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## Dr. Maria Klawe in Conversation @ Amrita

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**Dr. Maria Klawe, Dean of Engineering and Applied Sciences, Princeton University in Conversation with M Sreevalsan, Head, ICTS, Amrita Vishwa Vidyapeetham**

*10 Jan 2006*

### Interview Transcript:

Since your visit is immediately after the indo-us collaborative launch, why do you think we need to have such collaborations between the American universities , Amrita Vishwa Vidyapeetham and other universities in India?



Well, I think from the perspective of the American universities it is a wonderful opportunity for our students if they can be involved with collaborative research with students over here to really see the impact that Engineering, Information Technology and science can have in addressing world problems and i think that is highly motivating for students particularly for women and for under represented minority students.

From the perspective of the Indian Universities, I think India in general does a very good job of Undergraduate education but it has not built up a research base , particularly in Information Technology and other areas like biotechnology, health care and so on...India needs to go to the next level. Right now India is doing an incredible job of serving the call of basic level Information Technology Services. But if they really want to move to the next level in terms of both health of the economy of India but also making a real difference in the world, they need to develop the research capacity. I think by this kind of joint initiative between Amrita and US universities will be an opportunity for US faculty and US students to provide mentorship and collaboration to students here. It is also the case that, because of the fact that the IT industry in India has been so successful, it is very hard for recruiting the level of faculty that you would want to , given the demand for learning and information technology. So the whole idea of using the satellite network and having leading faculty members from the Unites States coming to teach courses. I think it is going to be very helpful in terms of raising the levels of Information Technology education here.

In your talk today , you mentioned about the small steps India has been taking and you also talked about a giant step India is going to take probably in the future. Do you think there are some key technologies and initiatives that are missing in India where we as a university should concentrate on?

I think the giant step is going to be the move into really focusing towards world class research. I think India can do this. The most important component, particularly in information technology, the most important component in research is not only the combination of intellectual talent, but also the ability teams of people to take on major challenges and work together effectively. I think India can really do that.

In terms of specific research areas India is missing ...to be honest I do not know enough. It is certainly true that India is missing a lot of research in computer science and computer engineering, it really needs to develop in terms of what it has done in information technology industry. In terms of other areas, Biotechnology, Nanotechnology I just do not know enough about India's capabilities to be able to comment on it. The reason that I know about the situation with IT is because that is my area and the work that I have done with ACM and talking to people with IT industry. I think India has a better opportunity to push forward in IT more quickly than Nanotechnology because simply the instrumentation for a major material science initiative is incredibly expensive. The great thing about IT is that it is mostly human brain power and creativity that is needed and India has that. Some of the other areas you need very expensive machinery and it is probably not the best area for India to compete with US, Europe or Japan.

Could you please throw some light on how Princeton could do this hand holding with Amrita if we start some research programmes in these areas?



The school of Engineering at Princeton completed an year and a half ago a strategic plan for the next decade. Sounds very consistent about the mission with Amrita. But the idea is that science and technology is so important in terms of addressing world problems. We need to educate a new generation of leaders who will focus on doing the research and education that addresses those problems. One of the areas that was chosen that the faculty and students at Princeton are really passionate about is Technology for developing regions. Rather than just focusing on developing technologies to have successful companies, we are really looking at what the major issues are in this world and how we can use technology to address those.

When I look at what Amrita is, the whole mission, the hospitals, the various campuses and so on there is a close synergy between what Princeton wants to do and what Amrita is doing. I think there is a possibility that faculty members from Princeton will be interested in establishing collaborative research with Amrita and the other Indian research universities in order to have a possibility of working on a real life problem and by doing that we will be able to engage Indian students in that research and Indian faculty as well. By being part of that collaboration exactly means providing that kind of mentorship.

I think there is also a good number of faculty members at US universities, certainly including Princeton, who were born in India, who perhaps did their undergraduate education in India and went to the US and stayed there, who are very successful. For many of those people, they really care about India and they might like to see a way they might not be ready to give back partly because if they have a really ambitious research career it is hard for them to make a permanent move back to India at this point and maintain the level of research they have been doing. But I think many of them come back and would like to teach a course for 3 weeks or 6 weeks and know that they are really doing something to make a difference to this country. I think that is going to be true for a number of people who are not of Indian origin. India is an amazing country and one of the best things I did as a younger person is to spend 6 months of my life in India. Many people will see this an amazing opportunity to make a difference at a time when the country is so much on the edge, at a time when so much has happened. Particularly for scientists and engineers, this is an opportunity where you could make a difference. You could see tremendous leverage in that contributions because India is poised to take advantage of this. So I think that is going to be very appealing to many people.

Since you have been emphasizing on research so much, do you think that introducing some research component undergraduate would be beneficial?

One of the 'mantras' in North America is that the US universities provide really great undergraduate education. One of the things they focus on is to try to give every student an opportunity to do some creative research while they are undergraduate students. The reason that North American universities do this is because there is very clear evidence that there is very clear evidence that the strongest predictor for going to graduate school in becoming researchers in areas of science and engineering is having that undergraduate research experience. All the things that encourage a student to do creative research seems to be the most important thing. I think that's some thing that India universities haven't really done yet, I think Amrita can be one of the universities in leading the way in doing it.

One of your areas of work happens to be gender issues. You find that lot of women technologists are not emerging out of these Universities. Could you please elaborate on that?

Let me talk a little bit about it. I am 54 now. I grew up at a time when it was very common in North America for Teachers and parents and every one to say girls can't do well in Math and Science. Really they would say that. I really loved mathematics and I felt this is really obnoxious. There were some girls, like me, when they hear this it will make them absolutely determined to be better than all the boys in math and Science it wasn't until when I was in my early 30s for the first time as Manager at IBM Research I realized that we needed to do something in our society about making it possible to be successful as a female in Math, Science and Engineering without being motivated the way I was, I just wanted to prove that I just wanted to prove that I was better than the males. I have spent a lot of time over the last 20 years or so trying to understand what it would take to make careers in Mathematics or Engineering and Computer Science and so on more attractive to women. One of the most interesting things is that over the last 30 years women are much more represented in Mathematics than it used to be. My own Ph.D is in mathematics, I would spend a lot of time focusing on what would work with mathematics, we made lot of progress there. But it is very interesting and very depressing is that in Computer Science just the opposite has happened that over the last 30 years, the participation by women in Computer Science programmes and careers has declined.

One of the things I find very interesting during my visit to the school is that in most Indian private schools all students, girls and boys learn at least how to program, there is a Computer Science curriculum from Level 1 to 9. So at least we are not having a situation where in when students graduate from high school there are more boys understanding how to program than the girls. Where as in North America there is probably only about 20 percent of the students learning how to program before they graduate from high school and only 4 percent will be girls. I think one of the things India has a possibility to do, and I really hope it happens, they have the possibility of as many females going into degree programmes in Information Technology , Computer Science and Engineering because they are not segregating at an early age. I there are lots of things one could do in terms of pedagogy and motivation that would keep young women interested in Computer Science as men are. One of them fits very well with Amrita's mission and that is of using Science and Technology for service, it is very appealing to young women. I think if North America had focused more on the purpose of Engineering and Computer Science - to make the world a better place, taught its courses that way, reinforce learning that way, it will have lot more females than what we have today.

In amrita we give some emphasize on values of education or values in life, how important do you think it is in today's world?

Ans: So this is a complicated situation in the U.S. context and its very interesting. So values in the U.S. tend to be very closely aligned with religion and in particular in the U.S. the dominant religion right now is fundamental Christianity and there is also within united states constitution there is this you are not allowed to follow religion in public schools and so there is a very interesting sort of conflict between being able to talk about values in the context of education. So in the U.S.A. lets talk about of the civic values, which are values but its a very sort of interesting conundrum because most of the people feel that spiritual values are very closely aligned with the religion. In Canada its different. So Canada has, I would say a much more clearly articulated set of social values that have nothing to do with religion. So caring for others would be one.



Putting the needs of the community first rather than needs of the individual first would be another one and I think that its very helpful to be able to talk about values in association with education and to be able to have students think about how what they are studying and what they might do with that knowledge interacts with those values and one of the things I like about being in Princeton that Princeton at least articulates very strong social values and so you can legitimately have this dialogue with students on what is the purpose of doing something or what are you going to contribute by doing something? Is it right to make this choice of career versus that choice of career in terms of what you might do for the world? So I think its very helpful to be able to have these kinds of discussions. I think that we will educate better scientists and engineers, information technologists by having them think about the societal context of what they contribute. So I think its a very positive thing to be doing.

I read that you are a good painter and done some fine arts , do you think as a technologist these creative aspects are necessary?

I've always been a painter , I mean I've been painting for as long as I can remember certainly from the age of five and its incredibly important to me. On the other hand, over and over again I have made this decision not to be a full time painter because I think that what I do as an educator has more purpose in the world but I can't live without that experience. For me painting is interacting with beauty. Its this constant sort of... for instance this evening watching the sunset over the mountains, for me the reaction to do that, to that

experience is to paint it. I mean that's just the... you know I immediately want to have my paints, and I want to have photographs of it and I want to be thinking about you know the different ways one might represent the sky and all those kinds of things. So for me having that ability to express some kind of interaction with the reality of beauty around me is a very important part.

My experience is that most people who are engineers or scientists also have you know something like, that it could be that they portray or it could be that they dance or it could be that they play music and I think we should do more to encourage the people we are educating as scientists and engineers and information technologists to acknowledge that part of themselves because often we create this image that if you're going to be a physicist you're going to be nothing but a physicist or if you are going to be a computer scientist, all you are going to do is write programs or design circuits or something like that and life is much more multidimensional and I think that people who do other things as part of their life end up being achieving more being better at computer science or physics or anything else and its partly this I mean may be its just that when you do this other thing you step outside yourself for a moment you step into another part of your self and that going back and forth between different ways of perceiving the world and interacting with the world I think does stimulate creativity and problem solving. It also helps you understand different people and their different perspective that they bring to problem solving better. So yes I think its huge part of my life i don't think I you know l... life will not be life without painting.

You have been in this campus for last eight hours or so. Could you please tell us your impression of the campus?



Its beautiful. I think that's the first one that strikes me is that just there is this when you arrive there is this sense of light and coz it wasn't raining. It might have been different if I came two days ago but anyway. Its just this sense of vibrancy and spirit and beauty, so that's the first thing and its partly the trees and flowers and buildings and so on but its also the people and so I feel this tremendous sense of... probably happiness is the right word from the people who I've interacted with here in that there is definitely a sense of joy. I mean one of the things that's very interesting about Princeton that I really notice compared to some other universities is the students of Princeton are joyful. I mean one of the things I do as dean is I have dinner with all of the first year engineering students in small groups. Its about 25 dinners .I do this because its one of my ways of getting to know the students, welcoming them to the university. Your first year university is a big transition for most students. The engineering curriculum is challenging.

So I'm sure it is at Amrita as well and one of the things that all this impresses me is that these students are truly joyful about being there .They think they are joyful mostly about the people, the fact that they are in this multi cultural community with people with enormously varying interests I mean no matter what you pick whether its fencing or juggling or studying Sanskrit or speaking Japanese or whatever. There will be a student whose passion that is as part of this group even among the engineering students its about 200 first year engineering students and just the range of passions and interests. But what strikes me at Princeton is that the students feel that this is going to be one of the happiest times of their lives and it is one of the happiest times of their lives. I felt a lot of that from the people that I've interacted with here at Amrita in that people are very happy with what they are doing here they feel that there is a purpose to what they are doing here. I think they feel a lot of joy and lot of satisfaction that they are doing something that's very meaningful and its going to make a difference and that's very tangible.