



HOUSE OF LORDS

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The Select Committee on Science and Technology

Inquiry on

GENETICALLY MODIFIED INSECTS

Evidence Session No. 2

Heard in Public

Questions 16 - 25

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Witnesses: Sir Roland Jackson, Professor Sue Hartley and Dr Sarah Hartley

USE OF THE TRANSCRIPT

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Members present

Earl of Selborne (Chairman)
 Lord Cameron of Dillington
 Lord Fox
 Lord Hennessy of Nympsfield
 Lord Hunt of Chesterton
 Lord Kakkar
 Lord Krebs (co-opted)
 Baroness Manningham-Buller
 Lord Maxton
 Duke of Montrose
 Baroness Morgan of Huyton
 Baroness Neville-Jones
 Lord Patel (co-opted)
 Lord Peston
 Viscount Ridley
 Lord Vallance of Tummel

Lord Taverne

Examination of Witnesses

Sir Roland Jackson, Executive Chair, Sciencewise, **Professor Sue Hartley**, President Elect, British Ecological Society, and **Dr Sarah Hartley**, School of Biosciences, University of Nottingham

Q16 The Chairman: Could I welcome you to this next session? Thank you for joining us. We are being broadcast, just for the record. Would you like to introduce yourselves for the record? If anyone would like to make an introductory statement, please feel free to do so.

Professor Sue Hartley: I am Professor Sue Hartley. I am president elect of the British Ecological Society. I am also a professor of ecology at the University of York. Between 1999 and 2006, I was a member of the Advisory Committee on Releases to the Environment, and I chaired their working group on post-market environmental monitoring. I was also an ad hoc expert on the GMO panel of the European Food Safety Authority between 2004 and 2009.

Dr Sarah Hartley: I am Sarah Hartley. I am a research fellow in the School of Biosciences at the University of Nottingham.

Sir Roland Jackson: I am Roland Jackson. I am executive chair of Sciencewise, which is a programme funded by the Department for Business, Innovation and Skills, so I speak here on behalf of the experience and expertise of Sciencewise. I should say that I am not a civil servant, and I certainly do not speak on behalf of the Government. I should add that I am also a member of the management board of the Industrial Biotechnology Catalyst, which to

my knowledge has not funded work directly on GM insects but does fund other GM research and translation activities. I am a member of the Nuffield Council on Bioethics and—I think this relevant to this inquiry—I am the chair of the council's current project on naturalness, understanding how the concept of naturalness is used in public and ethical discourse about biotechnologies in particular.

The Chairman: We will later be taking evidence from the Nuffield Council on Bioethics, so that will add to today. If none of you wants to make an initial statement, shall we go straight into our questions?

Q17 Lord Krebs: I would like to start with a very general question for all three of you, which is to give us your insight into what level of public awareness, understanding or concern there is in relation to GM insect technology, as opposed to GM crops. We know there has been a lot of investigation of public opinion and so on, including the Government's own GM Nation? debate a few years ago, in relation to crops, but has there been anything similar in relation to insects?

Sir Roland Jackson: As far as I know, the simple answer is not very much. It certainly has not appeared, for example, unlike GM crops issues, in the Public Attitudes to Science survey or generally. There has been quite a bit of media comment and reporting about it, but no significant structured public information and engagement in that sense, or dialogue in terms of listening to what people think about the issues. There is one exception, which is in your evidence given by the Pirbright Institute, which ran an event, to which it gives a link in the evidence. About 70 people attended. They know who the audience was, but they do not report it in the report of the event. Looking at it, it was a self-selected and quite knowledgeable audience, but interestingly it raised quite a lot of the generic questions around biotechnology that you would expect in any biotechnology, not just GM insects.

Professor Sue Hartley: Just to reinforce that, there has been far, far less engagement so far on GM insects, but I think that is beginning to start now. The Pirbright Institute meeting was held at Charles Darwin House and partially funded by the British Ecological Society. So far, it is probably fair to say that things have been a little ad hoc and quite localised compared with the much more comprehensive efforts on GM crops, but I think it is rising up the agenda and we are starting to see articles on BBC News webpages and so on, so I am sure that more is going to happen.

Dr Sarah Hartley: In the last five years, media articles have been increasing on GM insects, but for the most part those articles deal with the scientific aspects of GM insects, and there is very little debate around the governance issues or the issues we might think the public will be concerned about. That really has not changed. We have seen localised public engagement exercises within the regulatory processes, where specific applications are made for releases. We have seen one in New York State, with the release of the GM diamondback moth. That is an Oxitec and Cornell project. We have seen some debate on GM insects in the development of the EFSA guidance in 2013; a public consultation was held then and there was certainly some discussion about insects in that. These are localised pressure points where public concern has the opportunity to emerge.

Lord Krebs: Would you mind, Lord Chairman, if I just ask a follow-up question to Sir Roland Jackson in particular, although others may wish to comment?

I notice in your written submission you talk quite a lot about dialogue as a method of eliciting public responses and public views. I just wondered whether that is the approach you would advocate in relation to GM insects and we are going to start on developing an approach to public understanding, and, if so, how you go from the rather small scale of a dialogue, or even the event at Pirbright, which involved 70 people, to thinking about the view of the nation as a whole. How do you link the small to the large?

Sir Roland Jackson: It depends very much what you are trying to do, because any process of public engagement should follow the purpose of that engagement. If you are trying to inform a wide public about the underlying science, different perspectives on GM insects, then that requires one type of engagement. If, as a government department, as a regulator, as a scientific institution, as a funder, you want to listen and understand what issues the public brings to choices about research and development for GM insects, that is completely different. Those sorts of things, where you are feeding public discourse into policy and funding decisions, can be done, amongst other techniques, through these deliberative approaches; they are particularly suited to that. As I say, it very much depends on your purpose.

Q18 Lord Hunt of Chesterton: At a previous session, we noted that there is concern about using the name “GM insects”. The House of Commons inquiry felt that there might be a different title. In some countries, there is a different usage; they look at the output and the net result, rather than the scientific process involved in it. GM has all this history behind it. Is that a useful part of the public debate? Do you think we could focus on the product, that these are vaccines, cures or help the development of plants, rather than using this very scientific word, which people do not understand and gives them all the shakes?

Professor Sue Hartley: There are number of facets to our terminology, and I agree with you that it can be very damaging to the public debate if people get too fixated on terminologies and technologies, but we have certain regulatory and legal requirements that require, at the moment, things to be acknowledged as genetically modified if they are, and that has quite a strict definition. That said, my personal opinion is that moving away from the technology and thinking more about what the technology is designed to deliver, its aims, its benefits, its risks, its impacts and the need for that technology, is probably quite helpful.

Thinking about things as GM and therefore bad, and non-GM and therefore good, might not make a lot of sense when you are talking about impacts that could be delivered in either way. If you take what we are thinking about today and apply it to sterile insects, for example, they can be produced in an entirely non-GM way. Certainly some countries have a different approach to regulation. In Canada, for example, they look at the novelty of a trait, rather than how it is produced. We are where we are in terms of UK regulation and EU regulation, which is our jurisdiction, so we have that to deal with, but if we can engage in a bigger discussion about what these technologies do rather than exactly what they are called, that might be quite helpful.

I know we are talking about insects today, but as techniques develop it is now very easy to do lots of different sorts of modifications to plant genetics, for example, so the terminology is getting ever more sophisticated and confusing.

Lord Hunt of Chesterton: In terms of organisations—I should not call them “campaigning organisations”—that are concerned with the public dimension, which as I understand it is

your interest, and Sir Roland's and Dr Sue's, do you feel there is going to be some public debate about this that will help the Government perhaps to change its view or develop a different terminology, or are you just going to accept the current framework and make the best of it? The framework is wrong, is it not? It is misleading to people and it is causing all these difficulties.

Professor Sue Hartley: I am not sure it is entirely fair to say that the framework is wrong. We have to do a lot more to engage the public in that framework, and my colleagues will comment here, because that is really their area of expertise. One thing that has driven the debate on genetic modification is that the public have not been sufficiently engaged at an early enough stage.

Lord Hunt of Chesterton: "Framework" was the wrong word. "Terminology" is the word I was looking for.

Lord Fox: Slightly following on from that, I have engaged in a little non-scientific public engagement on this, since I knew that we would be discussing it. The public, whilst not having a knowledge of gene drive versus self-limiting, do have a received understanding of the introduction of non-native species and non-native organisms into an ecology. Generally, they understand these as the law of unintended consequences. The words "grey squirrel", "cane toad" and "Japanese knotweed" crop up spontaneously quite quickly. I wondered, in your sense, whether in fact we have to take that wider cultural understanding about the introduction of new creatures into environments if we are going to explain and indeed get assent from the public.

Sir Roland Jackson: I would say absolutely. This is summarised in our evidence. Looking at a range of public dialogues and other engagement activities around GM crops in particular, because there has not been much around GM insects, it is quite clear that there is no evidence of overwhelming intrinsic opposition to GM. Public concerns are very much conditional, including along the lines that you have mentioned. Clearly, safety and how that is assessed—I am sure we will come to regulation of it—is a starting point. So is this question of novelty. The technology is being sold to us as novel; that is exciting and people find it exciting. It is also slightly worrying, and when scientists turn around in the same breath and say, "Yes, it is novel, but of course we know how to manage it and regulate it", there is a slight mismatch there.

People worry about sustainability, uncertainty and ignorance. They ask, "Do scientists really understand the ecological complexity of these things?". People are not stupid. They know you have unintended consequences. People ask about the wider socioeconomic issues. They know that the introduction of a technology is not just about the science; it is about how it affects social structures, how it affects cultures, how it affects jobs and economies, so decisions have to be taken on broader grounds. People worry about governance and regulation. As we heard in the session earlier, there is a sense that these fields are moving very, very quickly, and if you look at the Public Attitudes to Science survey, the majority of people agree with the statement that it is moving too quickly for government to be able to regulate properly. There are legitimate concerns that go beyond the science and the risk assessment, and we need those discussions earlier on about GM insects before we get into any discussions about regulating a particular example. It would be safe and sensible, and a risk-management strategy, to do so.

Q19 Lord Maxton: First, can I just say, like Lord Peston, that I have no interest to declare whatsoever? Unlike Lord Peston, I have never been asked either. My question is a simple one. The link to the public knowledge of what is a very complex science, both yours and crops, is of course the public media. Are you happy with the way in which your science and the science of insect biology, et cetera, are covered, and crop is covered, by the British media?

Professor Sue Hartley: Shall I start? Yes—the media.

Lord Maxton: The *Sun* headlines.

Professor Sue Hartley: I would make a couple of general points first. It is important to recognise that the public can engage very effectively, even though they may not understand the science fully, because there are still the wider cultural, socioeconomic and value criteria that the public can engage with. As we heard a moment ago, they recognise the bigger picture, so that is a good thing. The other thing that is quite good is that, funnily enough, I think a climate of scepticism is actually quite healthy. As scientists, being challenged is a very good thing. As tempting as it is to say that the media have not been helpful, there is a responsibility on scientists to communicate clearly and effectively, and they often do not. We cannot blame it all on the media. Also, the pieces I have seen on the BBC about GM insects have been very accurate and balanced, so I think things are improving, and it is important for the science that they improve, but it is also important that we have that healthy debate and extensive public engagement.

Q20 Lord Cameron of Dillington: I have to declare an interest as a farmer, a Lawes trustee at Rothamsted, chairman of the advisory board of the Centre for Ecology & Hydrology and chairman of the strategic advisory board of the Global Food Security programme, which is a government-research co-ordination programme.

The danger of asking the second question of the session is that your question has been asked before by almost everybody, so perhaps I can put my question in a different way. There has undoubtedly been a big brouhaha about GM crops and polarised opinion, but from our research on the Global Food Security programme, when you ask people about genetic modification in the health industry, of antibiotic clusters and so on, the basic summing-up of the answer is, “Get on with it. Why are you waiting? Get it to us as soon as possible for the benefit of human health.” Now it seems to me that with insects you have both sides, have you not? You have agriculture and health. I just wonder what lessons can be learnt from perhaps both sides of that debate and how we can make certain that both sides get acceptable to the public.

The Chairman: I wonder if Dr Hartley would like to address that, because, particularly in your written evidence, you refer to some of the wider issues than just the scientific evidence.

Dr Sarah Hartley: To bring in an answer to one of the previous questions, where we have seen public reaction to insects there is also a sense of powerlessness at the moment, because the debate is so framed by the science. The only opportunities that the public have to engage on GM insects have been in scientific terms, and they have not been allowed to debate these broader issues—what we sometimes term governance or political issues. The science-based regulatory framework certainly privileges some at the cost of others, and it privileges those with scientific expertise at the cost of these other political issues. Certainly

when we look at the kinds of documents that the public are asked to comment on within these scientific processes, they simply do not have the expertise to be able to contribute meaningfully to the risk-assessment stage of the regulatory process.

The panel talked earlier about the difference between health and agriculture. Certainly we suspect that within Europe the agricultural applications of the insects will come through first. In the Brazil case, the public were on board. There was practically no public opposition to the GM mosquito in the fight against dengue in Brazil. There was certainly great political will at every level—both at the state and the federal level—for the GM mosquito. That kind of political will and the engagement of publics in actively fighting dengue in their communities on a regular basis put them in touch with the problem that they were facing.

In an agricultural context, it is going to be much harder, not just on the back of the GM crops crisis but in general. The problem is not so clear to the public, and this comes back to your earlier point. We can talk about the term “genetic modification”, but if we talk, as Professor Hartley said, about the problem at hand and bring the public into finding solutions to that problem, GM insects may be part of that solution. However, we will have to approach agriculture in a different way from health.

Professor Sue Hartley: To follow up very briefly on that, that is absolutely right, and the key thing for the public is who benefits and the need for this technology. With agriculture, people fail to see why we need to do this kind of tinkering: the crops are in the fields, the food is in the shops. For medical needs, people can see that this is appropriate, can benefit them and will lead to some real advances that might not have been possible by other techniques. I think back to when I was on ACRE and our agendas were first made public. We had on the agenda an application for a small field trial for GM wheat and several applications for GM vaccines. The postbag absolutely bulged with public objections to the GM wheat field trial. No one made a comment on the GM vaccines, although, from a risk-assessment point of view, they were much more problematic.

Q21 Lord Vallance of Tummel: Who is responsible for orchestrating this public debate? Where does the initiative lie? At the moment, it seems to be up in the air. Who should be doing it and how should it be done? A linked question is: where do the NGOs sit in all this? Are they helpful, or are they demonisers?

Baroness Morgan of Huyton: Which NGOs are engaged? Is it the NGOs that are involved in the ecology space, or is it NGOs that are currently involved, for example, in providing mosquito nets in sub-Saharan Africa? How widely do we draw partners into the debate?

The Chairman: Let us have an answer to that. I should just note that of the written evidence we have had, we do not have a lot of evidence at all from the NGOs, which is in itself quite interesting. Would you like to respond?

Sir Roland Jackson: Who leads or orchestrates any public debate or dialogue or whatever depends on who wants to listen and what the purpose of that listening would be. That gets us to questions of how the regulatory system works, which you dealt with in your previous session. The regulatory system is very much couched, rightly, around questions of risk to human health and the environment, and a science-based assessment of those. We have had a call in a lot of the evidence mentioned this morning to assess benefits against risks during that process. My response would be that benefit is not the opposite of risk. The opposite of benefit is disbenefit or disadvantage. Questions of benefits encompass a much wider range

of issues than the question of science-defined risk. If you are to have a system that looks at benefits as well as risk, you have to look at wider disbenefits—things like impacts on employment, ways of farming or landscapes, which are not dealt with in a risk assessment.

Then it becomes a question of how you get that sort of discourse, and what sort of institutions would listen to that sort of discourse. There are several possible loci for that. It could be government looking to frame decisions about choices for allocation of funding or policies around funding. It could be research councils or Innovate UK looking at how they prioritise particular activities and allocate particular funding. It could be a regulator, like ACRE, although I am not sure if it would be possible, under its current constitution, to look at those broader issues. However, if regulators are looking at those issues, they would need very different expertise on them from that they currently have. They need much wider social science and other people to take account of these broader issues. The simple answer is that it depends, and it depends on who is listening.

Lord Vallance of Tummel: I am asking something very specific; I am talking about GM insects, which is our agenda today. Who is responsible for starting off the debate? You have given us three could-bes. In whose in-tray does it sit?

Dr Sarah Hartley: It will depend on whether it is a health or agricultural application, first, but certainly Defra would be a key agent in establishing public dialogue outside a science-based regulatory framework. ACRE does not have the remit to consider those broader issues, and certainly within the European regulatory framework we do not have an opportunity to discuss those issues. That is why the reform of the regulatory system in Europe has taken place: to allow member states to reject GM crops on an individual basis outside the scientific system that EFSA manages.

We have learnt from GM crops that there is a need to discuss those political issues. Defra would be an obvious first choice. It would depend on the purpose of the engagement: whether it was to steer the direction of research towards social needs and to increase the potential social impact of the research, or whether it was to test public perceptions and bring the public on board, in which case you may want to engage BIS if it is more industry-focused. It would depend.

The Chairman: I would be disappointed if our final report does not clearly identify who should be owning this problem. I think that is one of our issues.

Lord Patel: My comment is in relation to the answer that Dr Hartley gave to Lord Fox's question. You felt that the discussion on GM insect modification for agriculture would be much more difficult than for health. When we think about and discuss the harm and benefits, we have to put it in the context of what harm the current technology might be doing regarding increasing crop production, for instance insecticides. The science now clearly shows that some of the insecticides used for improving crop production are doing a great deal of harm to non-human organisms and humans, and bees might be one of the examples from the recent science that came out of Berkeley University. The debate must include the harm and benefits of the current methodology and science compared with insect modification.

Dr Sarah Hartley: I might even go one step further and expand that out and say that perhaps we need to look at the problem of agriculture more generally and crop protection. If you look at the potential solutions that we have, right now we have a very insecticide-heavy

solution to that problem. We are suggesting, with GM insects, that we may have a better solution to the problem of crop protection.

Professor Sue Hartley: That is very true. This is a really important point, and it goes back to our earlier discussion about the terminology and “GM good” and “GM bad”. We have to set this against the wider context of what else we are doing to the environment. There may be some applications of GM that have environmental benefit. Equally, in comparison with what we are doing at the moment, there may be some that make things worse, and this is why this case-by-case assessment of impacts is so important. At the moment, we are probably not paying sufficient attention to the other modifications that we make to our environment.

Going back to the NGO engagement, this is where there might be a very interesting debate to be had. I held a workshop at the University of York on potential new applications of GM crops that were of benefit to agriculture in the global south—to developing economies and areas where farming is really struggling. Friends of the Earth were joint organisers of that workshop, because they felt that maybe now is the time to get away from this polarisation and to look at what the technology can deliver and whether that is beneficial or not—and, indeed, beneficial to whom? I think that is a huge concern to the public and where GM crops may have lost their way a little, in that the beneficiaries were thought to be multinational companies rather than farmers in India, for example.

Q22 Baroness Morgan of Huyton: That leads in quite nicely to my question, in a sense, which is: to what extent do you think public concern is about industry, and particularly big industry, more than the technologies themselves? Building on the previous conversation, is one of the lessons that we should be taking that we have to pitch the conversation at a higher level? I was quite disturbed, Dr Hartley, when you said, “This bit could be Defra and this bit could be the DoH”. Is there not a case for a much bigger, higher level conversation? Arguably, we have had that as a country around the use of stem-cell technology. Of course, there are detailed scientific conversations happening as well, but the public has engaged at a higher level, I think. Is that possible with this technology, and could it mitigate some of the concerns there are about industry?

Sir Roland Jackson: One of the issues is: why privilege one particular technology and one very specific aspect of the technology? The message from all the public dialogues around these contentious issues is: start with the problem that is of public interest. You may well find that GM technologies offer one solution or a set of solutions to that, but look at them in context. Lord Cameron mentioned the Global Food Security programme. I ought to state another interest in that I am chairing the oversight group for the public panel for the Global Food Security programme, which is a standing public panel that helps the programme look at some of these wider issues. It is interesting that when the debate is framed around broader questions of food security, questions about GM arise perfectly naturally but in the context of everything else. It does not make it any easier to say who the owner is, but that is a sensible way to have the discussion.

Dr Sarah Hartley: Often when we talk about public debate, we see this homogenous public at one side, whom we want to somehow engage with, but there are other ways of doing that. We can pluralise the kind of expertise that we have in some of the committees and governing bodies that we have, and at the research councils; Sir Roland will talk about that at some point. Certainly the WHO guidelines have been very clear about engaging stakeholders and publics at the research project level, and this is where responsible

innovation can help us. There are lots of opportunities throughout the innovation process—from the conception of the research right through to the kind of high-level public debates we are talking about—where we can engage with that homogenous, disinterested public. Also, there are lots of pressure groups, civil society groups, that have expertise that those projects would benefit from, understanding the kinds of concerns that are out there from experts who are not necessarily scientists in that field.

Q23 Baroness Manningham-Buller: I declare an interest as chair of the Wellcome Trust. In your answer to Lord Cameron, Professor Hartley, you said how much easier in this country it was to address health benefit as opposed to an agricultural benefit. Of course, that distinction between the health benefit and the agricultural benefit is absolutely not there in much of the third world. Can I have any of your observations on the difference between how we engage the public as to what we need in this country and in our compassionate response to the needs of the third world? There are going to be different attitudes. By the way, we have already covered the question I was scheduled to ask. I am more interested in this.

Professor Sue Hartley: That is very true. The important thing is to come back to what we have said all along. If we focus on the problem, we can then identify the most appropriate technology to address that problem, which may or may not be GM, depending on a whole suite of things such as the receiving environment that we want to operate in, what kind of agriculture we are talking about, what kind of crop, what kind of disease and so on. What was interesting and what emerged very clearly when I held this workshop at York—which involved GeneWatch, a large number of pressure groups and some of the cutting-edge researchers who were doing things like working on improved photosynthesis in rice—was that once you focused on the problem and the technology became a little secondary, people moved together much more. I think the public are able to recognise very clearly the issues in the global south. We only have to watch how much they donate for mosquito nets during Comic Relief and other charity events. They want to see these problems solved. That can be a starting point for engagement.

My colleagues know more about how best to develop that engagement than I, but I would say that one key factor is identifying an honest broker. That, I think, is what the public want to see. We have had issues before where there has been an appearance of vested interests in charge of the process, whether those are multinationals or scientists who do not want to discuss things openly and transparently, whatever the interests are. Everyone brings their values to a conversation, and it is about how to identify the best, most open and transparent way to have a conversation in which all voices are heard.

Lord Fox: In an earlier answer, Sir Roland, you put a question in the mouth of the public: do scientists understand the complexity of this? I suspect the answer to that is touched on by some of the discussions we had in the previous session, instigated by, I think, Lord Hunt, over whether sufficient research is going into ecology, but also whether the advent of gene drive versus self-limiting also opens up a whole new level of understanding that we require in other issues. Where are we in the level of understanding? How sincerely can we answer that question when the public ask it?

Sir Roland Jackson: I am not competent to answer that one.

Lord Fox: I am looking at all three of you.

Professor Sue Hartley: Thanks, Roland. I guess the overarching question is whether we understand enough about the ecological consequences of these technologies, and I guess the question is whether the public understand it and whether we, as ecological scientists, understand it. Of course, there is always the issue of just how much prior knowledge is sufficient before you do anything, which is a vexed issue in itself.

It is fair to say that we do know some things about the ecological consequences of GM insects and the different ways of producing them. We have done a lot of lab work, we have done a lot of modelling work, and we are good at modelling population consequences in this country. However, we have not done a lot of field trials. We can learn a little from where field trials have been conducted, but it is fair to say that we have rather more theoretical research than practical research at the moment. What might hold us back is that although we have a good knowledge of the ecological processes that are going to be at work—things like competition and impacts on food chains and food webs—it really is quite hard to generalise, partly of course because the technology is only one of the factors that is affecting outcomes. The nature of the species concerned, its lifestyle, its lifespan, its ecological environment—things that it feeds on and feed on it and so on—are all going to have an impact. There are a lot of indirect effects, and predicting those is a little more challenging than we might like. However, I would say that we have some good knowledge as a basis and more fieldwork would be helpful.

Lord Fox: Looking at Dr Hartley, how much of that answer is going to affect people's reaction—public perception—to this technology? How convincing does it have to be? How much does the ecological outcome really affect the acceptance of this technology?

Dr Sarah Hartley: It is definitely a factor, but I do not think it is the most important factor in public concern. The way this technology is governed will be more important.

Q24 Lord Peston: My question follows from what Lord Vallance asked some time ago about public debate. I am not persuaded, let me say, about this. Public debate legitimises the activities of the vast group of people who are anti-science and anti-technology. If you can conduct a thought experiment, there was a patent clerk sitting in an office in Switzerland over 100 years ago who was about to publish a paper on special relativity. If there had been public debate of the sort that you appear to think is a valuable thing, they would rather he had been shot, because the ultimate result of that was the atomic bomb and so on. In other words, we must not use this as a paradigm case that legitimises one of the greatest glories of our civilisation, which is natural science. Equally, we are rich because of technology. We are not rich, despite all talk of the Chancellor, from working harder; we are rich, because overwhelmingly we have made technological progress over the last 100 years. I am deeply troubled by your comment that this particular case is especially worthy of public debate. I am not saying that we should suppress public debate, but legitimising the anti-scientists is not something I would want to be a party to in any way—and I hope you would not either.

Sir Roland Jackson: I have a couple of things to say. I am not sure we have specifically said that we think there should be a massive debate about GM insects. We have probably said the opposite: that it should be done in context. I would also seriously challenge the view that the public is anti-science. It is absolutely the reverse. If you look at the Public Attitudes to Science survey work, the vast majority of the public, 85% to 90%, think that science has done wonderful things for us and is wonderfully beneficial. Eighty per cent would like the Government to fund basic research, even if it has no conceivable or obvious outcome. There

is huge public support for science and research. There are issues around the application of specific technologies, not all technologies. Because technologies interfere in social and cultural systems and employment, they are bound to be political. How political they are and the ways in which they are political depends on the technology. It so happens that GM is one of those technologies. It digs into people's ideas of naturalness. It has all these questions about motivations and purposes, balancing risks and benefits. It is just one of these things that by its very nature is social and political. You have to debate that, and you have to debate it before you start regulating it.

Lord Hunt of Chesterton: Can I put to you, in a way, the comment that comes from Lord Vallance? In the last 40 years, there have been two enormous scientific government outreach programmes. One was on AIDS, which was an enormous programme, which was accepted. The second one was climate change. Lord Vallance asked who was responsible. A very remarkable thing happened. A government department, Defra, went around the country having huge numbers of meetings. East Anglia was going to be underwater practically by now, the way it was being put. It was rather extreme, perhaps, but it was a huge programme, run by government, and you had all sorts of other organisations coming to these meetings up and down the country. Everybody accepted that we were dealing with a massive problem. It seems to me that there are precedents of a government department grabbing an issue and then working through it all over the country.

First, is this question of insects and plants on the same scale that requires that kind of national debate, or is it, if I may say so, a sort of series of functional debates, with the applications, but broadly co-ordinated? It seems to me that it would be quite interesting to know how big a scale this should be, and whether these previous examples are useful analogues?

Dr Sarah Hartley: At this stage, with GM insects, what is needed is an engagement perhaps even with expert publics to start with on where we might want to channel this technology. What are the kinds of problems that we encounter within the UK, in the agricultural or health systems, where this technology might play a role? That is where the concept of responsible innovation comes into play: this interaction between external stakeholders and the research community. There is a technology that has ability and potential, and then we have these societal problems. We need to marry those two together. This, I think, will help us in the future to deal with potential public concern, because the benefits will then be clearer. At this stage in the technology's development, that would be more beneficial than a more open public debate.

Professor Sue Hartley: That is exactly right, and one of the lessons from GM crops is having those debates early on and being realistic, open and transparent about what the technology can do and what it cannot do. That is something that we sometimes neglect to talk about.

Baroness Neville-Jones: It seems to me that this discussion reveals that intelligent and meaningful public involvement in the context of disruptive technologies is really quite important, otherwise things can go off the rails quite easily. It also seems to me that it should be embedded in what has come to be known as responsible research and innovation. Can you think of an example—bearing in mind the whole question of scale—of where that kind of engagement was really intelligently conducted? Is there a good possible paradigm example of where it has been done well that would help us and that could act as a model?

Sir Roland Jackson: There are a couple I can think of, one at the very early stage and one at a later stage. The discussions about synthetic biology were mentioned in the session before, and it was very positive that the two research councils—BBSRC and EPSRC at that point—commissioned that public dialogue, and the two chief executives wrote an open letter afterwards to the participants saying what they would do in consequence. A lot of those things have been followed through. I think it is still too early to tell whether sustained engagement is continuing in the right way, but it started right.

Much more at the applications end is the whole raft of consultations, including public dialogues and other surveys, that happened around the debates on mitochondrial replacement, on which, of course, both Houses of Parliament voted. That, again, is an example of a wide variety of engagement methods and scientific analysis and evidence being brought to bear and a judgment made in Parliament, as the ultimate body, as to the right thing to do. Both of those, in very different ways, are good examples.

Baroness Neville-Jones: That is very helpful. How much does it matter in all this that the scientists to whom people would turn have to say, “I do not know the answer to that question”? One thing that seems to emerge is being able to answer the questions, but there must be instances where you do not know the answer. How much does that matter, and how do you engage the public in acceptance of that being a perfectly legitimate position to be in and one that should not stop further research being done?

Professor Sue Hartley: That is a really good question. It is what I was alluding to a moment ago when we talked about what the technology can and cannot do. When people overhype technology or sound a lot more certain than they really are, it leads to a lot of problems. It is far better to be open and honest from the start about what you can say with confidence, what you can say with a bit less confidence and what you are genuinely uncertain about. You can then follow that up by saying, “Because of this uncertainty, there are certain things we should not do until we have more evidence, and this is how we might approach getting that evidence, and then there are other things we can say we are fairly convinced about and we think we should be able to move forward”. There is the IPCC approach of saying, “We are 95% confident about this; we are 50% confident about that”. It is probably a little harder to do with some of this ecological data, but we can try to do that. The key message is open, honest and transparent communication about what is known and what is not yet known.

Baroness Neville-Jones: Will that help move towards things like field trials, when one goes from the laboratory to the real world?

Professor Sue Hartley: In the end, we have to gather evidence from the real world. That is the only way some of these questions will be answered. We have to identify the point at which we feel we know enough to safely move to real-world field trials, and fortunately in some areas of the world they have already started to do that, so we can build on that experience.

Q25 Lord Patel: I have a quick question, because we have had a lot of background discussion about this. The US National Academy of Sciences set up a group to look at the state of the science related to gene modification, including all the different technologies of gene drive, gene editing and chemical—or synthetic, as some people call it—modification of genes, and what regulatory framework ought to underpin this science. Do you think we

should have a similar group? If we were to, the Royal Society and the Academy of Medical Sciences would be the kinds of academies involved.

Professor Sue Hartley: That is very sensible, and the Royal Society has done this sort of thing before. It would be an approach. One thing to bear in mind is that the UK and the US are quite contrasting in rather more ways than we probably have time to discuss right now, but that might underpin exactly how that was driven forward here.

The Chairman: I take that as a yes, I think.

Sir Roland Jackson: My response would be that it is not just a science issue, and therefore having an activity like that very publicly led, for example, by the Royal Society, might not be ideal. A broader partnership might be sensible to bring in a genuine diversity of voices. As you will know, the Nuffield Council on Bioethics has just started a piece of work involving quite a multidisciplinary group on genome editing, which will produce a framework report.

Lord Patel: That is for humans, though.

Sir Roland Jackson: No. It will initially produce a framework report, and then the plan is to work up particular examples. I would expect human germline editing to be an early one, but you would have to ask the chair when he comes in front of you in a few weeks' time.

The Chairman: As I said earlier, we will have the opportunity to talk to the Nuffield Council on Bioethics later this month. We have run out of time. We could have spent a lot longer, and I must apologise to my colleagues who have been trying to come in unsuccessfully. However, we have covered a lot of ground, and I am absolutely clear that public engagement strategies is going to be a very important component of the inquiry and the subsequent report. Thank you for giving us a very strong lead as to how this should be conducted. Thank you very much to Professor Hartley, Dr Hartley and Sir Roland Jackson.