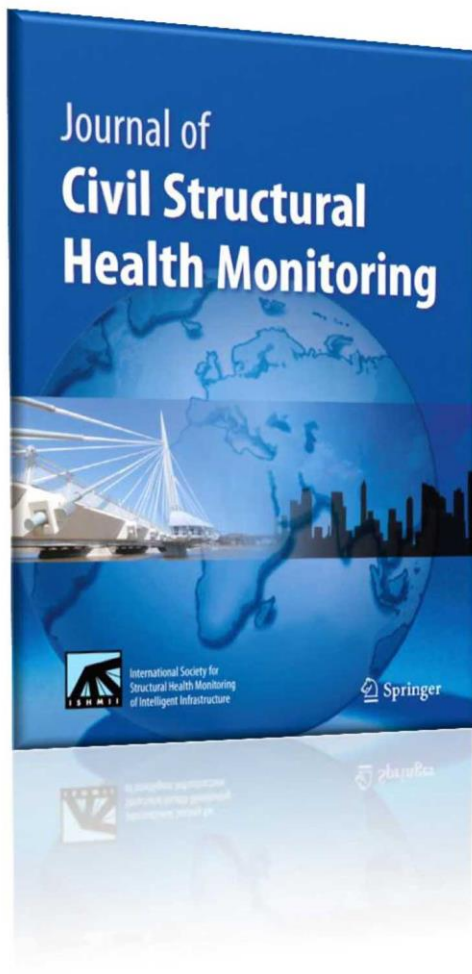
## ISHMII INTERNATIONAL CONFERENCE





# The 6th International Conference on Structural Health Monitoring of Intelligent Infrastructure (SHMII-6)

[Visit the SHMII-6 Website](#)



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*Volume 3, Issue 1, February 2013  
is available to ISHMII members who  
have logged in to their account at  
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## WORKSHOPS AND CONFERENCES

2013



**7NSC 2013**  
**Oakland, California**  
**May 20-22, 2013**

[7th National Seismic Conference on  
Bridges & Highways](#)

Additional information is also available from Jerome  
O'Connor, P.E., Conference Coordinator at  
[conf7NSC@buffalo.edu](mailto:conf7NSC@buffalo.edu).

***ISHMI is Proud to be an  
Outreach Partner of 7NSC.***



**ICSBOC - 2013**  
**[8th International Cable Supported  
Bridge Operators Conference](#)**

## THE MONITOR



**Build ISHMI by Contributing  
to  
*The Monitor***

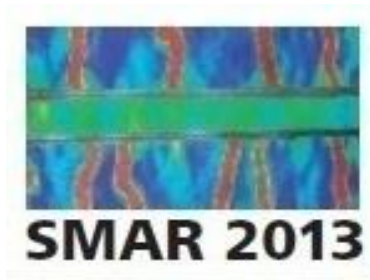
**Brief research articles suitable  
for publication in *The Monitor*,  
ISHMI's e-magazine, are now  
being solicited.**

**Please submit articles through  
[Sreenivas Alampalli, Ph.D.](#),  
Editor-in-Chief, or the members  
of the [Editorial Board](#).**

## ISHMI PARTNERS

**June 3-5, 2013  
Edinburgh, Scotland, UK**

The only event hosted by and for owners and operators of the world's major bridges.



**SMAR 2013  
Istanbul, Turkey  
September 9-11, 2013**

[2nd Conference on Smart Monitoring,  
Assessment and Rehabilitation of Civil  
Structures.](#)

**2014**



## **CALL FOR PRESENTATIONS**

**European Transportation Research  
Arena (TRA) - Symposium on  
Composite Materials in Transport  
Infrastructures, Vehicles & Vessels**

**Paris La Défense (France)  
14-17 April 2014**

The Organizers of TRA2014 invite members of ISHMII to propose presentations meeting the descriptions of topics 5 - Transport Infrastructures and 7 - Vehicles & Vessels Technologies - for the Symposium

## **FiberSensing**

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The main markets are structural health monitoring in Civil Engineering, Energy and Aerospace Industries.

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## **CONTACT ISHMII**

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Canada**

*Membership Notes and The Monitor* are delivered to members and colleagues. Your colleagues can receive both for free.

Detailed information is available  
at the Conference Web site

<http://tra2014.sciencesconf.org/>

**Deadline: March 31, 2013**

*Please submit your contributions at  
<http://tra2014.sciencesconf.org/>  
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[monssef.drissi-habti@ifsttar.fr](mailto:monssef.drissi-habti@ifsttar.fr)  
with your proposed presentation.*

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