



PRIZES HONOUR WORK ON HEALTH, POVERTY

HIGH-IMPACT VACCINATION PROGRAMMES. REACTORS TO PURIFY DRINKING WATER. A DATABASE THAT ILLUMINATES THE CAUSES OF POVERTY. THREE HIGHLY FOCUSED PROJECTS CARRIED OUT BY SCIENTISTS FROM THE DEVELOPING WORLD WON HIGH HONOURS AT THE TWAS GENERAL MEETING.

In a rapidly changing world where the rise of global economy is aggravating gaps between nations, goals such as mass vaccination, safe drinking water and poverty alleviation become a priority. Three different projects addressing these problems were selected for international recognition during the 24th TWAS General Meeting held in Buenos Aires.

Firdausi Qadri, the director of the Centre for Vaccine Sciences at the International Centre for Diarrhoeal Disease Research in Bangladesh, was awarded the C.N.R. Rao Prize for Scientific Research. The prize, named after TWAS Founding Fellow and former president C.N.R. Rao, acknowledged Qadri's highly focused determination in achieving widespread vaccination plans against a disease common in her country.



Bangladeshi scientist Mohammad Abdul Hasnat, the recipient of the Atta-ur-Rahman Prize in Chemistry, was honoured for building a special reactor able to get rid of dangerous water-dissolved chemicals. Access to clean water in South, West and Central Asia is an urgent problem, affecting almost 200 million people. By establishing this prize, world-renowned organic chemist Atta-ur-Rahman, president of the Pakistan Academy of Sciences and former TWAS vice president, meant to encourage young chemists to pursue original investigations at the interface with other disciplines.

Brazilian economist Ricardo Paes de Barros was awarded the Celso Furtado Prize, named for the late Brazilian economist and intellectual. The prize recognizes social scientists who have lived and worked in a

developing country for at least ten years. It was assigned to Paes de Barros for his efforts to illuminate and alleviate poverty and inequality in Brazil, and for his advocacy of the need to refine public policies to address these two conditions more efficiently.

QADRI: VACCINES FOR ALL

Qadri, the Rao Prize winner, has devoted more than 25 years of her career to the study of infectious diseases. Her passion and knowledge of the immunological basis of infections have led her to identify factors that affect children's response to oral vaccines, especially in developing countries.

"Nutrition and inadequate hygienic measures promote enhanced susceptibility to infectious disease", she explains. "Toxin-producing strains of *Escherichia coli*, a bacterium whose healthy cousins live in our guts, and other dangerous pathogens such as *Vibrio cholerae* represent a major burden in Bangladesh, especially for children. That's why it is urgent to devise new diagnostics and innovative therapies. But it is likewise important that we make better use of existing drugs."

By working in close collaboration with international organizations and merging disciplines such as immunology, genomics and proteomics, Qadri has collected data that prompted her to actively advocate mass vaccinations against cholera and typhoid fever.

"Every year between 100,000 and 300,000 people die of *E. coli*-associated diarrhoea, and 100,000 of cholera worldwide", she said in a recent interview.

Qadri, who sits in international councils such as the Bangladesh Academy of Science, the Infectious Disease Society of America and on the advisory panel of the World Health Organization, is the promoter and coordinator of the project 'Introduction of Cholera Vaccine in Bangladesh'. The project is funded by the Bill and Melinda Gates Foundation and advocates the introduction of a low-cost oral vaccine.

Her scientific contributions to the clarification of



Bangladeshi chemist Mohammad Abdul Hasnat (centre) accepts the Atta-ur-Rahman Prize in Chemistry at the 2013 TWAS General Meeting.

Facing page: C.N.R. Rao Prize winner Firdausi Qadri discusses her work. Far right: Bai, Qadri, Barañao and Salvarezza. (Photo: Roque Silles)

the dynamics of such enteric infections as those caused by *Vibrio cholerae*, *Helicobacter pylori* and *Salmonella typhi* are internationally acknowledged. Her past honours include the Gold Medal from the Bangladesh Academy of Sciences, in 2008, and the *Institut de France's* and Rodolphe Mérieux Foundation 'Grand Prize' in 2012.

HASNAT: PURIFYING H₂O

A chemist by training and by passion, Hasnat won the Atta-ur-Rahman Prize in Chemistry for building an innovative reactor to remove nitrates from drinking water.

In the last 200 years, human activities have unbalanced the natural nitrogen equilibrium existing between air, soil and water. Massive atmospheric release of nitrogen has caused this element to accumulate in water through precipitation. Water pollution by nitrogen compounds may cause the 'Blue Baby Syndrome' triggered by the conversion of nitrates into nitrites by an infant's digestive system.

"This chemical reaction is particularly dangerous", explains Hasnat, "because nitrites then react with blood haemoglobin turning it into methaemoglobin" with the effect that the blood is "no longer able to carry oxygen."

He has created a reactor to purify polluted water by exploiting an electrochemical reaction that makes nitrates flow towards absorbing membranes. This process, ultimately, removes the noxious substances from the water.

“The reaction is quite selective towards nitrates”, he explained, “as it leaves in place other minerals that are useful for the human body.”

Hasnat carried out his first investigations at the University of Dhaka, Bangladesh, from 1997 to 1999, and soon became an expert in chemical reactions called catalysis, where specific substances, or catalysts, are used to increase the speed of the chemical reaction.

The Atta-ur-Rahman Prize, with an award of USD5,000, is the latest in a series of scholarships and honours Hasnat has received since 1984. Along with his lab work, Hasnat is also a busy mentor. To date, he has supervised 15 PhD students, helping them to publish in peer-reviewed journals.

PAES DE BARROS: OPPONENT OF INEQUALITY

Extreme poverty and a lack of opportunities limit the lives of people in Latin America and throughout the developing world. And in some conditions, they can undermine the strength of a democratic political system.



Urged by professional curiosity, he has spent some time abroad, carrying out research at the Indian Institute of Technology in Madras (2001) before moving to Japan’s Kumamoto University (from 2006 to 2009), where he earned a PhD working on the optimization of reactions aimed at nitrate reduction. Then he spent time at Leiden University in the Netherlands before moving to Professor Norita Mohamed’s lab at *Universiti Sains Malaysia* in Penang in 2011 to investigate metal recovery from waste.

His latest interest is new sensors which he is trying to build after acquiring expertise as a visiting fellow at the University of Bath in the United Kingdom.

Ricardo Paes de Barros, the secretary of strategic actions at the Secretariat of Strategic Affairs of the Presidency of the Republic in Brasilia, Brazil, has been trying to address inequality for decades, with a special attention to the situation in his home country.

For his careful and passionate studies and for his achievements, Paes de Barros has been selected as the first-ever winner of the Celso Furtado Prize in Social Sciences. TWAS established the prize in 2012

to honour the late Brazilian economist Celso Furtado who had committed himself to help poor people in South America and to promote economic strategies to sustain and advance “peripheral economies”.

In a rapidly changing world, mass vaccination, safe drinking water and poverty alleviation are a priority.

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Ricardo Paes de Barros, left, winner of the TWAS-Celso Furtado Prize in Social Sciences, accepts his prize for work on understanding poverty, economic inequality, and public policies. Right: Paes de Barros discusses his work. (Photos: Roque Silles)

Paes de Barros has spent most of his late career pursuing goals that are in line not only with Furtado’s vision, but with TWAS’s mission as well. However, his research on economics started later in his life.

After graduating in electronic engineering in 1977 at the *Instituto Tecnológico de Aeronáutica* in São José dos Campos, Brazil, Paes de Barros in 1982 earned a master’s degree in statistics at the Institute of Pure and Applied Mathematics in Rio de Janeiro. In 1987, he obtained a PhD in economics from the University of Chicago and then spent six years at Yale University, USA, as a visiting professor, from 1990 to 1996. There, he developed his passion as an advocate of poor people and opponent of inequality.

Paes de Barros’ clear vision of Brazilian society helped him shape a new trend in his country’s public policy. He has promoted a more conscious engagement of Brazilian policymakers in social matters. In addition, he has devised a set of formulas to measure inequality of opportunities systematically, in particular among children.

Children not only suffer for circumstances that are beyond their control, such as gender, age and birthplace. They are also affected by the lack of access to education and to clean water.

We need to harness science to fight for health and against poverty.

His most famous book is *Measuring Inequality of Opportunities in Latin America and the Caribbean*, written with Francisco H. G. Ferreira, J.R. Molinas Vega and Jaime S. Chanduvi and published by the World Bank and Palgrave Macmillan in 2009. In this book, he and his co-authors examine inequality in seven Latin American countries. By unifying data across services, children and circumstances, the authors determine how equitable (or not) a society is.

Their analysis makes use of the ‘Human Opportunity Index’, a measure of the absolute level of basic opportunities in a society. The Index examines how many opportunities in terms of basic services a child has, and how equitably these opportunities are distributed. Using data representing some 200 million children and spanning roughly the last decade, Paes de Barros and colleagues built a comprehensive picture for each of the 19 largest Latin American countries.

Before this work, no one had devised systematic measures to summarize the level of inequality of opportunity observed in Latin America. Now, researchers may be able to explore with greater precision how children’s personal circumstances influence their access to services that are necessary for a productive life. ■

◆◆◆ Cristina Serra