

WHAT SCIENCE CAN AND SHOULD DO

THE GLOBAL WATER CRISIS: TAGORE AND A VISION FOR OUR PLANET



CHARLES HARD TOWNES

1964 Nobel Laureate in Physics

1999 Tagore Award Recipient

2005 Templeton Laureate

KEYNOTE SPEECH OF THE 3RD ANNUAL TOWNES AND TAGORE SEMINAR ON THE GLOBAL WATER CRISIS

Sponsored by the U. C. Berkeley Department of Public Health

University of California at Berkeley, July 21st 2012

IIBHB.ORG



The International Institute of the
Bengal and Himalayan Basins

Charles Townes desires that the Third Annual Townes and Tagore Seminar on the Global Water Crisis be dedicated to the founding father of Bangladesh, Bangabandu Sheikh Mujibur Rahman (1920 - 1975), to acknowledge his respect for this great statesman who sacrificed his life in the cause of a secular, independent democracy.

The Third Annual Townes and Tagore Seminar is lovingly dedicated to
Bangabandu Sheikh Mujibur Rahman
(1920 - 1975)



Sheikh Mujibur Rahman, seated. Current President, Zillur Rahman, in foreground second from right, and Rashbihari Ghosh, standing fourth from right, with six other members of the Awami League. Photo from *Father of the Nation*, written by his daughters, Sk. Hasina, the Prime Minister of Bangladesh, Sk. Rehana, and others. © 1997.

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Professor Charles Hard Townes was born in 1915 and invented the microwave laser, or maser, in 1953 while at Columbia University. His discovery of this technology made possible many subsequent scientific revolutions and earned him the 1964 Nobel Prize in Physics. Dr. Townes also received India's Rabindranath Tagore Award in 1999, and he became the 2005 Templeton Laureate for his writings on religion, spirituality, and ethics. In 2003, he gave the Birla and Schrödinger Lectures in India. His public service includes chairing the Human Rights Section of the New York Academy of Sciences, the Advisory Committee on the first human moon landing, and Ronald Reagan's MX missile commission, where his efforts led to an 80% reduction in the administration's eventual missile deployment. He is currently Professor Emeritus of Physics at the University of California at Berkeley. Along with Glenn Seaborg and Dr. Ghosh, he is the cofounder of the International Institute of the Bengal Basin, Or IIBHB. Charles will celebrate his 97th birthday on July 28th.



Rabindranath Tagore (1861-1941), the great Bengali poet, wrote *Gitanjali*, Sanskrit for "Offerings of Song," the collection of poems for which he was awarded the 1913 Nobel Prize in Literature, becoming the first Asian to be recognized by the Nobel Committee. As does much of Mr. Tagore's work, *Gitanjali* celebrates the beauty and value of nature and our connection with it. Like Charles Townes, who in 1999 received the Rabindranath Tagore Award, Mr. Tagore was a scholar and a religious thinker, and he is also regarded as an early environmentalist. The two men also share the study of modern science, a great concern for social equity, and a spirituality that is in harmony with the nature and ecology of our planet. Dr. Ghosh's interest in work of Mr. Tagore began at the suggestion of his former friend and advisor, Professor Linus Pauling, the recipient of the 1954 and 1962 Nobel Prizes in Chemistry and Peace.



The Stream of Life

The same stream of life that runs through my veins night and day runs through the world and dances in rhythmic measures.

It is the same life that shoots in joy through the dust of the earth in numberless blades of grass and breaks into tumultuous waves of leaves and flowers.

It is the same life that is rocked in the ocean-cradle of birth and of death, in ebb and in flow.

I feel my limbs are made glorious by the touch of this world of life. And my pride is from the life-throb of ages dancing in my blood this moment.

Rabindranath Tagore,
From *Gitanjali*, 1910



The Townes and Tagore Third Annual Seminar on the Global Water Crisis

The Poetry of Light: Charles H. Townes, Rabindranath Tagore, and the IIBHB

Now in its third year, the Townes and Tagore Seminar is at once a celebration and a call to action. Professor Charles H. Townes, the 1964 Nobel Laureate in Physics and the 1999 and 2005 recipient of the Rabindranath Tagore and Templeton awards, is urging us to seek solutions to our planet's escalating environmental problems with a special emphasis on the global water crisis. Likewise, he calls on us to put these solutions into effect. We cannot separate the water crisis from the expanding problems of pollution, climate change, and the loss of biological diversity. To the extent that these crises contribute to the collapse of our planet's ecology, the human crises of poverty, hunger, and disease will grow with them. All such crises are combining to create a public health disaster of unprecedented urgency; and our organization, the International Institute of the Bengal and Himalayan Basins (IIBHB), cofounded by Dr. Townes, is fortunate to have as its sponsor for this event the Department of Public Health of the University of California at Berkeley. As our resources become more scarce, human suffering will increase; as safe and potable water becomes less available for hydration, sanitation, and agriculture, the plight of the less fortunate members of our species will grow, as will political unrest.

Yet we are also here to celebrate. For Charles Hard Townes, who invented laser technology in 1953, the study of nature is also a celebration of its beauty, wonder, and majesty. Still, for Charles this work cannot truly be counted as a celebration unless and until we strive earnestly to bring its benefits to all people without harming the other species that contribute to health and balance of our planet's ecosystems. Today's event is, as well, an early celebration of Charles' 97th birthday on July 28th and a celebration of the 151st anniversary of the Bengali poet and scholar, Rabindranath Tagore (1861-1941), whose beliefs about and hopes for nature and its ability to sustain human happiness are similar to those of Charles. So let us acknowledge the lives and good works of these men of great compassion and great insight.

Much of Rabindranath's *Gitanjali* (Sanskrit for "Song Offerings"), the collection of poems for which he was awarded the 1913 Nobel Prize in Literature, is a celebration of the beauty and value of nature and our connection with it. The contemporary West remembers Rabindranath as a great poet, and while this assessment is not wrong, it is only part of the story. Like Charles, he was also a philosopher, a religious thinker, and a student of modern science. Amartya Sen, the 1998 Nobel Laureate in Economics, stated in his banquet speech in Stockholm, that "Rabindranath would not resent the development of modern industries in India, or the acceleration of technical progress, since he did not want India to be shackled to the turning of the 'wheel of an antiquated invention.'" Sen also tells us, "Rabindranath had a deep interest in the environment—he was particularly concerned about deforestation and initiated a 'festival of tree-planting' (*vriksha-ropana*) as early as 1928. He would want increased private and government commitments to environmentalism; but he would not derive from this position a general case against modern industry and technology."

Rabindranath was a student of modern science and, like Charles, very much concerned with social equity and a spirituality that is in harmony with the nature and ecology of our planet. He did not regard the celebration and preservation of nature as at odds with modern scientific understandings of nature and its development for the benefit of all people. Similarly, both men

have in common their belief in the ability of mutual respect to create understandings between the great civilizations of the world. For all these reasons, the IIBHB looks to Charles and Rabindranath as sources of its values and inspiration.

Finally, we should mention what these two men share in terms of their ability to shape our perceptions of the universe and to inspire us with the magnificence of their vision. In 1913, the entire world awoke to an offering of songs, a poetry that celebrated our species' place in the cosmos. Today, nearly a century later, we might consider how Charles has awakened in us the songs of our present age. Since Isaac Newton's time, our appreciation of nature's exquisitely organized diversity has been advanced by a modern physics which increasingly must look to the beauty of mathematics for its formulae. Surprisingly, perhaps, mathematics, a discipline so far removed from physical experience, allows our species, aided by its technological advances, to construct and test theories which, in turn, lead to ever more profound and revolutionary understandings of the physical universe. —Grand and more beautiful statements of nature's underlying unity. We should note here that many of the scientific revolutions that have occurred over the past half-century have done so as consequences of laser technology—and that the pure, intellectual beauty of mathematicians has blossomed more fully into our awareness of the beauty of nature itself as a result of Charles' invention. The stories these revolutions have brought us are wonderful to hear.

Accounts of first and last things and realms beyond the senses intrigue human beings as much today as they did in past millennia. Yet, to the myths of our ancestors we have added a new kind of narrative. The Odysseys of the present age, documentaries and popular science writings, fill us with wonder and admiration by putting before us the mysteries and paradoxes of quantum mechanics, black holes, and the first moments of creation. However, these stories move us as much as they do largely because the coherent light of laser technology has led human minds and imaginations to the beauty buried so deeply in the unknown. We listen to these stories, we think about our place in the cosmos, and we realize that this poetry of light has allowed the stars to sing to us more clearly and more beautifully than ever before. The expanded and renewed sense of the wonder with which we now look to the heavens might to a large extent be considered Charles Townes' *Gitanjali* and the Song Offering of modern science.

But beauty means very little without caring. Much about our planet has changed since Rabindranath's time. As a result of the application of our scientific and technological knowledge toward unsustainable development over the past century, our planet's ecology has deteriorated catastrophically. Today it is certain that Rabindranath would be at the forefront of the environmental movement. In fact, we can no longer afford to ignore him. —We may summarize the origin of the current environmental crises with his observation, "when we become merely man, not man-in-the-universe, we create bewildering problems, and ... shut off the source of their solution." Similarly, Professor Townes states that we are "supported by the cosmos and sustained by it...[but] it will primarily be humans themselves who will be determining their future and the future of their environment—not external events. To an embarrassing extent, we are in charge. And it will not be so much physical limitations, but our interests and sense of values which will be the primary determinants of our future."

2012 TOWNES AND TAGORE SEMINAR ON THE GLOBAL WATER CRISIS: KEYNOTE SPEECH

What Science Can and Should do: Rabindranath Tagore and a Vision for our Planet

Charles Hard Townes

I am very pleased to be here today, and I praise the International Institute of the Bengal and Himalayan Basins, Dr. Rashbihari Ghosh, and the IIBHB volunteers for holding this yearly seminar on a topic that is of immense importance to all of us — water¹.

In 1999 I became the recipient of India's Rabindranath Tagore Award. This honor was perhaps appropriate in that the vision and values of Tagore are in many ways similar to mine. Mr. Tagore was, of course, a poet whose significance was acknowledged by the 1913 Nobel Prize in Literature. But any acknowledgement of his genius would be incomplete if it did not include his standing as a philosopher, religious thinker, student of modern science, and environmentalist. However, to put Mr. Tagore's accomplishments into a perspective appropriate for a discussion of the environmental crises that increasingly threaten our world, we should note that his pursuits always reflected his appreciation and respect for the beauty and goodness of nature and also in his unceasing advocacy of the health, happiness, and equitable treatment of the people of India and everyone else on our planet. All of these values are crucial for the mission that is before us—that is, to find and implement solutions to the water crisis. But let us start at the beginning before there was a water crisis.

The Bhagavad Gita, the “Song of God,” begins with the waters of the Ganges. Similarly, in the Kurma Purana, the initial state of things is said to have been a limitless cosmic ocean, and its waters, like those of the Ganges, are sacred. The waters of this ocean are in fact an incarnation of Vishnu, the Sustainer, prior to the creation of our world, and as such they are the origin of all subsequent life. Thus, for Indian thought, water is a fundamental reality of life in much the same way that for modern science it is the basis of all life on earth.

A century ago in Bengal, Tagore observed the cosmos directly and felt it in the beating of his heart. Today, laser gravitational wave observatories stretch for miles across the landscape seeking to measure in the beating of pulsars the dilation and contraction of time itself. Likewise, our telescopes orbit the earth, we calibrate them with lasers, and they send back the story of the early universe. Much has changed about the way we view the cosmos. Much of what Tagore felt in his heart, we now measure with lasers. The beauty and the majesty of the universe are in no way diminished for us by the increasing difficulty and complexity of the theories we use to describe nature. Nor is our wonder abated by technologies that remove the observation of the universe ever further from our actual senses. The invention of laser technology 60 years ago broke the ground for many scientific revolutions, and we have as a consequence a much better understanding of our place in the cosmos, a renewed wonder, an expanded sense of mystery, a greater awareness of the fragility of life on earth, and a recognition that we are not doing enough to protect our environment and our water resources.

*1 Press coverage and conference photos can be found online at the following URLs:
<http://www.indiawest.com/news/5983-time-running-out-in-global-water-crisis-researchers.html>
<http://www.indiaabroad-digital.com/indiaabroad/20120810?pg=41#pg41>*

2012 TOWNES AND TAGORE SEMINAR ON THE GLOBAL WATER CRISIS: KEYNOTE SPEECH

What Science Can and Should do: Rabindranath Tagore and a Vision for our Planet

To be at home in our universe, we must do the same things that allowed Tagore to be at home in his: we must respect the blue planet that gives us life, we must fight for its environment, and we must take the necessary steps to achieve the happiness and wellbeing of other members of our species.

The Global Water Crisis

Like all other life on this planet, we consist mainly of water, and the maintenance of life requires access to adequate quantities of water free from toxins and other hazards. Yet, over the past century, what we have done to the environment has degraded the suitability of our planet for life. The manifestations of climate change and sea level rise make the preservation of our fresh water resources ever more crucial, yet we have done much less than we should or could have done in this regard. As evidenced by our rush towards fracking and tar-sands exploitation, we are exacerbating the water crisis in many ways: by expanding our carbon footprint, by wasting precious water resources on dirty energy, and through the poisoning of our drinking water. As sea levels rise, the availability of fresh water in low-lying nations such as Bangladesh, will markedly diminish; and as the available water decreases, famine and waterborne disease will increase, especially in the developing world. There is no equity, no humanity, no decency, and certainly no story worthy of song in what amounts to decisions by affluent nations to export death and disease to those who are less fortunate and more vulnerable through their contributions to climate change and the aggravation of the water crisis.

The Mission of the IIBHB

The water in the universe may be measured in trillions or even quadrillions of our oceans², But on earth there will be no refills. There is no water crisis in the universe, and there should not be one here. Over the past two centuries, unwise agricultural and industrial practices have seriously depleted our planet's aquifers, these processes are becoming more prevalent, and their damage is increasing.

If our species is to survive in the new millennium, we must support the efforts of Rash Ghosh, the IIBHB, and others to develop and implement practical, long-term, large-scale, and cost-effective solutions for the preservation of pure ground and surface waters and for the remediation of the damage that has already been done. And we must be sure to benefit all people. An equitable distribution of water will not succeed without addressing through sustainable development the special social and economic needs of the disadvantaged, including women, minorities, and the poor.

² *These figures refer to the water recently discovered around Quasar APM 08279+5255, which is estimated at approximately 140 trillion times the volume all of our oceans combined. The figures cited are conservative estimates of the water in the cosmos.*

2012 TOWNES AND TAGORE SEMINAR ON THE GLOBAL WATER CRISIS: KEYNOTE SPEECH

What Science Can and Should do: Rabindranath Tagore and a Vision for our Planet

The Big Picture

The big picture includes the entirety of creation, but it also includes the least of us. The magnificence of nature means very little if we do not respect it in ways that include a concern for the health and happiness of all members of our species and a caring for the planet that sustains us. May our revolutions in cosmology and physics lead to revolutions in ecology, in equity, and in understandings between peoples. This is what science can and should do, what technology can and should do, and what we all can and should do—and it is up to all of us to see that it happens. Our sense of the goodness and majesty of the cosmos will be greatest, when, like Tagore, we allow it to open our hearts. Only then will we find in the heavens the full extent of our own humanity. When this happens, our hope will grow larger than our fear, and our resolve will overcome everything else that stands in our way.

The Water Crisis in India

Some important aspects of the current status of the water crisis affecting 2 billion people on the Indian subcontinent include the following seven points. Doctors. Rashbihari Ghosh and Sterling Bunnell will provide further elaboration.

1. Aquifer drawdown. Groundwater depletion and surface water contamination of the subcontinent's water systems are very serious and require immediate attention.
2. China's Brahmaputra dam project is on hold for now. This massive dam will be several times larger than its Three Gorges Dam and will divert water from the hydrologies and ecologies of India and Bangladesh.
3. Pollution by agriculture, mining, industry, and sewage are worldwide problems with local variations. These problems are more extreme on the Indian subcontinent and in other parts of the developing world.
4. The privatization of water is working against social equity in Asia and throughout the world.
5. Climate change: the melting of the Himalayan glaciers is a reality and a cause of great concern.
6. Deforestation leads to the destruction of watersheds as well as the destruction of the beautiful Sundarbans forest on the Bay of Bengal, the largest Mangrove tract in the world.
7. Dealing with water crisis in this region requires the good will and cooperation of society as a whole.

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A Call to Help Dr. Ghosh and the IIBHB

I would like to mention here that the IIBHB's work was disrupted by the closure of its facility at 1700 Dwight Way by the City of Berkeley about 5 years ago, and I made all the efforts I could to help. Please see the poster³ that summarizes the events and how the city took over the property and sold it for 1/6 of its value plus the more than \$200K which had been deposited for repair. This repair fund was used to close escrow rather than for actual repairs. I appeal and encourage all of you to stand behind Dr. Ghosh to fight this injustice and support him as best you can. Dr. Ghosh is a man of honesty, integrity, courage, and vision, and his dedication and sincerity are beyond question. Despite having lost his two properties and his \$200K cash deposit, he is still here to continue his mission of over 3 decades to improve the lives of millions. He deserves our support.

Thank you, and we look forward to a productive seminar.

Afterword by Dr. Townes

I should also mention that the soundness, practicality, and science of Dr. Ghosh's approach to the remediation of toxics in surface and ground waters has been endorsed by the many highly qualified scientists, engineers, public health professionals, and medical doctors who have supported him and attended his seminars in the past. These have included the Nobel Laureates Linus Pauling, Glenn Seaborg, Arno Penzias, Martin Perl, Douglas Osheroff, and me, as well as Professor Richard Wilson of the Harvard Physics Department, who has a special interest in the arsenic toxicity of the ground and surface waters in Bengal. Additionally, Dr. Ghosh has secured the support and participation of many other highly qualified and educated scholars and professionals in other fields. Please refer to the IIBHB.org web site for further information about Dr. Ghosh, his life's work, which is the work of our institute, and about the injustices he is suffering at the hands of city officials.

CHT, 2012/08/07

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For further information about Dr. Townes' talk or the Townes and Tagore Seminar, please contact:

IIBHB	510-870-4988	director@iibhb.org
UC Berkeley School of Public Health	Michael Broder	mbroder@berkeley.edu

³ The poster mentioned by Dr. Townes was on display outside the auditorium where he delivered his keynote address. The poster contained a copy of an open letter by Dr. Townes to the citizens of California and the world for their support of Rash Ghosh's attempts to prevent the unjust seizure of his property by the City of Berkeley. The poster was published in a number of San Francisco Bay Area newspapers and is reproduced on the final page of this pamphlet.

About the International Institute of Bengal and Himalayan Basins

The International Institute of Bengal and Himalayan Basins (IIBHB) is a nonprofit organization headquartered in Berkeley, California, and registered in the United States and India. We work on environmental and ecological issues in California, the Bengal and Himalayan Basins, and in other locations around the world. The IIBHB also supports educational, health, housing and human rights in the Bengal Basin as well as in other areas where its services are needed.

The IIBHB was cofounded by Dr. Rash B. Ghosh, a Bengali-American scientist, Professor Glenn T. Seaborg, the 1951 Nobel Laureate in Chemistry and discoverer of Plutonium, and Professor Charles H. Townes, the inventor of laser technology, the 1964 Nobel Laureate in Physics, and the 1999 and 2005 recipient of the Tagore and Templeton awards. Rash earned his Ph.D. in hydrology under the direction of Professor William Kershaw at the University of Manchester in Great Britain, and during the 1980s he was introduced to the works of Rabindranath Tagore by his friend and advisor, Linus Pauling, the 1954 Nobel Laureate in Chemistry and 1962 Laureate in Peace. Rash has been the Charles H. Townes Chair Professor of Water and Environmental Chemistry since 2008.

The IIBHB has attracted a wide range of experts in many fields who are ready to assist in the search for solutions to the various water problems that exist throughout the Bengal and Himalayan Basins and the rest of the world. In addition to Linus Pauling, prominent scientists associated with the IIBHB have included Nobel Laureate in Chemistry, Glenn Seaborg, Nobel Laureates in Physics, Arno Penzias and Douglas Osheroff, and its current advisor, Charles Townes, a prominent advocate for South Asian issues. The IIBHB has local chapters in England, Bangladesh, and India.

Our mission is to operate globally using our experience in South Asia and California to create working models that address the water crises in emerging economies. The Himalayan and Bengal Basins and their vast catchment areas are home to one of our planet's most important fresh water resources. This region includes vastly different hydrologies, geologies, and ecosystems, and it spans elevations ranging from the world's highest peaks to one of the lowest lands on the planet. The extreme differences in elevation, geography, and ecology make this region exceptionally valuable for developing water management and remediation technologies for the rest of the planet.

The IIBHB offers pro bono environmental consulting services to industries, landowners, and citizens in the US, on the Indo-Bangla Subcontinent, and elsewhere. Two-hour sessions are available with additional hours for those working for the benefit of the community, including nonprofit and political organizations. Confidentiality is assured. Expert advice is available from the faculty of some of the best universities in the United States, Europe, and the Indo-Bangla Subcontinent.

Contact director@iibhb.org

510-870-4988

CREDITS

Photo of Charles Townes pp.1, 3, & 10 courtesy of Dr. Townes.
Photo of Sheikh Mujibur Rahman, p.2, from *Father of the Nation*, written by his daughters, Sheikhs Hasina and Rehana, © 1997.
Photo of Rabindranath Tagore, text of "Stream of Life," and Bengal map, p.3, Wikipedia.

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INTERNATIONAL INSTITUTE OF BENGAL AND HIMALAYAN BASINS

145 Dwinelle Hall, University of California at Berkeley

BERKELEY, CALIFORNIA

TOWNES AND TAGORE THIRD ANNUAL SEMINAR ON THE GLOBAL WATER CRISIS

July 21, 2011

1:30 – 2:00 PM

RECEPTION/MIXER

2:00-2:15 PM

MUSICAL PRESENTATION

Sushmita Ghosh

Gail Muldrow

2:15 -2:45

SEMINAR INTRODUCTION

Rosalie Say

WELCOME

“No Man is an Island,” Founder’s Introduction: Mamade Kadreebux
Welcome and Prefatory Remarks, Rash B. Ghosh, PhD, Founder, IIBHB

SPECIAL WORDS FROM FRIENDS & WELL-WISHERS OF PROFESSOR CHARLES TOWNES

2:45 – 4:00 PM

SESSION 1

The Global Water Crisis in Relation to Groundwater
Rash B. Ghosh, PhD, Founder, IIBHB

Charles Townes and the Poetry of Light: Introduction of the Keynote Speaker
John Paulin, PhD, Technical Writer and Editor, IIBHB

KEYNOTE ADDRESS

What Science Can and Should Do: The Global Water Crisis: Tagore and a Vision for our Planet
Charles H. Townes, PhD, 1964 Nobel Laureate in Physics, 1999 Rabindranath Tagore Award
Recipient, and 2005 Templeton Laureate

4:00 – 4:30 PM

BREAK

4:30 – 6:30 PM

SESSION 2

The Groundwater Crisis in the Sahel, Africa

Julia A. Walsh, M.D., M. Sc., Professor, School of Public Health, UC Berkeley

The Nile, the Aswan Dam, Water Resources, and Appeal to find the IIBHB a New Facility

Hossam Nasser, PhD

The Living Machine: Recovering Water from Sanitary Wastewater

Derek Whitworth, PhD, President, IIBHB

Introduction of Nobel Laureate Speaker

Derek Whitworth, PhD, President, IIBHB

How Science Changes our Lives

Douglas Osheroff, PhD, 1996 Nobel Laureate in Physics

Low-Cost, Sustainable Industrial Waste Water Treatment in Bangladesh

Sukomal Modak, PhD

Summary and Concluding Remarks

Sterling Bunnell, MD, Former President and Advisor, IIBHB

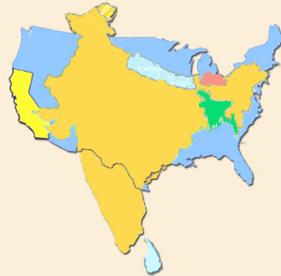
MASTER OF CEREMONIES

Rosalie Say

7:00-800 PM

DINNER WITH LAUREATES

IIBHB.ORG



The International Institute of the
Bengal and Himalayan Basins

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السلام عليكم

PEACE