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11-13-2015

Biotechnology Trailblazer: Hayat Sindi (Vol. 3 Issue 1)

Global Leadership Dialogues

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Recommended Citation

Global Leadership Dialogues, Volume 3, Issue 1: "Biotechnology Trailblazer: Hayat Sindi" 2015. Center for Governance and Sustainability, University of Massachusetts Boston.

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GLOBAL LEADERSHIP DIALOGUES
Insights and Inspiration from Change Leaders

Photo of Hayat Sindi at UMass Boston: Maria Ivanova

Biotechnology Trailblazer

HAYAT SINDI

Hayat Sindi is cofounder of Diagnostics For All, a Massachusetts nonprofit that designs low-cost diagnostic devices to improve health services in developing countries. She is also president of the i2: Institute for Imagination and Ingenuity, an organization that seeks to engage scientists, technologists, and engineers in entrepreneurship and social innovation.

Hayat Sindi was born in Mecca, Saudi Arabia. She earned a degree in pharmacology from King's College in London and became the first woman from the Arabian Gulf to earn a PhD in biotechnology, which she completed at Cambridge University.

She has combined her knowledge of biotechnology and pharmacology to aid in the invention of low-cost, portable, and efficient testing mechanisms, such as early breast-cancer detecting devices and paper strips that can be used to test for various diseases. She was also among the first 30 women ever to be appointed to the Consultative Assembly of Saudi Arabia. Sindi is a visiting scholar at Harvard University, a senior research scientist for biotechnology at Schlumberger Cambridge Research Centre, and an honorary research fellow at the School of Biological and Chemical Science at Exeter University.

Her exceptional work in the field of science, technology, and innovation has been recognized through prestigious memberships and awards. Prince Khalid Al-Faisal awarded her the Mekkah Al Mukaram prize for scientific innovation in 2010, the National Geographic Society named her an Emerging Explorer in 2011, UNESCO appointed her a Goodwill Ambassador in 2012, and the Clinton Foundation honored her with the Global Citizens Award in 2014 for her leadership in civil society. In addition, she was appointed as a member of the Scientific Advisory Board of the Secretary-General of the United Nations in 2013.

Maria Ivanova, co-director of the Center for Governance and Sustainability, sat down with Hayat Sindi in March of 2015 for an interview for this series of the Global Leadership Dialogues.

Volume 3, Issue 1

CENTER FOR GOVERNANCE AND SUSTAINABILITY
JOHN W. McCORMACK GRADUATE SCHOOL OF POLICY AND GLOBAL STUDIES
UNIVERSITY OF MASSACHUSETTS BOSTON
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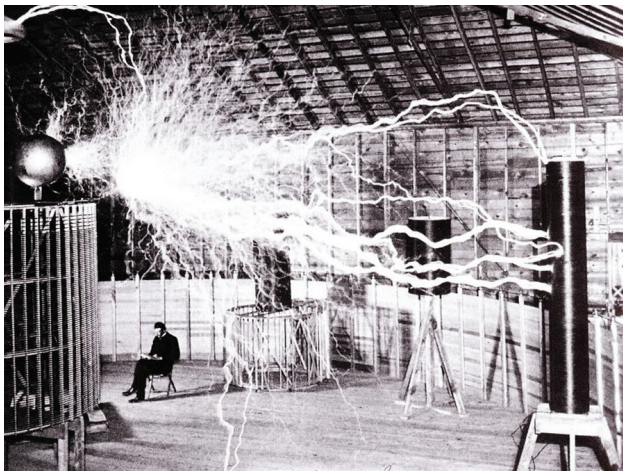
UMASS BOSTON

You are a world-renowned scientist with a degree in pharmacology from King's College London and a PhD in biotechnology from Cambridge University. When did you first realize that you wanted to become a scientist? Share with us your professional journey as a scientist and as an entrepreneur.

I was about 4 or 5 when I realized I really wanted to become a scientist. I was so impressed by the stories I read about scientists. I used to cut out their pictures. I would put them in my room and create my own stories about their lives. I really wanted to be like them one day because I had this curiosity about them and their fields of study. I used to go to my mother's dresser and put on her clothes to look like an adult and imagine I was like them. I would stand on top of her dresser and put a box over my head, pretending it was a helmet and imagining that I was in space with no gravity and no oxygen.

I believe if you want to change anything in your life, it always starts with an inspiration.



Dickenson V. Alley, photographer, Century Magazine

Inside Nikola Tesla's laboratory. His magnifying transmitter was an invention that aimed to transmit electrical energy wirelessly.

I always had this curiosity. They were my heroes. As children, I think we all make decisions that depend on the people who influence us, whether they are our teachers, favorite authors, or our parents. There is always a human touch involved. In my case, my heroes really gave me a starting point. I believe if you want to change anything in your life, it always starts with an inspiration. They inspired me and I wanted to continue learning about them. I used to ask my father "How can I be around people like them?"

Who were some of those scientists who influenced you so strongly?

When I was a child, it was a mix of Muslim-Arabic scholars and Western scholars like Al-Farabi, Marie Curie, Albert Einstein, and Isaac Newton. But then when I was growing up, my hero became Nikola Tesla. I started learning about electromagnetic and magnetic fields right here in Cambridge, Massachusetts. But I also learned about philosophers and linguists. I admire anybody who has made a difference and inspired people. But really, for me, I was inspired to know more about scientists and if I could become like them. I think that is one of the things that we are not aware of when we are teaching our children in school. When you read about these great scientists and innovators in textbooks and stories, they are put on high pedestals and students think they could never be like them. You would have to be an extraordinary person to think that you could one day be like them or even better than them, and not every student will have a great parent or person in their life to encourage them. My father always encouraged my education. When I passed every year, he would take me to the best toy shop in all of Saudi Arabia. I would always choose a toy that I could dismantle and rebuild with my own hands.

I had passed the first grade when I was 5 years old and was the best in my grade. I remember one of my neighbors brought me a beautiful, very expensive handmade doll as a gift. I was totally offended. I gave it back to her and told her to give it to a 1 year old who did not know how to read and write. My mom was embarrassed. She told my father that he needed to talk to me about my poor manners. He told her that I was right, that I had just been greeted by all these great scholars, and I simply had no use for a doll.

Tell us about your formal education as a woman growing up in Saudi Arabia and then moving to the United Kingdom.

I have always loved school and learning. I never liked having to stay home sick from school because I felt like I would miss so much. I idolized my teachers because they gave me the lead. I remember on the first day of school I wore my best dress instead of my uniform because I was celebrating. That day, the teacher asked if I could watch over the class while she stepped out to go to the principal's office. That was remarkable because we even had students in the class who were between 18 and 20 years old. There were many students because education had

not been open to girls for a long time. For the younger students, being around these older girls allowed us to mentally advance more than we might have otherwise. With that mix of ages, it felt a bit like the older girls were mother figures looking after us. It was also a challenge for the teacher since her responsibility included managing a class with such a variety of ages and making it attractive to each individual student.

So for me, it was a leadership moment when she asked me to look after the class, and I knew that she trusted me. I idolized my teachers, and I loved school for the sake of learning. I wanted everyone in the school to get high grades. I would get upset when not everyone in class would get As. I used to notice the students who struggled and I would ask them if they needed help after class and sit with them and try to help them understand the material. I knew some of them were having issues at home like divorce, which made it harder to focus in class and get the extra help they needed. I had a commitment to social responsibility from a very young age.

King's College London at night

When I was older, I asked my family to send me to England because I wanted to study pharmacology. I was inspired to study pharmacology because my father had very bad asthma, and I used to see him when he was short of breath and fighting for his life. Seeing him suffer like that made me want to be able to develop drugs that could alleviate those symptoms. Pharmacology in Saudi Arabia does not have its own individual department; it is a part of medicine or part of pharmacy. One of the best pharmacology schools in the world is at King's College in London, so I asked my parents to send me there. Eventually they agreed to let me go, and I spent four years studying about inflammation and asthma.

Of course, when I arrived in England I was in a completely different culture and civilization. I did not know English, so I was worried about things like making friends and ordering food. The weather was also completely different. It was very hard in the beginning.

What I discovered was that the more you excel in your studies, the more people will respect you and want to be your friend because that is what makes you cool. People will tend to accept you more when you are willing to offer them something, like help with studying. I had to study English, and I managed to get accepted into King's College under the condition that I would study pharmacology. I helped my professor set up the thoracic medicine department at King's College under the auspices of a Princess Anne Award, and I received a First Class Grade for my work on allergy and graduated with honors in pharmacology. I was in charge of setting up that department with my professor. Eventually, the department was created, and I spent 13 months working there. I remember we used to have an asthmatic patient at the hospital, and during that time we received a new asthmatic drug from Germany that had not been extensively tested. We ended up doing a sort of clinical trial on the patient with this drug. And inspired by that, I decided I wanted to be an inventor of tools.

From there, I applied to a PhD program in biotechnology at Cambridge University, and I was able to learn about electromagnetic and magnetic fields. That was truly a great journey. It almost feels as if you are starting from zero, but then you get to use your previous knowledge to achieve this new goal. I did not really get to use pharmacology until I had mastered

biotechnology because you can use biotechnology and pharmacology to design drugs. The same thing happened when I worked with Schlumberger Cambridge Research. I did not use my pharmacology background, but instead I used techniques to redesign bacteria, by making them evolve naturally in a lab, to aid in cleaning up oil spills in the environment. I received an honorary fellowship with Exeter University to do so. It was an amazing experience for me because I was working with medicine and health, but then suddenly I was dealing with pollution, combatting it with organic material.

You are also an inventor. Please share with our readers some of your inventions and what motivated them.

My inventions are all developmental, mainly to design low-cost diagnostic tools. For my PhD, I developed the mechanism of application of a new invention called a magnetic acoustic resonant sensor (MARS), which serves to monitor shifts in the environment. This mechanism is a plain platform without any wires and without interference with the biological layer. It is completely pure glass with the help of a magnet that generates acoustic waves. From my PhD, I invented something else called light-induced transfer emission, which uses a nanopulse laser to create up to a gigahertz of sound from light. It is a very sensitive device that can detect breast cancer in early stages. From there I went to Harvard and worked with a coinventor to develop another technology called paper diagnostics, which uses paper with a micro-fluid type of design to be able to detect liver dysfunction with a drop of blood, and it can give you results in less than a minute. Now we are writing a patent for a low-cost portable magnetic resonance imaging (MRI) machine. These are the main inventions, but of course you invent here and there. I also started the i2: Institute for Imagination and Ingenuity, where I seek to create social innovators. Our aim is to spur entrepreneurship and innovation for scientists, technologists, and engineers in the Middle East and around the world, and give rise to social innovators who benefit the world.

There is a need for scientists to be more involved with the community and to bring science and society closer together.

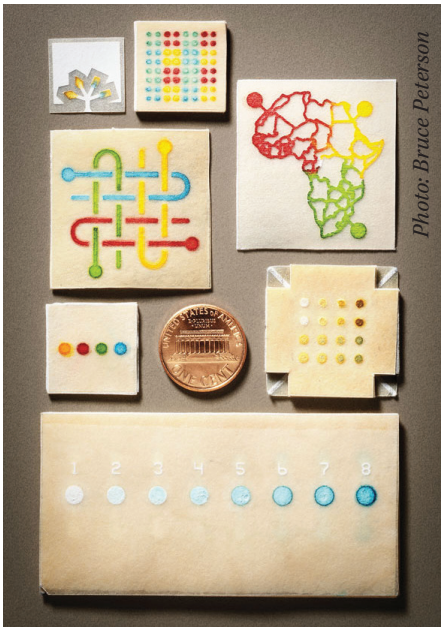


Photo: Bruce Peterson

As small as a penny, paper diagnostics is an affordable testing device, using blood or urine samples to detect various diseases in minutes.

Science was born to solve problems, but we seem to have detoured from that idea a bit. When penicillin was invented, everyone said it was magic because it saved millions of lives. We need to bring science back to that level. We still need to have scientists who research out of curiosity about how the world works (which is the core of science), but we also need to have a role in helping people and solving real-world problems. There is a need for scientists to be more involved with the community and to bring science and society closer together.

When I was talking about these issues in 2006, people thought I was crazy. Now when you go to any conference, this is the trend you see. People thought that, here in America, innovation was going down and they wondered why. It seemed that people started to talk about social innovation because there was so much famine, viruses, and the market crash. It made us think that the way we do business and carry on with our day-to-day lives was in question.

You have been quoted as saying that science is a universal language that transcends nationality, religion, and gender. Have you encountered any barriers based on your nationality, your religion, or your gender? And if so, what might our students or others aspiring to these positions learn from you?

Definitely yes, I would be lying if I said no. It is not at all something negative about any country I lived in. I lived in

Saudi Arabia, England, and America. In all three countries I struggled and did not get exactly what I wanted. And what I learned from my life, from what I have been through, is that we should not be judgmental. Because when you start to label people and give them titles, you loose the spirit of a human being. You lose what we are made for, if you believe in the creator, in nature, in Allah, or God. We were not made to be labeled and judged. The outside can completely influence your opinion.

I work with children a lot in how we can create education and innovation, and I like to work with different countries. I especially like putting together students from different countries, and have them work together. When these students work together, they become great friends. Often times in older students, you see them cluster into their own groups because they already have preconceived views about people and have been corrupted by the way we listen to the news or the media about who we are. But children, in their innocent way, will remember these friendships for the rest of their lives. They will see no gender, no religion, and no nationality. And that is also the beauty about science. When you sit in a room and people really respect who you are and what you bring, they do not care what you look like. But it does not mean we are 100 percent cured because women still need to work 10 times harder than men, and people who speak with an accent are often judged. And if you practice a certain religion, some people will already have specific ideas about who you are based on stories they have heard from the media. We need to come out of these chains that will drag us all to the bottom. We need to enlighten ourselves, and especially accept that people are different; that is what is beautiful about the world. If you judge them, do not motivate them, or break their soul, how are you then going to see their full potential?

When the king appointed women to the Shura, it was a first-time experience for everyone. The outside world had never seen women in this position, and they were surprised when it happened.

Let us zoom in now more on the policy side. You were among the first 30 women appointed by the king of Saudi Arabia to the Shura, the Consultative Assembly. Please tell us about the work you do within the Shura and what your experience has been as one of the first women to be appointed to the assembly.

Photo: Maria Ivanova

During Hayat Sindi's visit to UMass Boston, she sat down with Provost Winston Langley to learn more about the university and to discuss human security.

When the king appointed women to the Shura in 2013, it was a first-time experience for everyone. The outside world had never seen women in this position, and they were surprised when it happened. The citizens of Saudi Arabia had never known women in this position, and it was even a surprise for the king himself. No one knew how it was going to be, whether everyone would accept it, or if our male colleagues would accept us in this position. I remember when I was first appointed, some people did not support it because they thought I was born to be in the lab and that the appointment would kill my passion for science. I understood their concern, because it is not the ideal situation for a scientist. But it is very important to find people who understand, or who can translate the importance of science to decision makers. That is what I do in the Shura. My approach regarding the Ministry of Transport, Health, and Education is always the same. I always analyze in a scientific way first, and then I search for solutions and for a vision to the future. Most countries are looking for ways to create visionary approaches to solve issues. This has been my experience working with Middle Eastern countries. I am so lucky to have a degree in science because science gives you another microscope to see the future.

That is an interesting way to see things, "microscope to the future," because usually the metaphor is using "binoculars" to see the future.

Hayat Sindi was among the first 30 women to be appointed to the Consultative Assembly in Saudi Arabia, shown here.

That is because not everybody can see things that way. Not many people can look at things through a microscope, and not many people can be engaged with you in the process. So if you are a visionary, you need to really attract people to look in the microscope with you, to be excited, and to see something only you and I can see, because you have been trained to pay close attention to detail, and you are born to be a visionary. It is just the way you are. In the Shura, the way I look at any report about any ministry is to first look at it from a scientific point of view, then from an analytical point of view, then link society and science together, and, finally, I give a solution. All of us in the Shura have the heart, mind, and passion to make society a better one.

It has been a great experience because I have learned so much about how governments really run. When you do not work in the government, you are passionate, emotional, and want things to happen. But when you face reality, you realize there are three things that you cannot change. First thing you learn is that the government is set up in a certain way, and you cannot change that. The second thing you learn is that you need to be straightforward with your solutions. Given your education and expertise, you need to explain what needs to change and give them straightforward solutions on how to solve the problem. Finally, the most important thing you learn is that, even when you tell people that what they are doing is wrong, they are still reluctant to change because they are comfortable and cannot see the future. You need to be persistent, patient, and evolve with them. That should be the way forward because when you are dealing with society, there are a lot of emotions and traditions to keep in mind. People get resistant quickly because they are content with who they are. That gives me the whole picture of how to lead change and how to really focus my energy on specific goals, rather than going around trying to fix everything. You need focus in order to understand which direction will take you to the end of the tunnel, and follow that path.

What are the particular issues you are pushing forward in the Shura?

I am always in favor of development in youth, innovation, women's issues, and in ecosystem sustainability. People tend to think that sustainability only has to do with science, and that is not true. Ecosystem sustainability can apply to different sectors.

What we do in the Shura is we receive all the reports from all of the ministries. Whenever we have any questions or disagree with the report, we have a dialogue with the minister or other political figures and we come up with a legislative project. It is up to them to make a decision.

Does the Shura work in committees?

Yes. I was on the committee for higher education, but now I am on a committee for energy and economy.

You also serve on the UN Scientific Advisory Board to the UN Secretary-General, which is a science-policy interface institution at the global level. What, in your opinion, is the value added of the board, and how can it advance science and decision making for sustainable development?

Our lives are touched by science and technology every day.

Hayat Sindi spoke at the PopTech conference in 2011 in Camden, Maine, as she launched the i2: Institute for Imagination and Ingenuity.

At first, when I had heard that there was such a board, I thought, "Wow, they are finally taking science seriously!" That shows how much they need scientists and how they realize science is going to contribute to solving problems.

Our lives are touched by science and technology every day. When we had the second Scientific Advisory Board meeting in Paris, and we defined science as social innovation, I was so happy because I had been calling it that for 10 years. The board is full of very impressive scholars. Sometimes I look around and do not know how I compare to them. Everyone has different disciplines and unique styles. This is the way forward because it will touch many aspects in our lives. From poverty to climate change, women's issues, education, energy, water, children, and the developing world—we see that everything is influenced by science and technology; it is embedded in our way of life.

Related to that, what do you see as the major barriers to these types of developments? And what is the role of universities in bridging these gaps?

Decision makers must empower and educate people. Universities can assist with that understanding by showing students how technology works from the start. You can have students open a mobile phone and show them how the different parts work together to create a mobile phone. By making science more realistic, students will not simply look at their phones and think "I buy this from Apple"; instead they will understand the design and function of that device. Knowledge is power. From the start, we need to unpack science and make people understand it for themselves. We need to make sure it does not seem so out of reach.

We do not inspire our students enough to believe they can be great scientists one day. We do not train them to question the old models. We have to also encourage students to question science, because not everything you see is definite.

This is what we do in social science. We ask questions about what is happening, but that is never enough. We always ask why it is happening, and now, the way social science is developing, especially in the field of global governance studies, we are asking what should be done about it. We ask what is, what ought to be, and how do we get there. You are one of those inspirational people who have transcended this in multiple ways.

The inaugural meeting of the UN Secretary-General's Scientific Advisory Board took place in Berlin, Germany, from January 30–31, 2014.

I hope to influence more people to be embedded in this type of philosophy across every discipline.

On that note, our final question is, what advice do you have for young people who are now launching their careers in the natural sciences, social sciences, and innovation?

I want to be completely honest with them. It is not a rosy road, but that is why you must learn to enjoy the unknown. You will come across so many people and so many obstacles that try to distract you and demotivate you. I want the inspiration to capture students' hearts and minds. It does not matter what route you take; do not be discouraged. Not everything is so straightforward. If it were straightforward, then no one would have such great influence in the world. You will take a different route, but you will not feel it or realize it most of the time. Be prepared for things to take longer than you anticipate and for you to take a different career or path. Enjoy the unknown because those elements can make your life amazing.

About the University

With a growing reputation for innovative research addressing complex urban issues, the University of Massachusetts Boston, metropolitan Boston's only public university, offers its diverse student population both an intimate learning environment and the rich experience of a great American city. UMass Boston's 11 colleges and graduate schools serve nearly 17,000 students while engaging local, national, and international constituents through academic programs, research centers, and public service activities.

Part of the five-campus University of Massachusetts system, UMass Boston is located on a peninsula in Boston Harbor, near the John F. Kennedy Library and Museum, the Massachusetts State Archives and Museum, and the Edward M. Kennedy Institute for the United States Senate. To learn more about UMass Boston, visit www.umb.edu.

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Based on in-person interchanges, the stories told in the Global Leadership Dialogues Series offer insights into the professional work and personal experiences of notable professionals in the global governance field. The series provides in-depth perspectives on what these leaders think about key issues in global governance, what inspires them, and how they imagine the future.

Citation Information

Please use the following citation for this brief:
Global Leadership Dialogues, Volume 3, Issue 1: "Biotechnology Trailblazer: Hayat Sindi" 2015. Center for Governance and Sustainability, University of Massachusetts Boston.

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16.285SK