Speech by Toss GASCOIGNE
Vietnamese Ministry of Science and Technology
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Honoured guests, ladies and gentlemen. I am delighted to be in Ha Noi for a discussion on the public communication of science and technology. I would like to thank Dr. Tran Quang Tuan for his invitation.

The questions you are facing about the science communication are very important ones.

Your Government invests in science and scientific research, but how best can this investment be realized? How can new ideas be transformed into new industries, and generate employment? How can scientific research in health, agriculture and the environment be translated into new practices to be adopted by citizens?

These questions are not unique to Vietnam but are being considered by governments across the world.

If a society is to take full advantage of the discoveries of scientists, it has to have a basic appreciation of the science and what it means. But the gap between science and citizens is growing. Even well-informed scientists cannot keep up with the rate at which new knowledge is generated; and as my Canadian colleague Professor Bernard Schiele pointed out recently:

> *This explosion of knowledge means we no longer have a shared culture of S&T, and this position is going to worsen in the future.*

If Schiele is correct in claiming that the knowledge gap is growing wider as science expands, then how can a modern society function in a logical and progressive manner?

If the knowledge gap is growing wider as science expands, then how can a modern society function in a logical and progressive manner? Government is guided by the views of the citizens. Ultimately citizens make decisions about how they will behave and operate. They need to have a basic understanding of the issues and the implications of these issues, even if they are difficult to understand.

Today I want to address two aspects of science communication:

1. What is science communication and what are its origins?
2. What are the challenges and benefits for countries, particularly in the developing world?

Part 1
What is science communication and what are its origins?
In researching a journal article recently, I looked at the emergence of the term ‘science communication’. Where did it come from, how well is it established, and has it achieved the legitimacy and authority to handle the questions posed by this meeting?

Science communication has established an identity over the last 60 years. In the aftermath of WW2, governments increasingly regarded science as important. At the same time they recognised their own lack of skills, so they appointed special advisors to lead presidents and politicians through science-based issues, performing a classic communication role of translating the significance of research results for a lay audience. Science communication now had a political imperative. The US has a science advisor to the President, Australia has a Chief Scientist and so does Great Britain. There are many equivalent positions in other countries, often distinguished scientists who work with the Ministry for Science, and help lead discussions and debates on science policy and funding.

So three aspects of society came together: science, the economy, and policy. There was a corresponding convergence of questions related to science and society, science in the media, and the role of science journalists. By 1970, a new practitioner and research area was emerging to address these questions.

The 1970s marked the start of informal exchanges among researchers and practitioners who worked in science communication, such as academics and science journalists. In Europe (particularly France and Spain) these exchanges grew into meetings, symposiums, formal conferences, peer-reviewed journals, and later into associations at a national and international level.

The international PCST network was conceived in the 1980s, and held its first conference in 1989. Since then it has held 12 formal international conferences in countries ranging from Madrid and Montreal, to Cape Town, Seoul and New Delhi. In Asia we have held symposiums in Beijing and Jakarta (but not yet in Vietnam!). Registrants are evenly balanced between those coming from a university background and involved in research and training, and those from practice: writing, editing, or working as 'communication managers' for research institutes, science centres or museums.

There is a strong international interest in research. The PCST conference in Seoul in 2006 attracted 320 abstracts and 264 full papers from 38 countries. This is a typical number for our conferences. Science communication has also both books and specialist journals. A Google search "books on 'science communication'" generated 115,000 results and indicates the topic has been well-explored. Journals include the *Journal of Science Communication*; *Public Understanding of Science*; *Science Communication*; and from China *Study on Science Popularisation* and *Public Communication of Science and Technology.*

A new profession has arisen, the science communicator. They may be employed in a number of ways:

- communication manager for a research organisation or museum
- journalism
- writing and editing
- training scientists in communication
- working to change the culture in areas like health (preventative campaigns)
- working with farmers to change their practices
- working in Government to develop science policy

This has created a need for formalised training in science communication, and courses are now offered throughout the world. *The Directory of Science Communication Courses and Programs* lists 51 courses and programs at 44 separate universities in the USA, generally at undergraduate or postgraduate levels.

'Science communication' is well-understood in many countries as an object of study and research. The area draws its tools and concepts from sociology, psychology, media studies, statistics and other areas, and has an interdisciplinary approach in common with modern social sciences.

Over the last 50 years science communication has gained recognition. What began with academic discussions developed into departments in universities across the world. It swelled spontaneously into a loose international network that filled the need for the community to meet and discuss approaches. An international association and a series of national associations provided for this community of scholars, educators and practitioners. It became legitimised and defined at the professional level by new job opportunities and the emergence of courses in universities.

When it comes to discussions on national participation in science, the community of science communication offers expertise, training and experience in dealing with these issues.

Part 2
What are the challenges and benefits for countries, particularly in the developing world?

All countries face a challenge today: how can we compete successfully in very competitive world markets? How can we improve the standard of living and health in our own country? And how can science communication help?

The thinking behind most governments when they consider if they should invest money in science communication runs like this:

- We want a modern, knowledge-based economy
- Only this sort of economy will deliver the satisfying, high-pay, sustainable jobs that will ensure our national prosperity
- We believe it would assist us to achieve this sort of economy if we had a population which understands and appreciates science
- We need a population which understands health and safety issues, and how to limit the spread of communicable diseases like TB and AIDS, and non-communicable diseases like diabetes type 1 (not a problem, I think, in Vietnam)
- We need to modernize our industries and help farmers (for instance) have better farming practices, control the use of pesticides and grow better varieties of crops like cassava
- We want to ensure the next generation of scientists and technologists, and to stimulate students to do science at school and university, particularly in the "hard" sciences like mathematics, physics and chemistry – a problem in all western economies
- Therefore we develop methods for taking science to the people, to educate them, to train them and to involve them in national decisions

The needs of each country are different, depending on their industries, the sophistication of their education systems and their geography. Australia, for instance, has a national strategy on science communication and this program has four broad aims:

- to increase public appreciation of science, and help ordinary citizens understand what scientists can do, and what they can NOT do
- to inform citizens about science-based issues so they can make informed choices eg on climate change action, on vaccination of children against diseases, on eating unhealthy food
- to boost confidence in the decisions the Government makes to invest money in research
- ensure a supply of science graduates

Vietnam has its own challenges, as a rapidly developing country in the most vibrant region in the world. I have only a limited knowledge of what these challenges are, but from my experience in attending conferences and running workshops in Indonesia, Malaysia, Papua-New Guinea, Korea, India and China, let me guess a few of them.

Example A.
Earlier this week we ran a workshop with scientists from CIAT, the Centre for International Tropical Agriculture, at their offices in Ha Noi. One of the young scientists is finishing a study of Vietnamese farmers and the way they grow cassava. This is of course a very important cop.

Her study involved over 80 farmers, from three different regions in Vietnam, one in the south, one the middle, and the other in the northern regions. She was interested in their knowledge and understanding of pests and diseases of the cassava crop, including mealy-bug and witches' broom. Did they know these pests and diseases, and how did they deal with them?

Farmers in the south had the highest recognition rate and they dealt with mealy-bug by spraying with chemicals. They were unaware of another possible solution, of bio-controls: using the natural enemies of the mealy-bug to attack and kill it. By spraying with chemicals, they killed the mealy-bug but they also killed the wasp that naturally attacks this pest.

There is another reason why they should not use chemicals, the cost. Chemicals are expensive and can damage the environment.

She asked the farmers if they had attended farmer extension or education classes. Yes, they had, but they did not remember what they had learnt in the classes, and in particular, they were unaware of alternative ways of controlling the mealy-bug. The researcher also asked them how they liked to learn and get information, and the unanimous answer was from other farmers. The responses from male and female farmers were separated into two sections and she found that female farmers had a better knowledge of the pest although they spent less time in the field.

So what science communication lessons can we take from this?

1. That farmers learn best from other farmers, so if we want to change the behavior of people working in agriculture, we should train farmers to become the teachers

2. Farmers learn by seeing and doing in a practical environment, rather than being taught in a classroom
3. Working with female farmers might be a powerful way to influence community views

My colleague Jenni Metcalfe will talk about her experiences shortly, in setting up farmer trainers in both the Philippines and in Australia.

Example B
We have found it very helpful, both in Australia and internationally, to establish a community of science communicators. Internationally the organization is called the PCST (Public Communication of Science and Technology) and in Australia our national organization is called ASC (Australian Science Communicators).

"Australian Science Communicators" (ASC) is a national organization for people interested in science communication. It was formed in 1994, when each research organization and museum had one or two staff to manage the media, organize events, edit a newsletter, write the annual report and mount displays. These people felt isolated because they had no association where they could meet colleagues to share ideas, ask questions, advertise events or look for jobs.

The first step in forming ASC was to call a meeting of people prominent in science communication. Twenty-four people attended - science journalists, media officers from research organisations or communicators from national bodies representing science and engineering. The meeting was at the National Press Club in Canberra on 3 February 1994, and it discussed the aims and activities and membership of the proposed organization.

The proposal was accepted and a small steering committee was elected to take the idea forward. Six months later we adopted a constitution and elected a committee, and ASC was underway.

ASC has been running now for 21 years. It organizes national conferences and regional meetings, and has an active email discussion list that advertises events and publications, and allows members to promote media releases, to seek advice or express their point of view on contentious matters. We have a constitution, a national President and a web site, and members pay an annual subscription.

ASC also hosts international events. In 1996 it organized the fourth PCST Conference, and in 2007 hosted the international conference for science journalists in Melbourne.

ASC has about 450 members. Most of these people handle communication issues for research bodies or universities or museums, as public relations or media officers. Some are writers and journalists or consultants; others work for the government in science policy areas. Other members work in research or teaching at universities. It includes scientists interested in communication.

The organization has been highly successful in its main purpose, of creating a community of science communicators. People throughout Australia know each other, can work together,

seek advice, and exchange good ideas. It has allowed the running of events and meetings which would not have been possible without the links and the publicity machine ASC provides. Both South Africa and New Zealand have used the same approach to set up their own associations.

I spoke at national meetings of science communicators in Indonesia, in 2011 and 2013. They too were considering whether they should establish a national group for science communicators, to boost economic activity and help discuss matters of national interest. One of the special difficulties Indonesia faces is that the country consists of 17,000 separate islands, so organizing physical meetings is expensive. Indonesia believes that using electronic communication is the solution.

So they would link their science communicators together electronically, and allow them to talk to each other, ask questions, and tell others about successful events they had held by email. This may be a solution for Vietnam, with a strongly connected community (in Ha Noi, certainly, but what about rural areas?).

Example C.
Training scientists in talk to the public about their work
In an ideal world, communication should be a natural part of the scientific process. But in the practical world we all inhabit, it's clear that some aspects of the communication process take a special effort by scientists and research organizations. The most difficult element in the communication process is dealing the public, and this is often regarded by scientists as an extra task which interferes with the real work of research.

Scientists are comfortable communicating, but only to some audiences. They spend much time writing papers for publication, giving seminars, attending conferences and symposia, and emailing and meeting with colleagues from home and abroad. All these activities are forms of communication, and scientists do them willingly—partly because they like doing them, and partly because their advancement in science depends on it.

The audience they are least comfortable dealing with is the public. The public is unpredictable. Members of the public may have views, prejudices, superstitions and attitudes founded on a poor understanding of the situation. They have unrealistic expectations about what scientists can do and how long it will take. They have little appreciation of the scientific method, or the way scientists conduct research and debate results. Scientists fear that dealing directly with the public can cause them to lose credibility with their colleagues, because it requires a degree of simplification and because they may be accused of publicity-seeking.

The public bears some responsibility for these difficulties. Instinctively they steer away from science, because they don't understand it, because they think it's difficult, because they have bad memories of science lessons at school, or because they're alienated from science. People tend to think that scientists are somehow 'different', and not from the ordinary world. When scientists are portrayed in fiction—in films, for instance—they're often painted as strange creatures. Cartoon scientists are old men with weird hair, working in isolated and ramshackle laboratories. Their experiments are characterized by explosions, failures and bad smells, and their language is incomprehensible. They're often portrayed in negative

terms, as misguided or evil, or as mad, bad and dangerous to know. Occasionally they save the world, but more often their reckless experiments bring it to the edge of disaster.

Scientists are aware of this view of science, of the stereotypes that exist about themselves. For example, scientists participating in focus group discussions felt that the public saw them as 'boring men in white coats in a world of their own, people whose actions and motives are to be regarded with suspicion or distaste'.

These prevailing cultural attitudes allow people to accept placidly their lack of understanding of science. Many are quite willing to laugh away their lack of numeracy or science skills ('I never could do maths or science at school!') but would be very embarrassed to admit they couldn't read or write.

In the views of some scientists, it's unfortunate that funding for science and the acceptable boundaries for science is influenced by this same public. In Australia – and probably in many other countries - scientific research is largely managed by government. It is the Government that determines budgets and allocates funding; they set research priorities, and limits on how far science can go (for example, in stem cell research or genetically modified crops). So, if scientists want to increase research funding or influence legislation, they need to get the public to support them.

Scientists have another reason for working with the public. Some research will have direct implications for the general population and affect the way people live their lives. When this research is put into practice, people may need to change their behaviour. Scientists need to explain what they've found out and the implications of these findings for ordinary citizens. This can result in warnings or advice to the public: eat less fatty food, reduce water consumption, don't drive after drinking alcohol, change farming practices to increase crop yields, preserve a threatened plant or animal species, don't tip raw sewage into a river or the sea, prepare for global climate change. Other research will come up with new and better ways of doing things, and the public needs to adapt to these new technologies to take advantage of scientific advances. Examples include the mobile phone, inoculation against disease, electronic banking and the internet.

So one activity of science communication is to train scientists in communication skills. China, for instance, has an ambitious program in this area. It runs workshops for scientists across the country, introducing them to journalists, and teaching them how they should deal with the media.

These workshops are based on a model workshop we ran in Beijing for CAST, the Chinese Association for Science and Technology. They invited us to Beijing, recruited a small group of scientists with good skills in English and three journalists, one each from radio, TV and print. We ran a trial workshop for this group over one day, and there were many observers in the room; and now the Chinese have adapted our program so it is suitable for their circumstances and use it across the country.

We – Jenni and other members of her staff, and myself – have now run workshops across Australia and in many other countries: India, Malaysia, the Philippines, Papua-New Guinea, Thailand, Vietnam, Uganda, Colombia, Saudi Arabia, Kenya and Indonesia. They are all

about training scientists in communication skills: working with journalists, or how to stand up and speak to different audiences, or how to write for groups ranging from farmers, policy-makers and the general public, to other scientists.

Let me give you the example of our media skills workshops.

The workshops normally run for one day, 9 am to 5 pm, with a maximum of 10 (or perhaps 12) scientists participating. They are very practical: all the participants will be interviewed at least three times on their story. They are also informal: we encourage the scientists to ask questions and to discuss issues that arise. It is not a series of lectures but discussions and practical exercises.

The participants are seated around tables arranged in a hollow square. We have a data projector and a whiteboard, and bring a video camera and provide a booklet of notes. We always use two presenters to keep up the energy levels and stop our participants becoming bored.

Scientists really enjoy meeting journalists and working out how to explain their work to them. Most journalists in Australia have degrees in the humanities or social sciences. Three working journalists come into each workshop, one each from television, print and radio, and we like to get a mixture of journalists, some specialising in science stories and other general journalists who might cover any story: an election, an earthquake disaster, a murder – or a science story. It is important for scientists to learn to tell their story to both specialists and non-specialists.

Each journalist is in the room for a period ranging from 90 minutes to 3 hours, and each session begins with a conversation. We ask questions such as:

- How many stories do you do each day?
- How do you choose the stories? Where do the ideas come from?
- How long does the interview with a scientist normally last? What questions do you ask?
- How do you get all the pictures and footage you need?
- How long is a typical story?

After this conversation and a chance for questions, the journalist, the camera and one of the presenters now move into another room. Each of the participants comes out in turn for a 5 minute interview, with individual feedback and advice on how well they went. This is where the journalist gives tips to the participants on how to answer questions: it is important to speak with authority and also to be enthusiastic about the research. What mistakes do scientists make when they are interviewed?

At 11 am the second journalist comes into the room. They will be from the print media, usually from the largest newspaper in that city. This session begins with a conversation about the practicalities of the day of the journalist, similar to the conversation with the television journalist.

While the interviews are taking place in the second room, all the other participants will be discussing other matters such as how to handle difficult questions from an aggressive journalist, or interviews on controversial topics such as environmental or safety issues, or genetically-modified organisms in food.

Journalists are quite likely to ask questions like this because many scientists work in controversial areas. Scientists have to be very careful in responding to these questions. We teach them that they need to consider carefully what they want to talk about before the interview starts. They need to have a straightforward message with two or three key points because journalists do not have the time or space to broadcast a complicated message with lots of detail.

After the third journalist, from radio, the last task for the participants is to complete an evaluation form. Did they enjoy the workshop? What as good about it? What would they change? By this time each participant has been interviewed by each of the journalists.

The workshops have been very popular in Australia, but they have also worked well in all the countries. Scientists particularly enjoy meeting journalists but are surprised that they often need to find a new way of telling their story, because journalists are more interested in the *effects* of their work than the way the scientists conducted the research.

Media skills workshops are one part of the solution to encouraging a greater dialogue between scientists and the public. This is an important discussion because many of the solutions to major problems in our societies have a scientific basis. Science can help people on the environment, health, agriculture, food, energy and other issues. But it is important for scientists to hear back from the community, to listen to the concerns people have, to discuss opposing views. Unless this dialogue takes place, the effectiveness of our scientists will be compromised.

So, Dr. Tran Quang Tuan, perhaps I have not answered all the questions you raised with me. But this is a lot of information, and now I would like to hear from you and your colleagues.

What is most important to you? How do you think science communication can help you in Vietnam?

If you have any questions for me I would be very happy to answer them

Before I finish I should like to invite you to attend the PCST Conference in Istanbul in April next year. I would also like to invite you to look at our web site: www.pcst.co, and to join our international discussion list. This is free, and will allow you to join an international discussion on science communication matters.

Toss Gascoigne

Toss Gascoigne was elected inaugural President of the PCST Network in 2006. He works at the interface between politics, science and the media. He served as Executive Director for the Federation of Australian Scientific and Technological Societies (FASTS); and the Council

for the Humanities, Arts and Social Sciences (CHASS. He has co-authored studies on the attitude of scientists to the media, on the way journalists regard scientists, and on scientists commercialising their research. He is now a life member of the PCST Network and the Treasurer of the organization.

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