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"THE LARGE PROPORTION OF PHYSICS STUDENTS ARE WOMEN," WONDERS AMERICAN NOBLE PRIZE WINNER.

October 19, 2014 in Exclusive Interviews, Special Dialogs by AVA Diplomatic [Leave a comment](#)

The winner of the Noble Prize of physics in 2003, Sir Anthony James Leggett is a prominent, globally known professor of physics. Dr. Leggett's researches in the areas of low-temperature physics and superconductivity have brought about substantial developments. In January, 2014, along with two other American eminent professors, Dr. Leggett participated in the National Conference on Superconductivity Developments held in Sharif University of Technology, Tehran, Iran. Currently, Dr. Leggett is a professor of physics at the University of Illinois, and to learn more of his achievements and reason to visit Iran, his most important works and the possibility of knowledge transfer between the universities of Iran and the U.S., we held an interview with him which is as follows.

AVA Diplomatic's Exclusive Interview with the Noble Prize Winner of Physics, Dr. Anthony James Leggett.

Why did you choose to study physics?

It was a rather complicated path by which I concluded that I would like to study physics. My first degree,

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as you may know, was not in physics; it was in liberal arts, in fact, in classics, ancient history and philosophy. Basically, as I came toward the end of my first degree, obviously, I had to think about what I wanted to do for a career, and I had had very little exposure to anything outside academic life, and I was not very imaginative. So, I really didn't contemplate any career outside academia, so, since I'd, in some sense, been best among my first degree subjects, the subject I'd best enjoyed most and been best at was philosophy. My first thought was that I should go ahead and do a doctorate in philosophy and then become a professional teacher of philosophy at the university. That would've been the obvious career structure. Then, as I thought about it, I gradually came to the conclusion that, somehow, that wasn't what I wanted to do in life, and then, I started asking myself why, why not? Now, I think had I been more imaginative, the path wouldn't have gone into academic life at all. But that really never crossed my mind. So, it had to be something wrong with philosophy, and so I started asking myself "what exactly is it that I don't like about philosophy?" which were preventing me from spending my whole life doing it. And I came to the conclusion that crudely speaking, at least, as it was practiced in Oxford in those days, what counted as good or bad work in philosophy, or what counted as correct or incorrect work seemed to be very subjective and depended a lot on the precise way in which you phrased your conclusions. That depended on the opinions of your colleagues and so forth, and that was no objective touchstone for whether what you are doing is right or wrong, and I came to the conclusion that I really wanted to be working in a field with some kind of external criterion or touchstone, which would tell me whether my ideas are on the right line or not. And eventually, I concluded that physics was the sort of discipline I wanted to work in, and I was extremely fortunate to get much help from a great many people because it was a very, very unusual transition to make in those days in Britain; a transition from an undergraduate degree in liberal arts towards a research degree or search career in physics besides the teaching career. And I had to get a lot of help, but I did get it and was eventually able to make the transition a success.

Has the study of philosophy inspired you in any way in your field of study right now?

Yes, very much so. This ranges from rather elementary points. Let me give you a very elementary example of a way in which some contact with philosophy has made me more skeptical in physics. Very often, in physics, in experimental literature in physics, but we find papers which say something like this; we have been X, and so some theorists have proposed a theory of such and such, this theory predicts such and such in an experimental phenomenon. We have done mixed term and we have found this phenomenon. Therefore this proves that this theory is right. This is actually an elementary logical philosophy. A very elementary point, and there are a lot more fundamental levels.

Philosophy has made me a lot more skeptical than most of my colleagues about some of the established wisdom in physics. I mean two questions which philosophers continually ask when they get up in the morning is first of all, what do you mean? And second how do you know? These two just sometimes don't go consistently with each other, but that's how philosophers do. And yes, I think it's very interesting, my attitude towards physics. More specifically, it meant that I had more long-term interests in what you might call the philosophical foundations of physics, the questions like quantum theory of measurement in the error of time and things like that.

You are very famous in the field of low-temperature physics. How important and applicable is the subject to the new science?

First of all, the very definition of low temperature physics is somewhat ambiguous. I mean until maybe 25-30 years ago, one would have thought of low temperature physics as referring to a phenomenon which happens below 10 degrees absolute. You might think we should extend the definition to make it below 50 or 100 degrees absolute. However, the things that have happened in the last 25 years, in particular high-temperature superconductivity mean that what we would now class under "low-temperature physics" now in fact extends quite close to room temperature. For example in highest temperature superconductivity that we know of, right now occur in the half of room temperature. So we're getting pretty close. If in fact we ever do find superconductivity at the room temperature which I think we may will, and then I suspect it could be caused under low temperature physics. It is somehow paradoxically, but because we have always regarded traditionally superconductivity a low temperature phenomenon. So anyway, I think the definition of low temperature physics is somehow ambiguous. If I ever had to make a generic case of why it is important, I would say that a lot of traditional phenomenon in low-temperature physics has much direct application. Some of them have applications to metrology, for example, and that's primary, because to do competent, efficient metrology, you want to get rid of as much noise as possible, and obviously, one way of doing that is to get to low temperatures. But, low-temperature physics gives, in some sense, an opportunity to study the effects of quantum mechanics under conditions where most of the noise has gone away.

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You have won a noble prize in the field of super fluidity. How has winning the prize affected your scientific studies?

Let's say not much. I think the main effect has been that I get a lot more requests to evaluate other people's researches than I was previously getting, and if I'm not careful, that text would take a lot of my time. But as regards my own individual research, I don't really think it's big much a fit.

Do you agree with data exclusivity in some developed countries, esp. in the realm of physics? That's what we much see in new science.

I know there had been difficulties for Iranian physicists like their access to some websites. Correct me if I'm wrong, but I think the problem is that these sites are not free and they have to pay for them, and Iran has not had the funds available to pay for them. But you know, I have been in other third world countries, say India, but haven't experienced such problems. I think it may be a problem rather specific to Iran in recent times.

Well, you know that science is a universal concept...

Well, yes, as general principle, but sometimes it's classified for specific purposes for some special cases, but apart from that, yes, it should be generally accessible or rather preferably accessible and free for anyone. I believe there should be an organization in charge of free distribution of data. That, in fact, would remove a lot of difficulties Iranian physicists have had lately.

In 2004, you were appointed Knight Commander of the Order of the British Empire by Queen Elizabeth II. Can you tell us about the process of granting a knighthood in the UK?

OK, do you mean the process by which it is decided who is going to get a knighthood or the one by which it is physically awarded? Which one do you mean?

I'm addressing the process. I mean the levels. Is it like anybody introduced you? For it is a rare award to be given to anyone.

Something like half a dozen of my colleagues in the British physics community has knighthoods. I don't know the details to the process. There is some kind of committee which proposes those who are qualified or eligible to be awarded the knighthood, and once the nominees are selected, they have the right to either refuse it or accept it. In face quite a few people over the past decades have declined the knighthoods. But I didn't if you are interested in that matter, I remember there was an article in the English newspaper, the Guardian, which was about those who had declined the award and the reasons they refused it.

What was the main reason you went on a trip to Iran?

First of all, I should say that I had one former student, Dr. Mohammad Shahzamanian, who has been working for many years in Iran and I also had considerable correspondence with other Iranian peers.

About the process of my trip to Iran I must say that's a complicated question! The person who was mainly responsible for hosting me is Dr. Mohammad Akhavan from Sharif University of Technology. He had the support of the President of Sharif University, Dr. Roustazad, and another important role was played by Dr. Jafari, a faculty member at Sharif University at the early stages. I was quite keen to go because I did have a lot of former students who have been working in Iran and I hadn't seen for many years, Dr. Shahzamanian, for instance. And I had had quite a bit of correspondence with Iranian critical physicists, and also as not so many get the opportunity to visit Iran and by professional capacity, I found that was attractive.

What was your family's opinion about your trip? Because media reflects a rather different image of Iran from what people really see or experience. To what extent was the image you had in mind different from what you experienced?

Look, I've been to various countries with which at the time the country I've been living and working did

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not have terribly good relations. For example I traveled to the former Soviet Union at the time that, relations with west was not that great. My experience has been by and large that in day to day relations with regular people these things don't really matter. In some ways I think I could imagine that I could live in Iran for a week and never would it occur to me that the relations with US are hostile. There are only certain areas in which it has a big impact. It really depends from which aspect you are looking at it, you know. It was pretty much the same when I was in former Soviet Union. I could so walk the streets and conduct all sorts of business with ordinary people. And no tension was realized. But it has become a belief for me that whenever I am invited by my professional colleagues they will take very good care of me and make quite sure that I don't get any bad experience!

Did other scientists attend the first national conference on advanced super conductivity held at Sharif University?

Well, first of all, you should know there were two rather senior US physicists who were basically invited on the same package with whom we had a talk-around. One of them was Professor Warren Pickett from the University of California at Davis, and Professor Paul Chu from the University of Houston. My wife didn't come with me, for various reasons but their wives did come. In addition, there were more than one Iranian-born physicists working abroad, perhaps in the US, who came there to take part in the conference.

How do you evaluate the scientific level of Iranian participants?

Well, at undergraduate or post-graduate levels, you could compare the trainings Iranians receive are probably comparable to those in the US or the UK. On the other hand, the research, or rather particularly the experimental research has been handicapped rather severely over the recent decades because of the sanctions imposed internationally. Well, literally, I was quite impressed with what people managed to do despite the effects of the sanctions.

Did you also have any encounter with the students of Sharif University? How was that experience?

Very positive I would say. One thing that did particularly impress me was the large proportion of physics students who were women, and that is something rarely seen in America or Europe, you know, generally speaking, in physics department, women are relatively small minorities, but I think here they form the majority. I remember that my former student, Dr. Shahzamanian has only women students.

And how do you find their scientific levels?

Well, at a bachelor's degree, I can say they are certainly comparable to those in the US, and perhaps even in Britain, where the levels are a bit higher. But at postgraduate levels, they suffer, I imagine, somewhat, from lack of exposure to international context. They were much pleased with making those contacts and were willing to extend them.

Your trip to Iran is known as science diplomacy. To what extent do you believe in such a term?

Honestly, when I received the invitation, I didn't know there were two other senior scientists invited along with me. First, I primarily looked at it same as the kind of trips I might take to India or Singapore or wherever else, or in other words, it was primarily an academic exercise: I would give lectures, discuss them with faculty and students, and evaluate some projects and leave comments and so forth. But when I got to Iran, it became clear that it did have a diplomatic aspect. This was fine with me. I mean I'd been very happy to play whatever role I can in that. What was tried the most in that time was that the head of Sharif University and Professor Akhavan would much tend to strengthen the academic contacts between Sharif University and the three universities we represented from the US. I think one thing we can obviously try to do is to propagate a view in the US academic community. Many of the effects of the sanctions, certainly on physics, in Iran don't have very much to do with what eligibly was the purpose of the sanctions. Therefore some more subtle thinking should be done about the implementations of the sanctions. I mean, obviously I certainly hope for an agreement soon to come so as to remove the sanctions entirely, but if the results dictate that the sanctions are maintained, then I hope, at least, that the implementation will be a little more discriminating.

Has the approach of science diplomacy been successful?

Well, actually, to be honest, among the three of us the person who was most was Professor Pickett. I think they had already put some kind of agreements with Sharif University in place. At the University of Illinois, I've inquired about this and it look like apparently we can go ahead and make arrangements on the departmental levels. Actually, such agreements look nice on the paper, but over the years, it has proven to not make any difference one way or another in our relationship with foreign universities.

A lot of countries have had student exchange with Iran. But it has never happened between Iran and the US. Do you think it is probable to take place in a near future?

Actually, I must say that we do have Iranian students at the University of Illinois, in particular Iranian grad students. I have a couple of Iranian students myself. But this was not part of a more general arrangement. Yes, we do very much hope we can make semi-formal arrangements. I myself have actually set some time talking to some various university officials about this issue at the University of Illinois. And the advice I received was that probably the best thing is to go ahead –as long as it is only students and ordinary faculty members rather than Presidents of universities – and make informal agreement. So, we were informally arranged with. One thing we certainly like to do is to arrange with professor Akhavan and his colleagues to spend a certain amount of time here at the University of Illinois sometime during the next year or two, we are certainly trying to work towards that.

So there has been a plan for academic exchanges. What are your suggestions for increasing the number of such trips from the US to Iran?

I think one way to go is by making such individual university to university arrangements at the faculty level, because that will get you around a lot of bureaucracy. For example at one stage, one of the university officials I consulted mentioned that he thought we had to get official permission from some office in the US state department which I don't know the name of, which basically administers the sanctions, and he thought we're going to have to get some kind of official written permission from them. But it turns out that if we just do it informally at the faculty level we really don't have to do that. So I think at the Illinois at least that's the way we're going to do it. Maybe in other universities you have to do it in other ways. I'm not sure.

On your trip to Iran, which officials did you manage to meet? And what was the most significant outcome of that?

There, I met with the Minister of Science, Dr. Faraji Dana, Deputy Minister for International Cooperation, Flora Monji, vice president, Sattari, and Deputy Minister for Technology and Innovation and the Presidents of Universities of Isfahan, Shiraz and Sharif. As to the outcome, I think we got a much better impression of the sorts of difficulties under which Iranian physicist have been working for the last few decades. We've set in motion arrangement for the exchanges with individual universities. And obviously we hope that in addition to us, other universities in the US consent to make the same arrangements.

I must say that I was impressed by the realization that even the top Iranian officials of whom we spoke showed that the present oil riches of Iran are not going to last forever and it is essential to develop their economy in various and a lot more sophisticated ways, with a lot more investment in the educational system.

Which cities in Iran did you visit?

Tehran, Esfahan, Shiraz. Some of my colleagues also took a trip to Persepolis which I couldn't join.

What was so significant about those cities? What memories do you have from them?

Apart from the pure history in Isfahan, I found tradition and value in Shiraz and perhaps other cities. People know the value and much appreciate it. There were also historical monuments which were interesting.

Did those trips change your viewpoint toward Iran?

I think, in a sense, I was not that surprised. Because Let's say, I have never really taken the view that ordinary life in a country which happens to be at the time politically hostile toward one's own. The life is

going to be very different from how it is at home! There was one or two individual things that did surprise me and I think to be honest one of them was the extremely positive role which women and particularly women students were playing. And I think I was somewhat influenced by the pictures which one tends to see in the in the western press which shows most Iranian woman as the ones that don't earn anything and so forth. And one might think this must mean that they can't be taking an active role in university life, but I thought that was not at all the case.

Have you been to any other countries in the Middle East?

I went to Turkey for a short while. But if you are asking about Islamic countries I have also been to Malaysia.

How different is Iran from other countries in the Middle East?

Well, obviously, Iran is unusually not an Arab country in the Middle East and they obviously have different feeling about their own history than what Arab countries do. Again, to be honest, I would not have known this from my personal exposure. But I mean what I read is that the version of Islam that is mostly practiced in Iran is Shia or Sunni. But that isn't an important difference. I should say once again that I wouldn't have been able to tell myself before I saw it. I don't know enough of Islam, I'm afraid.

Are you interested in having another trip to Iran? Maybe to do things which you thought you should have pursued on your previous trip.

I would certainly want to do some standard tourism excursions that I didn't make. For example I didn't take a trip to Persepolis, and I wouldn't mind doing that. But I think more importantly I would simply want to give a few lectures and to interact with my Iranian colleagues. I meant I think that was the most important purpose of such a trip.

What do you think about the matter that sometimes scientists fear the trip to an unknown country? They are afraid of how regular people would treat them or so forth. How can we mend this false image that people have toward a country?

Well, what we can do is just to tell people that it is quite the opposite of our experienced. We were just amazed by the friendliness which we were treated by the ordinary people, even though they. Well especially because we were from US.

What do you think we can do to better our political relations?

Well, quite frankly, I have to say we are pretty small fish, and that the issues which sort of bedevils the relations between the US and Iran over the recent decades should be sorted out at the highest political level. Once these problems are sorted out, we can certainly try to do our bit. But I must say quite frankly I don't think the ball is in our court.

If there is anything you want to add to our talk, we would be much pleased to hear it.

Well, overall, I want to say that I really enjoyed my short trip to Iran, and I certainly hope that I will be able to take a trip to Iran and also for my Iranian colleagues to visit us in Illinois.

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