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Professor Ian Chubb spoke with Richard Stubbs, the Afternoons presenter, about citizen science and strategies to encourage participation in STEM subjects.

RICHARD STUBBS: Professor Ian Chubb is Australia's Chief Scientist. He has held that position since 2011 and he clings to power in a series of machinations that makes Game of Thrones look positively sluggish. He wants to talk to you about – well – citizen science. What is that?

There's a new paper from the Office of the Chief Scientist – that's his office – which highlights the important role that you and I in the community can play in helping solve real world problems. Hi Ian.

IAN CHUBB: Hello Richard.

RICHARD STUBBS: Ian, there's all sorts of things involved in this. First of all, do you think the smartphone has been the greatest contribution to ordinary people getting involved in helping science projects?

IAN CHUBB: Well it's certainly been important. It's a lot better and indeed probably more accurate to be able to take a photograph of something that gives you information on the time of day, the latitude and longitude and a high-quality picture of whatever it is that you're looking at or you think you've discovered. You can send it off somewhere rather than having to write it down in a book and scratch on a piece of paper with a twig because you didn't bring a pen. It makes things a whole lot easier and a lot better.

RICHARD STUBBS: Yes it does. I like the idea of you out in the bush there just scratching with a piece of twig, annoyed at yourself for not bringing a pen. There's also that whole uplink and being able to talk to lots of other like-minded folk so you're not alone in the bush with your twig, you're able to chat with people about things.

IAN CHUBB: Yes, you can talk about things and in some of the very organised projects that we have in Australia you can get in contact with a scientist very easily, or often the whole project is based around discussions between citizens and the scientists, who are of course also citizens. That sort of cooperative partnership is also a very important part of it and to be able to pick up and dial a number and talk directly to the scientists or be in pretty rapid contact with a scientist is an important part of it too.

RICHARD STUBBS: Yeah absolutely, and also the community of other citizen scientists. I do like the term "citizen scientist" by the way. It reminds me of Starship Trooper for some reason. And you could have said "gifted amateur", I would have liked that as well.

IAN CHUBB: Well, that's what it would once have been called. Back in the nineteenth century there were lots of examples of people who made very profound discoveries and inventions who were effectively gifted amateurs; people with enthusiasm but above all people with real curiosity as to why things were what they were and how they worked.

RICHARD STUBBS: You've put your finger on something there. In the times you were talking about it was something of a social exercise, it was something that was appreciated if gifted amateurs had a crack at something and showed an interest. That was to be applauded. I think we've lost a bit of that today. It seems we're at low levels of kids studying science in year 12. I'm sure you've got a concern that somehow science in our minds is in the realm of specialised people as opposed to affecting all of us.

IAN CHUBB: That's certainly a significant part of the issue. I think as a community, generally speaking, we tend to take science for granted. You're in Melbourne, I'm in Canberra and I'm using some equipment, as you are, that would not have been available were it not for scientists, engineers, information technologists and so on. So all of their skills come together and enable us to communicate in real time and you can broadcast to however many people listen to your programme on the radio, which again came about because engineers and scientists have discovered things to make them more effective, make them easier to use and make them of higher quality so the sound quality is good and so on.

RICHARD STUBBS: We are not divorced from science, it is all around us.

IAN CHUBB: Well, on an hourly basis basically.

RICHARD STUBBS: Ian, do you like Louis CK, the comedian?

IAN CHUBB: I don't know him.

RICHARD STUBBS: Well, I didn't think you would have met him. But you could have, because you know, you're a senior. Look him up, because a) he's hilarious and b) he's got this great talk in his routine where he just talks about how blasé we've become with the marvels of science. He was talking about being in a plane, 30,000ft up in the air and on the internet. It boggles his mind and we take it all for granted.

IAN CHUBB: Yes, it boggles mine too. And I will look him up but I've not heard it. It's very true. Many of your listeners would have eaten something today and there's a fair chance that the nutritional value of the food has been developed or preserved through various scientific and engineering processes. Some of them might have taken some medicine for high blood pressure or a cough or cold or whatever. You wouldn't have that without science either, but I don't think too many people think when they screw the top off the bottle to take something even for a chesty cough, that in fact there's a lot of science behind it. And a lot of scientists.

RICHARD STUBBS: Yes, one hopes. When we're citizen scientists we tend to be data gatherers and it tends to be within environmental sciences. I'm looking at a list of all the different projects, things like Redmap and Penguin Watch, but there's all sorts of things. I've got everything across Australia here. It just lends itself to that I guess, because we don't need the expertise to be able to count the penguins or list the fish.

IAN CHUBB: Well that's true. Undoubtedly there are some things that require a high degree of specialisation or a high degree of knowledge to be able to prosecute the research in those fields. But there are a lot of others where you can involve the citizen scientist and a lot of them are.

There are about 90 projects around Australia at the moment involving 130,000 people and a lot of them are in environmental sciences. You can get people dotted around Australia

measuring rainfall, measuring wind direction, looking at soil moisture or river flows or river depth and the aquatic life in a river. All of those are things that people can go out and observe and then put into a database that generates all the knowledge we need. But there are other things too and there will be more things as it takes hold and more and more people become involved. Because basically, they're doing what they're interested in and what they're curious about and we can never underestimate the level of curiosity that's intrinsic to most people.

RICHARD STUBBS: And we've got to encourage it, otherwise we become like the Eloi, we just frolic on the top of the earth and the warlocks are doing all the work and we don't understand how it works.

IAN CHUBB: And don't understand it because they don't need to. But we do need to.

RICHARD STUBBS: Bad things happen.

IAN CHUBB: I've said many times that the agenda here is to do more research and get more people involved, but the complementary agenda is to increase the level of science literacy in the community so more and more people know how science works and how scientists work and know more about the scientific method. So when we have to sit back and have a debate about serious issues and ways in which the community can move forward, things like climate change or vaccination or energy sources and resources, the more scientifically literate the community is, the more informed the discussion will be and the better will be the decision.

RICHARD STUBBS: Really? Because if we're informed then we won't be swayed by emotive language and then the whole structure of our political debate will change!

IAN CHUBB: Wouldn't that be sad.

RICHARD STUBBS: I don't understand what you're saying to me now.

IAN CHUBB: I'm just saying let's get better. It's an aspirational goal!

RICHARD STUBBS: That's not going to be as exciting. Normally I just sit there uncaring until someone revs me up with emotive language and then I yell mindlessly and run around. I could try your way I guess.

Professor Ian Chubb is here chatting to us. He's Australia's Chief Scientist. We mentioned, Ian, as we were chatting at the start here, that the rates of uptake of science subjects for year 12 students are low. How do we get more kids wanting to do science?

IAN CHUBB: Well I think we make it inspirational and I think we should teach it as it is practised, rather than teach it as it's written about in a textbook. I think what that basically means is that we've got to prepare and support our teachers better than we ever have in our history.

RICHARD STUBBS: What sort of stuff would you like to do if you ruled the world, Ian?

IAN CHUBB: If I ruled the world I would lift the esteem of the teaching profession to a very high level, because they have the future of this country in the palms of their hands for at least 12 years. And whether the students then stop there and go and do something or go into vocational education or go to university, they have to be well prepared and they have to

be well prepared for the unpredictabilities of the future and I think that comes through the education system.

RICHARD STUBBS: So we've got to pay teachers more to make the job more attractive?

IAN CHUBB: Yes, and look after them a lot better. We should put a heavy emphasis on in-service professional development, and I think we should put a heavy emphasis on pre-service development and preparation. We should give them the content they need to be confident that when they're sitting in a class full of some very intelligent young people they can ask questions or they can provoke them to ask questions, because that's how science works.

RICHARD STUBBS: What about after? Your daughters are brilliant at science, award-winning and high achieving. Did they go on to do science?

IAN CHUBB: How did you know that?

RICHARD STUBBS: I know things about you Ian.

IAN CHUBB: You apparently do.

RICHARD STUBBS: I know quite a lot about you. I've got my fingers steepled right now and I'm looking at you with squinty eyes over my fingers.

IAN CHUBB: So you're asking why my daughters who performed brilliantly at science are actually working, the two of them who did science, as lawyers?

RICHARD STUBBS: Yes. Because that's the other side of it, right? There are some kids who are brilliant, studied it, but didn't go on to become it. So there's a missing link there that we need to fix too, isn't there?

IAN CHUBB: Well there is. Going back to the magic wand notion, I would draw the business world much closer to the education sector. I think it's the education sector's responsibility to prepare people well and the business sector you'd hope would then take them up. So you've got to have push and pull working at the same time.

The President of the Business Council of Australia, Catherine Livingstone, has been making some very positive speeches and comments about the need for business to pay more attention to STEM, that's mathematics and engineering and technological sciences as well as science, and indeed to be ready to use some of the additional skills that come from a very solid science education. I'm optimistic that we're moving in the right direction. I think we probably started a bit late, so that just means we've got to accelerate it to catch up to where we should be.

RICHARD STUBBS: Exactly. Fighting words. Ian, thank you so much, wonderful to chat to you. I'll let you go back to your wizard's tower in Mordor now.

IAN CHUBB: OK. I'll wave that wand. Thank you.