HOUSE OF LORDS

Revised transcript of evidence taken before

The Select Committee on Science and Technology

Inquiry on

GENETICALLY MODIFIED INSECTS

Evidence Session No. 6 *Heard in Public* *Questions 56 - 64*

TUESDAY 27 OCTOBER 2015

11.40 am

Witnesses: Mr Matt Shardlow and Professor Jonathan Montgomery

USE OF THE TRANSCRIPT

This is a corrected transcript of evidence taken in public and webcast on www.parliamentlive.tv.

Members present

Earl of Selborne (Chairman)
Lord Cameron of Dillington
Lord Fox
Lord Hennessy of Nympsfield
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

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Lord Taverne

Examination of Witnesses

Mr Matt Shardlow, Chief Executive, Buglife—The Invertebrate Conservation Trust, and **Professor Jonathan Montgomery**, Chair, Nuffield Council on Bioethics.

Q56 The Chairman: Could I welcome Professor Montgomery and Mr Shardlow. We are being broadcast on the web camera. Would you like to introduce yourselves? If you would like to make an introductory statement, please feel free to do so.

Professor Jonathan Montgomery: I am Jonathan Montgomery, I am here as Chair of the Nuffield Council on Bioethics. By background I am an academic lawyer and I am Professor of Healthcare Law at University College London.

I should say just a couple of things about the basis on which I am giving evidence. I am sure many of you will know that the Nuffield Council on Bioethics is a non-government organisation; it broadly has functions which are similar to national ethics committees in other countries. I should acknowledge that we are funded by the Nuffield Foundation, the Wellcome Trust and the Medical Research Council, but under an arrangement that ensures that our agenda and opinions are fully independent. It is a five-year rolling funding programme. The council itself has about 20 members from a range of academic disciplines, clinical expertise, media and industry, but we draw a larger number of people into our deliberations, including a group of affiliates, and calls for evidence. We sometimes produce formal reports where we work through working parties. We do not have such a report on genetically modified insects but we have addressed some overlapping issues in work on genetically modified crops, the ethics of research in developing countries and, most recently, we have produced a report on the assessment of emerging biotechnologies, in 2012. I will be

drawing on the strands of recommendations and evidence from that when I answer questions.

We have two pieces of work we are doing at the moment which overlap a little. One is on the use of the idea of naturalness in public debates. Our report on that will be coming out at the end of November; I will draw on a few elements and we will, obviously, pass the report to the Committee when it is finalised. We also have a programme of work on gene editing. We did look at whether or not a particular piece of work focused on genetically modified insects was appropriate, but we identified a broader set of questions around the use of gene editing. We set up a core group which will look at some of the ethical challenges and frame some of the questions, and it is about to embark on a call for public evidence. We anticipate that will produce a draft platform report in the middle of next year and we will then look at a number of case studies, one of which may be on genetically modified insects—if you have not solved all the problems by then.

The Chairman: We will not have solved the problems, I can assure you. Thank you for that. Your report on gene editing will come out after our report; nevertheless, I am sure, as we are possibly likely to revisit the subject, that that will be the time to look at that. Mr Shardlow?

Mr Matt Shardlow: I am Matt Shardlow from Buglife, the Invertebrate Conservation Trust. We are the charity based in the UK—but we operate further afield as well—which looks after the invertebrates and the conservation of invertebrates: that is, insects plus all the other little things without backbones. Our aim is to prevent the extinction of species and to maintain sustainable populations of invertebrates in the countryside. We take a strongly scientific approach to how we go about our work; it is very evidence based, whatever we are doing, but we get involved with sometimes controversial issues where the evidence is not there, and obviously we use our charitable objectives and our ethical stance to try to guide our way through that. Hopefully, that will be relevant today beyond perhaps the simple scientific evidence that I am sure you have all been poring over and has been presented by some of your previous witnesses.

We approach GMs as we approach any other potential technology: as potentially very beneficial but also with risks, and those risks have to be managed. You have repeatedly heard people talk about case by case, and we take a similar case-by-case approach to the need for attention to the risks associated with new technologies and traits. There has been discussion about whether it is traits or organisms, and there are potentially some shortcuts around traits once those become well established, but you still have to look across risks every single time you go about releasing a new organism into the environment. While we see opportunities we also see risks, similar to a lot of work we have done in agriculture around pesticides, which I think is quite comparable. Here you have something that is released into the environment that has potential benefits and potential disbenefits, and we have learnt a lot from seeing how that has operated over the last few years, particularly how you look at benefits and how you might ethically weigh benefits against potential risks, damage and harm. That might come into some of my evidence as well.

The Chairman: Thank you very much. I am going to ask Lord Peston if he would like to start.

Q57 Lord Peston: My task is to get us going on ethical and safety questions and to introduce a general set of questions and discussion of those matters. To put it into context, I

believe ethical questions can be meaningfully discussed in the abstract and in specific cases, whereas when I was an undergraduate the logical positivists held sway and we were all told that all ethical questions are meaningless. That is certainly not my view. In due course I want to see how you approach that. The safety question, I take it, is the risk question: our attitude to risk. Again, I think one can have meaningful discussion on what is a correct attitude to risk, especially when it comes to government decision making and financing. That is the background.

I would like to ask you to outline to us, first, what are the main ethical questions that you feel both do and ought to—to produce a logical paradox—dominate this field? Secondly, would you take us on—but let us get through the ethical, first—to the attitude to risks bit, and again tell us what is your view on the correct approach to that? All this I regard as background to the way this Committee will eventually come to its own conclusions. Is that a good start for you? Who wants to go first? Professor Montgomery? Professors always go first.

Professor Jonathan Montgomery: Fair enough, even if we are not all, these days, logical positivists! At Nuffield we are nervous about focusing on the ethics of technologies, as opposed to the context in which those technologies are being considered and used. We would be, I think, encouraging you not to think that you can answer the question: are genetically modified insects ethical? What we can do is look at the range of factors that need to be taken into account in that context. First of all, we would recognise a number of contextual factors which were described in the previous session as the reason why people do it, but they are ethical goods that are at stake in decisions you might make about the use of genetically modified insects: issues around health, not just human health but also animal health; issues around food security and bio-security. They are all things that are properly described as ethical goods, as is research and promoting our understanding of the world around us. We should not ask questions about the idea of safety without also understanding where those goods fit into the decision-making process.

The second thing we would want to say is that a focus on risk encourages you to look only at a subset of the disbenefits and the anxieties, particularly the rather technological versions of risk assessments that some of the regulatory techniques encourage us to go through. Our report on emerging biotechnologies argues that these suffer partly from being very narrow in focus and partly from encouraging people to calculate things that are actually incalculable, which I think has already been touched on. They give a spurious certainty to the answer to the risk question. That needs to be linked to what we mean by safety, and we should be particularly concerned about the difference between those people who are directly affected by risk, their assessment of what counts as sufficiently safe or not sufficiently safe to make a decision to use technologies, and the broader questions about collective goods. I am sure we will come back to that in terms of the proper role of public opinion. Essentially, the question on safety is about whether or not it is worth taking the identified risks to secure the goods that are there, and we should spend some time thinking about who should really take those decisions, particularly where the decision to be directly affected may not be taken in the same place as the decision to develop the science.

I have two final observations. One is that our report on emerging biotechnologies drew attention to the importance of reflecting on the extent to which decisions we take to use or not use particular technologies tend to drive us down pathways which have consequences

for crowding out other possible research agendas. We therefore need to have a debate quite early on about these technologies versus other promising ways to look forward.

The final observation is on the debate about the proper language and approach to take in relation to uncertainty and caution. The Nuffield Council is not particularly keen on the phrase "the precautionary principle"; it is very keen on proceeding with caution and making sure that we take steps in ways we can monitor and understand better, and also to bear in mind that some ways of taking those steps are less risky and offer more hope for benefit than others. It makes sense to choose the ones that seem wiser and less risky, but we do not think it makes sense to pull a shutter down on things, following the argument that you should never take a step for fear it might work.

The Chairman: Mr Shardlow, do you want to add anything?

Mr Matt Shardlow: At a simple level in terms of our objectives as an environmental charity, we see the risks as a nested set of risks. There are ethical risks and considerations around—let us not forget this; we might pass on quickly—the fact that you are doing things to individual animals as well. For insects we may pass that over quickly—it is not as if we are genetically modifying a human being—but we should also ethically bear in mind we are doing something to an organism when we are doing this work, and that is an ethical issue which should not be completely glossed over. Stepping out from that, there are potential effects on the target species you are doing your work on and that might include, for instance, extinction. I would say that extinction is a wrong, in the way that killing a human being is a wrong. It might be something that sometimes you do, but you need to justify why you take that otherwise immoral action.

Nested beyond that, you have the potential effects on the wider environment, which you might put into three broad categories: the effects on other species through gene transfer; effects on the eco-system and the web through predator and prey relationships, and effects on the eco-system's usefulness and its beauty to us as human beings; the final one would be harm to people. That is how I would see the risk environment you are looking at around the specific potential things you need to consider, and obviously you can get much more detailed on that.

I would bring in another level of ethics here as well. You have heard a lot about the science, and the science is very important, and you have also heard people say that the European system for regulating GMO release is not working. When you quiz them further they have generally said: "The science bit is working okay but it is the political bit that is not working". We would be foolish to ignore that. The ethics is not happening necessarily at the science level; it is not necessarily happening at the risk assessment level, where, it seems to me, most are broadly happy that the risk assessments are being done in a sensible way, but the ethics is happening between the public and their politicians and is kicking in at a later stage. Some of that is not about trust necessarily just in the technology; it is about trust in the companies, the politicians and the scientists.

We need also to consider whether we are putting enough space between those different sectors, or whether to the public this just appears as an avalanche of positive scientists and industry people with a mixture of vested interests which they do not really understand but, "They are probably up to something". That is a really important part of this ethical discussion and probably one of the main reasons why GMOs in Europe are struggling to get released, even if they get through the ethical risk assessment.

Lord Peston: Can you clarify a couple of aspects of that? First of all, I had never heard of the precautionary principle until we started taking evidence, but it seems to be dear to the hearts of lawyers. I have wasted a lot of time on this—I think it is rubbish, but that is by the way and we do not need to go down that line—but what bothers me is the ethical side. Why do we not adopt a Rawlsian approach? In other words, why not say that, ethically, human life rates above the environment, and therefore the correct ethical position is that trade-off is not the meaningful approach; the approach is, "Have we done all we can to save life?", as in the poor malarial countries in the world? Then, subject to that, the environment is also important. Would either of you agree with that Rawlsian ethical position, or do you want to adopt the trade-off approach?

Mr Matt Shardlow: I can take the precautionary part and you can have a think about the second half of the question, Jonathan—I have left the difficult part to him. The difficulty with the precautionary principle is we love the precautionary principle as we define it, but it seems to me that everyone defines it differently. There is a whole bunch of people who hate the precautionary principle who seem to have a completely different definition of it from the one that I recognise. I recognise the precautionary principle as one based around risk, but based around taking action before you have absolutely conclusive knowledge; that you do not have to push the evidence to the absolute Nth degree of final certainty; that you do something about climate change before 100% of scientists say it is happening; you do something about a pesticide damaging bee populations before every single paper is absolutely in agreement. Once you have all the stages in place, the theory is there, the scientific evidence is here, here and here, and if there is not enough evidence to counter that, you do not allow a continued discussion around whether action is necessary; you get in and you take the action at that point. Some people seem to interpret it as, the moment you have some suspicion that something might not be working or if you have a vague fear that something might happen, you do not do it. That fundamentally is not what the precautionary principle was ever intended to be. I love the precautionary principle, but I seem to have a different definition from other people.

Professor Jonathan Montgomery: I was going to say something similar about the precautionary principle. I would add that there are many versions of it, so you will need to be clear if you are going to refer to it and describe the versions you think are worth talking about. We would take the view that another vice of the precautionary principle is it feels as though you only do it as a snapshot—it is a stop/go question—whereas actually, as I described earlier, there are many reasons to remain cautious even if you get the green light and go forward. Therefore, it is an attitude more than a decision vehicle. I am not quite sure I would draw out of John Rawls's work the particular issues that you pick up about the comparative value of human life and other aspects. We would probably share the view that there is an intertwining of environmental and human benefits.

In our understanding of the challenges of public ethics in these sorts of decision-making processes, we would certainly draw out some things from John Rawls: we believe that they should be governed by principles of equity, solidarity and sustainability. Our version of solidarity is recognising the importance of looking to the least advantaged in decision making, which is clearly one that draws from John Rawls's own work. That is important, because our assessment of fairness in the use of technologies tends to break the question of who is developing and exploiting the technologies from the question of who is to benefit from where it would be deployed. That has both positive and negative challenges for

technologies developed in Europe and used in developing countries; both the benefits and the disadvantages are going to be felt by people who are probably different from the decision makers. We might come back to that, I suspect, in questions. We also recognise that if you take a perspective on these decisions which recognises the long timescales, you do need to think about questions of sustainability, which includes the fragility of the ecosystems and thinking differently about those choices made that will be reversible, or will allow for a diverse ecosystem, from those which would make things very narrow and, therefore, more vulnerable to shocks.

Mr Matt Shardlow: Can I just add to that, which I agree with, often you are not left with the simple decisions you set out; you are often left with a set of decisions such as, do something now to disbenefit a small number of people because it will potentially benefit a vast number of people in the future. A lot of environmental protection is that sort of ethical decision.

Q58 Lord Hennessy of Nympsfield: I was interested, Mr Shardlow, when you were describing the parody view of those who have a down on industrial science; they think there are covert and dark forces at work with commercial interests trumping the science, and all the rest of it. Do you not think there is a danger, as there turned out to be in the GM crops debate, of parody views of each side of the protagonists making the running? For example, you could be parodied—not that I would ever think of it—as the trade union for the bug: "My brother the bug"; the invertebrates' trade union. I would not suggest that for one minute. When you were describing the "red in tooth and claw" commercial instincts, and views of that, there is this terrible danger. Do you think it would be a great pity, as I do, if the parody world of the GM crop mutated into the world we are talking about now?

Mr Matt Shardlow: Yes, I agree with you absolutely. I am warning against it rather than encouraging it, I think. I am also saying, let us also have regard for the fact that is going on and is becoming a dominant factor. Look at the number of countries who in recent weeks have declared they are not going to release GM crops into their land: Scotland, France and Russia; an avalanche of countries now saying, "We are not having GM releases at all." That is coming from an ethical point of view which is not based on scientific risk per se. We have to recognise that and we have to work our way through that.

I would say part of that is about making sure there is sufficient transparency. We have recommended in our submission having a register of trials so people can see what is going on with the science before it is done. This is very important because when this is done, for example, in pharmaceutical industries, you find a massive change in how the science is reported and understood. For instance, a paper published this year showed that before 2000, when in the States you didn't have to register large clinical trials, 57% of the clinical trials on heart disease showed positive effects, and after 2000 when they had to register them the percentage of positive clinical trials reported went down to 8%. Fifty-seven per cent dropped to 8% as the proportion of positive results being reported. There is a whole series of reasons for that and I am not saying it is because they were deliberately cherry-picking only the ones that fitted their results—although many would say that—but also the fact that journals only publish things that look interesting. Somehow trying to get around some of the cloudiness and obscurity in the relationship between government, industry and science and trying to make them more transparent and spaced apart could be part of the way of getting away from a debate that is about polarising "them over here" and "them over there".

Professor Jonathan Montgomery: I should inform the Committee that, in addition to the Nuffield Council, I also chair the Health Research Authority which oversees health and social care research for the English NHS and manages their research ethics committees, so we have very much an interest in the question of research transparency and the registration of trials and results. Although progress has been made, the fact remains we know a lot less of the knowledge base of science than we should do because it remains unreported and secret. Nuffield would also support, as part of the opening up of debates, processes to make sure that the science is as transparent as possible.

I would make two observations about the crossover with other debates. In relation to the GM crops question, as we are reviewing the report on the use of naturalness we have not particularly picked up a lot of direct discussion about GM insects, but it is clearly still the case that people are anxious about genetically modified crops. Our main understanding of the evidence so far—and, as I say, this is only a draft report at present—is that what seems most clear is that people talk across each other. The language of naturalness and unnaturalness is understood in different ways by scientists and the public. Therefore, used unreflectively, we have been unable to create a proper discussion of what is at stake because people use the phrases differently and we have not managed to bring them together. It is a clear challenge to do that going forward.

The other crossover is in relation to concerns around commercialisation and industrial interests. Certainly in the context of health and especially pharmaceutical research, the UK public displays considerable suspicion of research it thinks is motivated by industrial interests. The Health Research Authority's public engagement shows that very clearly. That will also play out in the public discussions in this context, which will need to be pulled out into the open and discussed carefully.

Q59 Lord Taverne: Coming back to the precautionary principle, would you agree with the recommendation of the Royal Society that, in light of the confusion about the precautionary principle and the way it is often abused and used for antiscientific purposes to abolish or prevent any new technology being supported which somebody does not like, the term should not be used in scientific discussions? Is that not wise advice?

Professor Jonathan Montgomery: I think it is wise not just in scientific discussions but more generally. For the reasons we have talked about, it is misunderstood, but we should not lose the concerns that lie behind it: that there are important questions about thinking reflectively as opposed to rushing ahead without thinking. Nuffield does not use the phrase "precautionary principle" except to explain that it does not use it, but it still wants to hold on to the idea of proceeding with caution and in a measured way.

The Chairman: We will treat it with great caution.

Viscount Ridley: Would Mr Shardlow agree with me that by far the biggest manmade cause of extinctions of species is invasive species, particularly the introduction of rats to islands and things like that? I am not necessarily talking about insects but I am sure it probably is similar in insects. This technology is potentially, as we have heard in the previous session, a way of addressing that. The benefits from a conservation point of view of this technology could easily outweigh the disadvantages.

Mr Matt Shardlow: It is certainly an important factor. Habitat destruction and intensification of the intervening bits, and the fragmentation of land associated with climate change

pushing up the southern margins of species distribution while the northern margins are frozen, in my mind, would be a bigger conservation issue.

Viscount Ridley: Historical records show that most extinctions we know about have happened on islands, where the problem has been manmade introductions of invasive species.

Mr Matt Shardlow: Certainly on islands you are right, as is your point about invasive species and the potential here, and we would welcome that being researched. You come back to requiring a sufficiently sized public purse to do that, because it is not necessarily going to be economically viable to try to eradicate something like the white-clawed crayfish. You need a programme of activity, and at the moment the programme around eradication of invasive species is not adequate to support the necessary level of scientific research investment. In principle, I would agree and we would like to see that area of work developed. Looking at how genetic modification could be used to introduce a sterile gene into white-clawed crayfish in the UK would be very useful.

Viscount Ridley: Just to correct you on that, the white-clawed is the native one. The signal crayfish—

Mr Matt Shardlow: I am sorry; yes, of course. I was thinking of a different crayfish that I am aware of.

Q60 Baroness Neville-Jones: This is a very rich debate. I wonder if I could perhaps drill down slightly into one of the aspects which has come up tangentially. As I understand it, we both agree you cannot validly answer ethical questions if you simply look at these various technologies in isolation from the context in which they are going to be used. Nevertheless, people are going to ask questions about, particularly, the ethical aspects of population suppression versus, for instance, replacement. Do you think the ethical and safety concerns vary and, if so, in what respects? One of the rather striking things is that the population replacement strategy, particularly if gene drive technology is used, is very difficult to reverse, so you create a new, ongoing situation which you are not likely to be able to change at all easily. That seems, in many respects, not to raise the same degree of ecological concern and worry as population suppression strategies. Do you have any comment on that and your general view on the whole question of the ethics that apply to these two different techniques?

Professor Jonathan Montgomery: I suspect Mr Shardlow will be better placed to do the specific answers. The framework we have developed suggests it may not be possible simply to answer that the same way in every circumstance, so we would clearly want to weigh out the ecological effect of the two strategies, which will depend on the ecosystem in which they are placed. It will depend a little on the relative effectiveness identified, so that if you have a very important public health problem and the relative effectiveness of one is different from the other, that would seem to count in favour of it and might outweigh a certain amount of ecological negative impact. Equally, if the efficacy is broadly similar our “proceed with caution” approach would suggest that something reversible, or which had fewer expected knock-on effects, would be the more cautious rather than the reckless approach. Our framework would give some tools to address that, but it would be very hard to do that without knowing the very specific circumstances.

Baroness Neville-Jones: Does it differ in any real essential, compared with conventional strategies—insecticides—or is it a variant of the same thing?

Mr Matt Shardlow: The main difference is around the first category, where you are effectively trying to get rid of something so you are introducing a process—whether that is through eradication or an actual genetic modification of that organism—and introducing something which is going to die out and disappear. That is a different level of risk category from introducing something where you might attach, for instance, a gene drive or you might hope it has some beneficial effect which will spread throughout the population. That is very different from anything we have done up to this point. We do not do that with genetically modified crops; our crops generally are highly altered already and dependent on us—they are domesticated plants, effectively. We are talking about the replacement of traits in wild populations to introduce something that is going to get out and go broader, which brings in other ethical considerations. For instance, if we have a system at the moment where the regulation allows countries to opt out of having certain genetically modified plants released into their territory, they cannot opt out of their neighbour introducing mosquitoes and them blowing over the border. There are a bunch of ethical considerations around introducing stuff into the countryside.

Coming back to Lord Ridley's point about the signal crayfish, we heard earlier about perhaps introducing a gene into bees that makes them immune to neonicotinoid pesticides. There does come a point where one starts to feel, "Maybe we should be avoiding some of these problems in the first place". That is the important thing, and we are not doing enough around that. It feels a bit odd to be making bees immune from a chemical we are still applying in the countryside and exposing them to.

If I may, I would like to quote from the Pope's recent Encyclical on Care For Our Common Home, which is relevant to this ethical debate. He said, "Often a vicious circle results, as human intervention to resolve a problem further aggravates the situation. For example, many birds and insects which disappear due to synthetic agrotoxins are helpful for agriculture: their disappearance will have to be compensated for by yet other techniques which may well prove harmful." There is a slight "old woman swallowed the spider to eat the fly" situation we might get into here, whereby we are creating problems, not fixing those problems, and having to come up with a further technical fix which may have further technical problems. We need to bear that in mind not only because that starts to bring in risks which are potentially harder to control if they become widespread throughout populations, but because of the public reaction to our trying to introduce genes into populations of wild animals which we are hoping will continue to be wild animals into the future.

Professor Jonathan Montgomery: We would be anxious about thinking that population suppression and population replacement using gene modification techniques are somehow ethically in a very different category from population suppression through herbicides and insecticides.

Baroness Neville-Jones: That was one of my questions.

Professor Jonathan Montgomery: The same ethical issues are going to apply to other techniques that end up displacing, replacing or suppressing populations. Our view would be that if you are going to suppress a population and you can do it in a more selective, targeted way, that may involve fewer risks to the ecosystem than others, and that we should consider

this as not being somehow a special question around gene modification but a question around the appropriate response to its suppression.

Baroness Neville-Jones: Essentially, the answer is, it does not really differ.

Professor Jonathan Montgomery: It is the same set of ethical questions. It will not universally produce the same answer.

Q61 Baroness Manningham-Buller: I wanted to ask about public understanding in this area. Mr Shardlow, you have talked about this perception of the government, or whoever, as "up to something" and the number of countries that have put all genetically modified stuff in the same "prohibit" bin. Do we actually have data on what the public understands on this subject? Lord Ridley is going to come on to how we can improve understanding. Both of you have touched on this, but any further comments would be welcome.

Professor Jonathan Montgomery: I can only say I do not think we have any direct information on this because we have not set up a project targeting this. We have some indirect indication from our discussions around the naturalness project, which has not identified any particular concerns in the context of insects.

Baroness Manningham-Buller: As far as you can tell, the public differentiate between crops and insects.

Professor Jonathan Montgomery: As far as we can tell they have not really thought much about the potential for a difference, but we have not set out to discover that. Importantly, we are not saying we have any evidence that they are not concerned.

Baroness Manningham-Buller: This is anecdotal, not substantial.

Professor Jonathan Montgomery: We have not asked that question directly. If it was very, very obvious it might have leapt out at us, and it has not, but it does not tell us what we would find if we did.

Mr Matt Shardlow: Just to echo that, it seems to be an issue of very little public awareness and debate. It is different, particularly, when we get into the realm of wanting things to continue to thrive in wild populations in the future. That is a different debate from the one we have been having about controlled release into agricultural fields.

The Chairman: You said earlier that you think the debate should be conducted around the context rather than the technologies. Would you not agree that, in practice, there has indeed been a debate about the context because it includes the wider GM organisms, not just insects?

Professor Jonathan Montgomery: That still feels like a debate driven by, "Do you like this technology or not?" defining it as GM. A contextual debate around different ways of addressing health problems caused by malaria, looking at a range of different technologies, would be Nuffield's proposition because it enables you to ask whether there are good reasons for going down this particular technological route as opposed to other possible routes, and explain what motivates people to explore those reasons.

Q62 Viscount Ridley: Some of what I was going to say has been overtaken by events. It is really a question of who should lead a public debate, how should one set it up and—the point you have touched on—should it be about GM insects or about how we solve infectious diseases and weigh the different technologies? In that context, in response to Mr Shardlow's

comments about the Pope and the old lady who swallowed a fly, given that we know that GM crops have in many cases hugely reduced pesticide use, when are we going to see a conservation organisation champion genetic modification rather than say, "We are not against it" or "We are against it"? When are they going to say, "Actually, this is a very good conservation tool that could be used to reduce the amount of harm we are doing in the countryside with pesticides and chemicals"? That is in the context of public debate. The public debate will work much better if next time round, Greenpeace is on one side and Friends of the Earth on the other, rather than them all being on one side of the debate.

Mr Matt Shardlow: I can only speak for my charity, Buglife; I cannot speak for those other organisations. You would have to bring that up with them. Buglife do take an open-minded and scientific approach to this issue; we do not have an absolute, dyed-in-the-wool, "This is right/this is wrong" approach. We do look at the evidence, we do look at the factors and we have said some positive and hopeful things about insecticide reduction with GMs. That is certainly an ideal to aspire and aim for, and we are supportive of people's efforts to try to do that. I am not sure all the evidence is in, and most organisations are quite careful because we do not want to end up promoting something that turns out to be a real problem.

In the last three weeks, in the Punjab, on GM cotton, £420 million has been wiped off the value of cotton by whiteflies. Whiteflies survive the Bt toxin in a way that many of the other pests, the bollworm and other things, do not. Here you have a situation which appears to be a huge problem—from the press reports you obviously cannot get a full analysis of what is going on in the Punjab: there is massive loss of profit from the yield, and 17 farmers have so far reportedly committed suicide in the Punjab. It is a problem with the GM crop, in that it is occurring in the GM crop; farmers are reporting spiders and beetles running around eating the whitefly in the non-GM crop, but in the GM crop they are not, and there is possibly a link to a different pesticide.

Viscount Ridley: Is this a well-evidenced story?

Mr Matt Shardlow: It is in the Indian papers at the moment. The regional agricultural director has been arrested for buying the wrong pesticide, which is apparently not strong enough. Those sorts of stories coming out in the press—talking about 17 farmers committing suicide and £420 million off the value of the GM cotton crop—are obviously going to make NGOs with an environmental concern very cautious about signing off on these technologies at this point.

Lord Fox: It is also going to give anti-GM campaigners an awful lot of anecdotage to peddle, none of which may actually be true.

Mr Matt Shardlow: You will notice I am trying to paint the picture of a lack of clarity about what has gone on there—lots of different reports, all slightly different. It is not as if there is an obvious answer where one can say, "That is the answer". That is the problem. There is something happening.

Viscount Ridley: There is well-evidenced data about the decline in the use of pesticides in Bt cotton in the subcontinent and the increasing yields. There may have been one problem in one part of the range in one year that you are telling me has been in the Indian newspapers; I am talking about stuff that is in properly evidenced scientific reports. There again, why can we not say that the benefits of this technology are so great that conservation organisations want to be championing it?

Professor Jonathan Montgomery: Could I pick up on a couple of aspects of that to get back to the question about what is the best way of framing the debate? One of our recommendations from the emerging biotechnology report is that it is important to understand what people believe is at stake because of the distrust in who speaks accurately about scientific facts. You end up, if you are not careful, trading peer reviewed versus non-peer reviewed science, anecdote against anecdote. To try to develop what we call a robust form of public reasoning, it seems important to try to find ground where people argue about the same things at the same time, as opposed to past each other. We would certainly think it appropriate to avoid the incentives on researchers to over-hype the possible benefits of their work. In many of our reports, including our recent research culture one, we have identified a range of ways in which journalistic pressures and funding pressures encourage people to claim things they really cannot with any certainty predict in order to get into over-claiming about potential benefits. That is as much a vice as the anecdote on campaigning organisations on the other side. We need to somehow insulate that into a bit of territory where it can be picked through.

However, more important, I think, is understanding what those sorts of arguments are symptomatic of in terms of values. We were particularly concerned in the emerging biotechnology report about the difficulties in getting voice for people who might be the likely beneficiaries of the technologies, which is something I picked up earlier. In our work we recently published on children in clinical research, we made use of some community engagement programmes funded by the Wellcome Trust to get an understanding of how communities in Africa would reflect on the involvement of children in research. It is very difficult to use those community engagement processes that are seen to be closely linked with the technologies, but it is a way of understanding what the benefits and the potential of these things might look like from the point of view of communities where they are most likely to be used early on. We have to get that perspective into the framework.

It is very difficult to get through the suspicion that this is being driven by people who want to use the technologies, and our advice is that that is one of the reasons why it is important to frame the debates in terms of a social challenge—what are we going to do about malaria?—to stop you saying the answer needs to be a technological answer. The answer might not be; it might be a technological answer; it might be an old technology better used or it might be a social intervention. However, if you are asking about the value of GM technologies in responding to those challenges, people have a sense of what they are comparing it with and they can have a debate.

We would be very keen to encourage you to think about not the instrumental—the ethical, legal and social implications of this technology—but the tools we might have to address these challenges, whether these new technologies improve on what we have, or whether we need them. You are much more likely to have common ground for debate if you frame it in those ways than if you ask something about a technology whose usage we cannot easily predict and, therefore, you are opening up the possibilities of all sorts of science fiction, both positive and negative.

Q63 Lord Krebs: In case I have not done it before I want to declare an interest as the deputy chair of the Nuffield Foundation, which is one of the funders of the Nuffield Council. My question, which was going to come a bit later but it does lead directly from the discussion which Lord Ridley's question started, is about how we nail the facts as opposed to

the rumours connected with GM technology. We had the discussion about the Punjabi cotton farmers. Do either of you think there is a role here for independent expert groups? In the regulatory environment there are groups like ACRE, which is a statutory body, and there are other groups like the Royal Society which publish independent reports and have no vested interest and simply look objectively at the available evidence. Do you think that is a way of holding to account the different sides who are making claim and counterclaim?

Professor Jonathan Montgomery: I would certainly support that approach. Nuffield sets out in its working practices to be inclusive in respect of the voices contributing to the bioethical debates and it tries to make sure that no one feels unheard, but it commits to testing those arguments against consistency, coherence and against the best available evidence. It wants to say: we should know what everybody thinks, but we should accept that public reasoning has some ground rules and that building an argument on something that is inaccurate is not good public reasoning.

Lord Krebs: On that question of inclusiveness, do you think that if, let us say, the chief scientist from Greenpeace were on ACRE, he should declare an interest just as a chief scientist from Monsanto should?

Professor Jonathan Montgomery: If it were our working party, we would deliberately recruit people we know are going to disagree because we think we will get a better debate, and we would make it explicit.

Lord Krebs: My question is: should he declare an interest?

Professor Jonathan Montgomery: I would expect it to be either formally declared or made apparent in the membership statements.

Lord Krebs: Thank you.

Lord Patel: Before I ask my question, which is about regulation, Professor Montgomery, do you think the Nuffield Council, in the light of this inquiry, should do an ethical review of GM insects, taking on board what you have suggested should happen in discussion around the benefits of eradicating disease?

Professor Jonathan Montgomery: As I touched on earlier, we have set up a programme approach to gene editing prompted by the CRISPR technologies. In our long list we had the possibility of a topic on GM insects. Our approach is, we think there are some significant common features to questions about gene editing, and we want to identify and draw those out, first, as a platform report, and then we anticipate there will be a series of case studies. We almost certainly will find ourselves looking at human genome editing as one of those case studies, but our early assessment is that that is rather further off than something like GM insects and issues in crops. Certainly, one of the case studies will be in this area because it is already on our long list, and we would expect to take that decision towards the middle of the year, when we have our platform report in place.

Obviously, one of the factors is, who else is doing work in the area? We would not expect Nuffield to duplicate work that is already done by others; we would only pick up a project if we identified that we could make a timely and distinctive contribution. We are also very pleased to work in partnerships, so if there were to be a big public exploration of attitudes around this we would certainly be keen to see what we could bring to that in our way of doing bioethics in partnership. You saw Sir Roland Jackson in an earlier session and he is also

a member of the Council. We are often looking for ways in which we can better inform our debates but, also, take what we have learnt into wider debates.

Q64 Lord Patel: Moving on to the regulatory environment—we have touched on this in conversations about previous questions—do you think the current regulatory environment, both in the EU and in the UK, is fit for purpose for GM insect technology?

Mr Matt Shardlow: Broadly it is, in terms of the risk assessment process. The risk assessment process seems to be working for the crops and I do not see any reason why it should not work for the insects as well. The problems, as we have highlighted before, come at different stages from that regulatory process. I made points earlier around increasing transparency in the scientific evidence, increasing the registration and pre-registration of trials, making sure that the information out there is transparent and that we see studies which have not worked as well as studies which have worked. Other than comments around the quality of that science and making sure that it is properly and statistically robust, one of the problems we have seen in pesticide regulation, which is in some ways comparable, is studies done by the industry which turn out not to be statistically robust and they are quoted as showing no evidence. If you do not have the statistical power to show the evidence, you are not going to find a conclusion. Getting good science as the basis of this is absolutely essential. To come back to your previous point, it sounds very much as if the Nuffield Foundation is doing an excellent job leading some of this debate.

Professor Jonathan Montgomery: It is the Nuffield Council; the Foundation is slightly different.

Mr Matt Shardlow: I am sorry; the Nuffield Council.

Lord Patel: The Foundation is the money.

Mr Matt Shardlow: Our universities have a 600-year history of having fantastic debates and moving issues forward within the academic community. This one is slightly harder because there is a sense of lack of trust in the academic community over this. How we break that out and make it a more public conversation is, I think, quite a difficult question.

Lord Patel: We have heard in evidence that people, with good scientific bases and good evidence scientifically, apply to EU regulators and because it has the label "GM" it goes in a "pending" box for ever.

Mr Matt Shardlow: My understanding is that that is because of the politics of different countries not wanting to have GM and to block it going through.

Lord Patel: So the current regulatory framework does not work.

Mr Matt Shardlow: If you look at the conclusions of scientific committees within countries, they often tend to parallel the political stance within those countries. In the UK we have had politicians for the last 15 years who have been pretty broadly supportive of genetically modified crops, and we have scientists who are pretty broadly supportive of genetically modified crops. That situation is not reflected in most EU countries; that is why it is blocked and gets stuck.

Lord Krebs: What about EFSA? EFSA is the EU's risk assessment body. What is its view? Does it coincide with the British view or these other views?

Mr Matt Shardlow: My understanding is it largely presents scientific analysis of the data to the EC, which then cannot get a qualified majority through the voting system. If you cannot get a qualified majority through the voting system and you have countries which are digging their heels in, then it gets stuck at that level. That is a political level which is to do with the broader ethical concerns in other countries, and people do have different perceptions of the truth and different perceptions of the risk. Those clearly vary from one country to another—how they are dealing with that and how they are politically expressing that. I am not sure how you easily fix that through a regulatory process or a single piece of legalisation. Obviously, the effort to allow countries to opt out of GMs has been an attempt to defuse the tension at that level so that countries can feel they have more control over their territory and genetically modified crop use, with the hope that that will have a reciprocal relaxation at a higher level within the process that will allow more crops to go through if there is a sufficient number of countries who really want that crop to go through. As that has only gone through this year, we will have to see if that works. In my mind that is almost a level above the regulatory process; that is more to do with the overall political wishes of the countries involved. To view that as a success or a failure depends entirely on which of those countries you are sitting in.

The Chairman: Lord Maxton, then Lord Ridley and we will probably then come to a conclusion.

Lord Maxton: I am going to be slightly difficult here, in the sense that human genetic modification, which was mentioned briefly by Professor Montgomery, is the thing that causes most of the problems. There are large organisations throughout the world, particularly in Europe, which are opposed to genetic modification of human beings. They then transfer that down to genetic modification in crops and then down further to insects. Am I right in making that assumption?

Mr Matt Shardlow: Instinctively, there probably is a link. I do not have any data; I am not sure if Jonathan has.

Professor Jonathan Montgomery: It is very hard to tell. The technology that makes people think about human gene modification actually becoming possible has only emerged in the public conscience quite recently, but the idea in terms of science fiction has been around for a very long time. Which is really driving this? I am not sure. It may actually be more to do with attitudes to technology, manipulation of nature, a sense of what is normal and natural, and it may be the same thing that is driving both concerns. That, of course, is why we have kicked off our project to try and dig into that more deeply.

Lord Maxton: Human genetic modification is not just a recent thing. You quoted the Pope: that whole religion is opposed to genetic modification simply using certain genes from certain sources. Are you telling me that has nothing to do with the way in which people react to genetic modification?

Mr Matt Shardlow: No, I do not think we are saying that. We might be saying there may be more to it. One example—which shows the complications—is people having a fear that if they eat genetically modified food that is going to somehow genetically modify them. That might be their fear, hence to them it all looks like a big bundle of things to be very afraid of, that they do not trust. I am going to regret quoting the Pope, but in some ways they feel there might be someone playing God. That, again, to a lot of people feels morally wrong: that someone is playing God by creating life. There is more to it than simply human beings.

There is a level of grade: just as we value human life differently from how we value the life of our pet dog, and how we value the life of a bird and the life of a bug in a field, there is a gradient in ethics in how we look at those different things. But I do not think it is just about humans.

Viscount Ridley: As a final point, I wanted to get on the record that last Friday's *The Indian Express* had a headline reading: "Proliferation of unregulated hybrids not Bt is to blame for pest damage to cotton this year."

Mr Matt Shardlow: As I said, it is a morass of confusion, but it is the sort of thing that adds to the fear of organisations coming out and saying anything positive.

The Chairman: We all recognise—and I say this to Lord Ridley, as a columnist—that we do not always believe everything in the papers! That is very unfair, but he is quite right to draw attention to anecdotage as opposed to peer-reviewed evidence, and that was his point.

Professor Montgomery, we would be very interested in hearing when your report on naturalness comes out later this year. Whether it will be in time to contribute to our deliberations I cannot quite be certain, but we will certainly be very pleased to keep in touch with that. Thank you both for your contribution to our discussions today; we have moved quite some way—from GM insects into wider ethical issues—but I think we have benefited from that. Thank you very much.