The *Universal Ethical Code for Scientists*

and the 'Crisis of Trust in Science'

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Executive summary

Background

We were asked to examine the effectiveness of the *Universal Ethical Code for Scientists* as a response to the alleged crisis of trust in science. This has necessitated a more general examination of the nature of this alleged crisis of trust in science. The results presented here are of an extremely provisional nature. The report had to be researched and written in the exceptionally short timeframe of two weeks: it would be wise to devote more time to the analysis of the problems and recommendations encountered herein before committing to any particular course of action.

Main Findings

1. The overall argument of this paper is that there is no single phenomenon of *the* public crisis of trust in science; rather, there are many different trust-related problems which arise in public/science relations. The proper resolution of many of these problems is likely to require a general rethinking of the role of public involvement in science and of the relationship between the institutions of science, of industry and of the State. A limited focus on changing scientists' professional ethics is unlikely to be sufficient.

2. When we say there is mistrust in science we might mean that scientists are not trusted to tell the truth (either because of incompetence or bias), we might mean that scientists are not trusted to perform research that is beneficial (rather than obscure,

whimsical, and self-indulgent), we might mean that scientists are not trusted to make good social policies, we might mean that individual scientists are not trusted, we might mean that scientific institutions are not trusted, or we might mean that corporate or government-based institutions which make use of scientific evidence are not trusted. Clearly, a focus on an ethical code for individual scientists will fix only some of these problems at best.

3. It is essential to clarify why one might care about trust in science. There are three broad sets of reasons. First, research scientists require enough trust from society as a whole to enable their work to continue, and to be funded at adequate levels. Second, trust in the testimony of scientists is important for public health reasons. Third, trust in scientific research may be important for generating broader economic benefits. These rationales require not only that scientists are trusted, but that they are also trustworthy. Hence efforts to ensure trustworthiness of scientists and scientific institutions are just as important as efforts to ensure trust in these individuals and institutions.

4. We argue that evidence of a genuine and generic 'crisis of trust in science' is lacking. What appears at first sight to be a crisis of trust in 'science' per se might be better analysed as a crisis of trust in industry or government sponsored science, or in the ways in which government and industry institutions make use of scientific advice. There are, for example, considerable difficulties in interpreting empirical data on trust and science: what appears to be mistrust may, in fact, be miscommunication. Moreover, there are cases where people in fact trust, and yet claim they do not.

5. When trust is a genuine issue, trust concerns sometimes focus on scientists' sincerity, sometimes on competence. Sincerity concerns can stem from scientists' involvement in industry and politics. These worries give rise to quite legitimate concerns over the ability of scientists to act and speak sincerely. Concerns about competence sometimes draw on cases where scientists ignore, or misinterpret, important elements of lay-knowledge in producing policy recommendations. Public engagement, and the involvement of diverse constituencies of scientists, may work to allay concerns in all of these areas.

6. Where scientists are also involved in the formation of policy, there can sometimes be a tension between the desire for the scientist to communicate sincerely, and the desire for the scientist to act as a competent policy-maker. Sincere communication about the limits of knowledge, uncertainty, and ambiguity surrounding technical scientific findings may be at odds with the production of decisive, reassuring policy measures. Scientists will sometimes find themselves drawn in both directions at once, with the result that maintaining trust in general will be difficult.

7. Turning now to the Universal Ethical Code for Scientists itself (UECS), it is important to clarify what its functions might be. It may aim at reassuring the public, or it may aim at re-shaping the scientific professional ethos. Only the second role seems likely to have much impact on public attitudes towards science. Indeed, there are reasons to think that re-shaping the ethos of a body of workers may be more effective than traditional methods of ensuring trustworthiness based on audit and accountability. The problem with these more traditional methods is that competent auditors/accountants will typically fall into the very profession they aim to oversee,

with the result that concerns over trust are simply shifted to the auditors/accountants. It is vital to note, though, that altering professional ethos cannot plausibly be achieved by a code alone: forms of training, comprehension, sympathy and enculturation are also essential. And even here, concerns about trustworthiness are bound up with broader institutional issues about incentives.

8. The UECS does not resolve one of the most pressing concerns for trust in science, namely the tension between competence and sincerity outlined above (5). The code might do some good in allaying competency concerns, but it could be re-formulated in a way that pays greater attention to the ways in which scientific and social concerns often inter-relate. As such, it may suggest too limited a model of scientific-public engagement to respond to some competency concerns. Finally, the code does not adequately respond to the problems which give rise to concerns over the sincerity of scientists: that their allegiance to non-scientific institutions makes them untrustworthy. These are not criticisms of the code as such, but they are criticisms of the thought that ethical codes are the primary ways to respond to alleged crises of trust in science.

The *Universal Ethical Code for Scientists* and the 'Crisis of Trust in Science': Report

In its influential 2000 report, "Science and Society", the House of Lords Select Committee on Science and Technology identified "public unease, mistrust and occasional outright hostility" towards science as an emerging problem.[i] Since then, the claim that there is a public "crisis of trust" in science has remained a central concern for both government and the scientific community and has been the subject of on-going study.[ii] In 2004-5, partly in response to such concerns, the Council for Science and Technology developed a "Universal Ethical Code for Scientists" (UECS), written by Sir David King and collaborators. This report asks whether the publication and promulgation of the UECS is likely to make any difference to the alleged "public crisis of trust in science". Section 1 outlines some of the issues involved in making sense of talk of public trust in science. Section 2 uses these results to summarise recent sociological work on public attitudes towards science. Section 3 assesses the UECS in light of these discussions.

§1 Trust, science and scientists: some initial distinctions

Before embarking on any discussion of the impact of the UECS, we need to be clear on whether there really is a public "crisis of trust" in science, and whether public mistrust in science is a bad thing. After all, some might feel that a measured scepticism regarding the deliveries of science is something to be hoped for, not something to be combated. In answering these questions we immediately encounter a series of problems: we must analyse the concept of "trust", the concept of "the public"

and the concept of "scientists". These conceptual issues are compounded by uncertainties regarding the significance of empirical work in these areas: it is by no means clear that there truly is a problem of public trust in science per se, rather than in the way government, or industry, makes use of science.

§1.1 Trust

"Trust" is a notoriously tricky term to define.[iii] For current purposes, we define "trust" as referring to the willingness of one (group of) individual(s) to rely on a second (group of) individual(s) to act in ways which are in the interests of the first (group of) individual(s).[iv] Three aspects of "trust" help to clarify different meanings of the primary assumption behind this report: that there is a crisis of trust of science.

First, there is a distinction between trusting people to tell us the truth (trust-in-testimony) and trusting them to perform certain sorts of actions (trust-in-action).[v] We might trust a student to tell us why his essay was late, even if we don't trust him to get the essay to us on time. Therefore, talk of a crisis of trust in science might refer to mistrust in the testimony of scientists (for example, the public do not believe scientists' claims that GM crops are safe); or it might refer to mistrust of scientists to perform research properly (for example, the public do not trust scientists to undertake research which is socially beneficial); or it might refer to both phenomena. Talk of a "public crisis of trust" seems to refer to both of these types of mistrust.[vi] However, they might stem from different sources, create different kinds of problems, and require different kinds of responses.

Second, talk of "trust" is "domain specific", such that claims that "A trusts B" are, typically, elliptical for more complex claims: "A trusts B with regard to actions or testimony in domain C".[vii] For example, Andy might trust Brenda to look after his houseplants while he is away, but not trust her to look after his children; or he might trust her testimony about the weather, but not trust her testimony about astrophysics. Again, this suggests talk of a "public crisis of trust" in science might be misleading, for example by leading us to overlook the difference between mistrusting scientists to communicate their results sincerely and mistrusting the ability of scientists to make wise social policies. To make this distinction vivid: there is a difference between believing that David Nutt was untrustworthy as an informant about the safety of drugs and believing that he was untrustworthy as a policy-maker.

Third, philosophers and sociologists often distinguish between interpersonal trust and institutional trust; i.e. between trusting that other humans will act in certain ways and trusting that a system for co-ordinating human behaviour will generate certain kinds of results.[viii] Talk of a "public crisis" of trust in science often seems ambiguous between two claims: first, that the public do not trust individual (groups of) scientists (to perform socially beneficial research, to tell the truth, etc); second, that the public do not trust the social institution of science (to generate beneficial knowledge, for example). However, there is an important difference between trusting scientists to play by the accepted rules of their professional institutions, and trusting those institutions to perform valuable functions. For example, someone might find recent revelations about the practices of climate scientists at UEA shocking because they show how they diverged from (one understanding of) the institutional norms of science; such an attitude should be sharply distinguished from thinking that climate

science is not to be relied upon because scientific endeavour is, in general, a bad way of understanding the natural world.

We have outlined three very general features of the concept of trust, all of which suggest that generic talk of a "crisis of trust" is unhelpful. Reflection on the concept of trust also suggests some problems for making sense of the second assumption: that if there is a crisis of trust, then this is a bad thing. [ix] There are at least two kinds of concerns which such an assumption might express: first, that it is a bad thing if the public does not trust the testimony of scientists, because such lack of trust will make the public more likely to behave in problematic ways (say, in ways which endanger public health); second, that it is a bad thing if the public does not trust scientists to generate useful knowledge, because this is likely to hamper future scientific research. In turn, this second concern can usefully be distinguished into two sub-concerns: the "scientists' concern", that public support is necessary for scientific research to thrive; and an "economic concern", that the development and translation of science into economic gain will not occur without public trust. Arguably, a version of the first concern is at the forefront of the House of Lords 2000 report (which focuses on public health scares); a version of the second concern is expressed by the UECS (which focuses on the need for a "social licence to operate as scientists"); and a version of the third concern is captured in the Working Group's statement that "maintaining public trust is vital if we are to secure maximum benefit from science and engineering in the UK".

Not only are these concerns importantly different, but all of them seem to assume that trust is always a good thing. However, this is not quite true: trust and mistrust can be

well-placed or misplaced, justified or unjustified, depending on the trustworthiness of the trustee.[x] Securing the instrumental benefits of trust requires that trust is well-placed: the public will not avoid public health problems if they trust scientists who speak falsely; there is little benefit in allowing "space" for scientific research if those scientists are useless; and economic benefits are unlikely to follow from public trust in science if that trust is mis-placed in charlatans.[xi]

Therefore, when talking about trust in science, it is important both to keep track of precisely which kinds of trust we care about and why, and to keep separate two possibilities: that the public mistrust scientists and this mistrust is mis-placed (i.e. the scientists are trustworthy) or that the public mistrust scientists and this mistrust is well-placed (i.e. the scientists are not trustworthy). In both cases, it might be a good idea to attempt to resolve the crisis of trust. However, a proper response to the first scenario might be to educate the public about what scientists actually do, whereas a proper response to the second scenario might be to re-educate the scientists. (As we discuss in §4, the UECS seems uneasily poised between these two approaches).

We can distinguish two kinds of conditions which must be met for trusters reasonably to believe that trustees are trustworthy.[xii] First, they must believe that the trustees are competent; we do not trust those who are unlikely to be able to do what we rely on them to do. Second, they must believe that the trustees are well-intentioned and/or sincere; however competent he is, we do not trust the con-man. In talking of a public crisis of trust in science, it is, then, important to distinguish worries that scientists are not competent ("they were wrong about BSE, so why believe them about GM?") from worries that scientists are not well-intentioned or sincere ("those climate scientists are

hiding information from us"). Neither, either or both concerns may be present in non-scientists' attitudes towards science, and neither, either or both might be justified.

So far, we have drawn on philosophical and social scientific definitions of "trust" to suggest that talk of a "crisis of trust in science" is too blunt, and to suggest that any response to this perceived crisis must take account not only of what public attitudes are, but whether they are warranted. One initial conclusion to draw from these remarks is that we need to be careful not to assume that there is a one-size-fits-all course of action, which will restore "trust" in science. As a concrete example of this, consider the following scenario for the development of synthetic biology.[xiii] If the public believe science cannot be trusted to generate useful knowledge, and so clamour to limit research into synthetic biology, one response to this problem of trust-in-action might be for synthetic biologists to claim that their work will lead to beneficial results. However, this "political economy of promise" might well backfire: if beneficial results do not appear, or if they take far longer to appear than initially supposed, a result might be a dwindling of trust-in-testimony, where the public will no longer trust biologists sincerely to communicate the limits of their work and knowledge.

§1.2 "The" public and "science"

As well as these general theoretical points about the concept of "trust", it is worth stressing problems with making sense of the claim that "the public" mistrust "scientists". First, rather obviously, different members of the public might hold very different attitudes towards science and the sciences. For example, the *Public Attitudes*

to Science 2008 report noted positive correlations between the public's educational background and their attitudes towards science.[xiv] We should, however, be careful: Yearley reports some research suggesting the counter-intuitive result that "the most scientifically 'literate' sections of society and the most scientifically 'literate' nations are not the most deferential to science".[xv]

Second, just as we might want to disaggregate the public, so, too, we might want to disaggregate "science" or "scientists". One way would be by scientific sub-discipline. For example, the public might think that physicists are to be trusted in their reports about the world, but not to be trusted to do socially beneficial research; bio-medical scientists, by contrast, might be trusted to do beneficial research, but not trusted to communicate their results to the public.[xvi]

A second way of sub-dividing scientists would be by institutional affiliation: for example, University-based scientists, versus Government scientists versus Industry scientists. Research suggests that most members of the public view independent, university-based scientists as more trustworthy than industry-based scientists, and 84% of the public agree that "it is important to have some scientists who are not linked to business".[xvii]

This latter phenomenon points to an important complexity, related to the discussion of trustworthiness above. As many writers in this field have noted, public assessment of scientists cannot rest solely on their assessment of the technical claims scientists make, and the reasons scientists give for those claims.[xviii] After all, if members of the public could engage in these technical assessments, they would be scientists. Rather,

then, public decisions as to whether or not to trust must take account of so-called "external" factors, such as a scientists' qualifications or institutional affiliation.[xix] As Wynne phrases the issue in discussing the related context of risk-perception, "public perceptions of, and responses to, risks are rationally based in judgments of the behaviour and trustworthiness of expert institutions, namely those that are supposed to control the risky processes involved".[xx] In turn, then, what appears as public mistrust of scientists might be better understood as mistrust of those seen as associated with a particular institution, than as mistrust of scientists *qua* scientists. Mistrust in individual (groups of) scientists might reflect not so much mistrust in the *institution* of science, but, rather, a worry that certain scientists are not acting as scientists "should" because they have been co-opted by other, mistrusted non-scientific institutions.[xxi] (See §2.2)

The suggestion that the institutions of science or groups of scientists might be trusted even if some individual scientists are not is backed-up by common sense, anecdotal data, and by other areas of research: cosmetics companies would not care about giving the impression that their claims are scientifically valid and nor would climate sceptics establish their scientific credentials if the public were not prepared to trust some kinds of science or scientists. Furthermore, a recent MORI poll claimed that 70% of respondents trusted scientists to tell the truth: such figures should be interrogated further, but they are certainly striking. Also, psychological research has suggested that "people will buy into bogus explanations much more readily when they are dressed up with a few technical words from the world of neuroscience".[xxii] These observations suggest that in some domains there may even be too much trust in apparently scientific claims.

§1.3 The interpretation of data

A final set of background issues concerns the interpretation of data. Suppose all scientists agree on some claim, but members of the public do not believe that claim. There are (at least) two possible interpretations of what has happened: first, the public might have heard and understood what the scientists said, but not trusted them; second, the public might not have heard or understood what the scientists said in the first place. In practice, then, it may be easy to describe public failures to grasp certain scientific claims as mistrust when, in fact, they result from a failure to communicate.

Clearly, in many cases, features of how the media represent scientific disagreement do lead to clear-cut cases of public misunderstanding of, rather than mistrust in, science. For example, in recent research 44% of respondents cited nuclear power as a cause of global warming and 53% believed that the evidence for and against the safety of the MMR vaccine was evenly balanced.[xxiii] However, research into the communication and public understanding of science has been attacked for assuming a "deficit" model, where *all* cases where the public mistrust scientists to pursue beneficial research or fail to accept their testimony are ascribed to ignorance. In turn, many commentators have claimed, then, that this research overlooks complex issues of trust and legitimacy.[xxiv]

Furthermore, it is worth pointing out that many cases where it is claimed that a deficit, rather than mistrust, explains public attitudes are, in fact, extremely complex, and involve both fact and value components, such that further analytical categories are

required. Nowhere is this more obvious than in debates over risk and safety. In this context, it is often claimed that the public irrationally refuse to defer to expert testimony (say, over the safety of the MMR vaccine). However, in such cases, scientific claims are, themselves, often implicitly value-laden. Consider, for example, Sir Richard Southwood's claim at the time of the BSE controversy that "we have more reason to be concerned about being struck by lightning than catching BSE from eating beef and other products from cattle".[xxv] This might be understood simply as a factual claim (the risks of contracting CJD are lower than the risks of being hit by lightning) or as a normative claim (because of the relative risk ratio, we should not care about contracting CJD). The latter claim, however, assumes that our assessment of the badness of risks should be independent of the causes of those risks: this is by no means clear.[xxvi] We might, for example, be more concerned about avoidable, or man-made risks, than we are about unavoidable, or natural risks. Therefore, even if it would be unreasonable for a non-expert to dismiss Southwood's factual claim, this is compatible with reasonably failing to trust his normative claim: what might have appeared to be either a case of no-communication or mistrust in Southwood's scientific testimony might, in fact, represent a reasonable failure to treat him as a moral expert.

Concerns over communication paint a mixed picture. On the one hand, cases where the public appear to mistrust scientists might be cases where they are simply ignorant of what scientists say. On the other hand, however, it can be easy to assume that the public are simply ignorant or irrationally distrustful, when, in fact, their reactions reflect genuine – and perhaps well-motivated – kinds of dis-trust and discrimination.

We cannot attempting to by-pass questions of trust in favour of questions about communication.

The second problem is that we might *say* we do not trust when, in fact, we do trust or, conversely, appear to act as if we trust when, in fact, we do not trust. The first issue has been discussed by Onora O'Neill, who notes that survey findings suggesting a crisis of trust often sit uneasily with the ways in which survey respondents do regularly entrust themselves to others.[xxvii] The second issue has been discussed by Brian Wynne, who suggests that what might appear to be trusting relationships can, in fact, be relationships where one party feels they have no choice but to rely on a second party, even though they lack any trust in that party.[xxviii]

§1.4 Conclusion

In this section, we have noted three kinds of problems for talk of a "public crisis of trust in science": first, that "trust" is a complex concept; second, that there are many ways of grouping different "publics" and different "sciences" or "scientists"; third, that data suggesting a crisis of trust are be extremely difficult to interpret. These results suggest that it is a mistake to talk of *a* crisis of trust in science. Rather, there are multiple possible problems, not all of which are real problems, and which cannot all be solved in the same (or even in complementary) ways. This is an important lesson to which we shall return in assessing the UECS in §3.

§2 Sciences, publics and kinds of trust

Even if there is no single problem of a public crisis of trust in science, we might be able to distinguish various "localised" cases where particular publics mistrust specific sciences, or specific kinds of scientists, to do certain types of things or to make certain types of claims. In turn, eliminating these forms of mistrust – whether through communication or through ensuring greater trustworthiness – might be an important task. In this section, we consider some sociological work which looks at various aspects of how and why (certain sections of) the public might be doubtful of scientific testimony, doubtful of the competence or the sincerity of scientists' commitments to action, or doubtful of scientific institutions more generally.

§2.1 Competency

One ground for withholding trust is a negative judgment of the competence of a putative trustee. Versions of competency concerns arise in recent sociological accounts of public attitudes towards science and scientists.

One recurrent theme, particularly that influenced by Beck's notion of the "risk society", is that, as a matter of fact, modern citizens have good reasons to fear further scientific research, given the ways in which scientific advances have unexpectedly given rise to new forms of risk (such as environmental problems) which science cannot itself control.[xxix] From the viewpoint of this sociological theory, then, we might say that non-scientists have good reasons to doubt that the institution of science will generate beneficial results, because they have excellent evidence that those institutions have created uncontrollable problems in the recent past. Assessing the plausibility of such large-scale claims is beyond this paper. However, if the

institutions of science really are "incompetent", in the sense that these institutions have led to disaster in the past, it is not clear that much could possibly be done to restore "trust in science", or that there would be much point in doing so.

As well as these large-scale macro-sociological trends, recent sociology of science has examined how experts and non-experts relate in particular contexts. An influential example is Brian Wynne's research on the relationship between Cumbrian sheep farmers and scientific experts after the Chernobyl fall-out.[xxx] Wynne's work highlights several important issues: first, close encounters with the actual workings of science led the sheep farmers to doubt the robustness of the experts' claims (for example, close encounters with how data were collected led the farmers to doubt the final results); second, the farmers felt that the officials overlooked important aspects of the farmers' own knowledge about sheep farming (for example, their knowledge of sheep grazing patterns); third, the farmers saw the experts as being sociologically naïve in their recommendations (for example, by overlooking the complexity of judgments involved in deciding when to take sheep to market). In effect, close encounters with real experts led the farmers to doubt the competency of those experts.

Wynne's close case-study points to some interesting themes of more general applicability beyond his particular study. First, it illustrates how the messiness of actual scientific work is often hidden in the presentation of results, such that exposure to reality can have a devastating effect on audiences' confidence in claimed results. Arguably, the public response to the leaked e-mails from UEA reflected such a concern. Scientific colleagues considered the e-mails to be perfectly run-of-the-mill examples of how science works "on the ground", but publics found them shocking. A

second key theme is how expert judgments may often be doubted by audiences because of the ways in which they seem to ignore the factual knowledge and experience of those audiences; for example, recent studies have suggested that patient groups often feel disvsalued by the ways in which scientists overlook sufferers' experiences.[xxxi] A third general theme is how the competency of experts may be undercut by recognition that they employ sociologically naïve assumptions in going from scientific data to policy recommendations; for example, abattoir workers' willingness to defer to scientific expert advice during the BSE crisis may have been weakened by the naïve assumptions the experts made about how abattoirs work.[xxxii] In short, if trust requires evidence of competence, then proximity to scientific work often makes publics doubt competency, sometimes unnecessarily (for example, because public views of how scientists should work are highly idealised) and sometimes correctly (for example, when scientists fail to appreciate alternative sources of knowledge).

A suggestion made by several writers is that a joined-up response to all three of these problems is to increase public involvement in scientific research and related policy-making.[xxxiii] Greater public engagement in setting research agendas will, it is claimed, create a greater awareness of how science works (thereby generating greater understanding of uncertainty); and improve research by making use of lay knowledge, including lay sociological knowledge, in a way which responds to worries over competence. In particular, according to many writers, such engagement is important when scientific research is related to complex or contentious social and political problems, and where the results of research can be expected to feed back into citizen's lives.[xxxiv]

However, although Wynne does advocate greater public involvement in science, he also suggests that issues of public trust might be more complex than the picture sketched above allows. For him, public concerns reflect not so much mistrust in the competency of particular experts (to make accurate claims or to carry out beneficial research), but a resistance to the institution of science. In particular, he suggests that lay responses to scientific expert claims often involve rejection of underlying normative assumptions (for example, that the environment should be completely under human control) and underlying normative models of human behaviour (for example, in rational choice terms) which are built into scientific research. According to this model, resistance to scientific experts is not so much a judgment about their competency as individuals, but a rejection of an entire way of thinking.[xxxv] If so, then restoring "trust in science", whether to speak truly or generate useful results, might be a forlorn task: the problem is a rejection of (what Wynne claims are) the assumptions of science as such.

Assessing the truth of these more general claims is, of course, extremely complex. So too is understanding their implications. Wynne might be read simply as suggesting a point already encountered above in discussion of BSE in §1.3: that it is very easy for scientific experts to slip from making factual claims to making value claims. In turn, we should not confuse cases where citizens express their democratic right to reject normative advice with cases where they reject factual claims. And we should not expect the public to fall uniformly into line with value-laden claims that issue from scientific institutions, any more than we expect universal agreement on normative claims in general. Finally, if value claims are frequently embedded within ostensibly

factual claims, the public may come to feel that even straightforward factual claims cannot be trusted.

Again, one way to respond to these kinds of concerns might be to appeal to greater public involvement in setting the scientific research agenda and in formulating science-based policy: even if such an approach would be no less likely to ensure that recommendations are value-laden, it would, at least, ensure that the value-ladeness occurred in a more open and democratic way. This seems close to Wynne's own normative recommendations.

Before moving to discuss issues of sincerity, it is important to note that most of the research we have discussed in this section focuses of what we have called trust-in-testimony (that is, trust in the claims of scientific experts), rather than trust-in-action (that is, trust in scientists to perform socially beneficial research). Indeed, it is notable that much of the literature focuses on the first of these issues, particularly in fields where science and politics are inter-twined. We know of no studies which attempt to show, for example, that the public think that scientists are incompetent to do research in areas which do not feed directly into contentious policy-making; say, for example, the experiments carried out at the Large-Hadron-Collider at CERN. However, it is important to note that such research can, of course, raise a separate kind of concern: that, even if scientists are likely to do high-energy particle physics well, it is a waste of money to give them the resources with which to do such physics. It is, then, interesting to note that in areas where science is directly of political relevance (say, toxicology studies), there might be reasons for public involvement in research, but,

also, that in areas where science is not directly of political relevance (say, particle physics), there also be democratic reasons for greater public debate.

§2.2 Sincerity concerns

Much recent work in the sociology of science has stressed that "people do not experience scientific expertise in a pure context, freed from imputed interests and other background expectations", but typically receive scientific claims for a purpose, and "since expertise is so commonly related to the experts' (or the experts' bosses) practical agenda, people evaluate the information in the light of their regard for the organization disseminating it, and of any ulterior reason which they believe they can spot".[xxxvi]

According to this approach, assessment of scientific claims is likely to be linked to concerns over the agenda of the institutions to which those scientists are aligned. In turn, our understanding of the institutions shapes our judgment of the sincerity of the speaker. It is commonly believed (even if it is false) that the institutions of science are concerned solely with the disinterested pursuit and dissemination of knowledge, such that one can expect a true scientist to speak *sincerely*, even if she is incompetent or incomprehensible. Much recent sociology of science has, however, focused on what happens when scientists are associated with non-scientific agendas, as, presumably, this is the arena in which Yearley's "background expectations" play an important role in assessing sincerity. Three cases are particularly interesting.

First, increasingly, scientists are either employed directly by business and industry, or their research is partially funded through such sources.[xxxvii] If, then, there is general suspicion of business and industry, then, assuming something like Yearley's approach, there will be doubts as to the sincerity of those scientists aligned with business. Indeed, concerns that industry scientists are untrustworthy are found not only from survey data, but from other scientists, as exemplified by John Ziman: "by its very definition, instrumental research is undertaken precisely to serve the interests of those who organise, plan, fund and hope to benefit from it. For that reason, scientists engaged in that mode of research can seldom be trusted to give entirely independent advice on controversial issues about which they are surely knowledgeable. This… is a straightforward matter of street-wise credibility and practical prudence".[xxxviii] Ziman's "street-wise" concerns may also be backed-up by more hard data: for example, the protocols around reporting of privately-funded medical research might give rise to worries that, even if no-one is being "insincere", there are reasons to doubt that the public (indeed, even other scientists) are hearing the full story.[xxxix]

A second important topic concerns trust in government scientists. Scientists working for the government have both to establish policy-relevant scientific claims and to communicate scientific claims to the public. In the first of these roles – communicating data "upwards" – scientists are often under pressure to simplify complex issues and uncertainties, and to place probability estimates on hard to assess claims.[xl] It is not clear whether these issues are relevant to discussion of "public" trust in science, but they do speak to general concerns about the distortion of scientific results as they pass through the policy process.[xli]

In the second role, where scientists are expected to communicate "outwards", the norms which shape government communication – for example, norms which favour clear, easily-understandable statements – may be in tension with the complexities of scientific research – and decisions as to what to communicate might be shaped by considerations (say, avoiding fear) which may not be fully compatible with expressing scientific uncertainty. In turn, then, these pressures can lead to situations where communication over-simplifies issues, leading to confusing states-of-affairs (as in the BSE crisis) where what is "certainly false" one week is suddenly declared "true" next week. In turn, exposure to such swift changes of advice might fuel scepticism that scientists have stronger reason to toe the policy-line than to express their beliefs.[xlii] As Collins and Pinch phrase it, "in Britain, the official response to public health risks has traditionally been paternalistic reassurance. The government judges that the danger of panic usually outweighs any real risk to its citizens. Thus their job is taken to be to allay public fears."[xliii] It is important to stress that allaying unnecessary fear might be a legitimate job of governments. The problem, however, is that if scientists are given the role of allaying fears, then their ability to speak sincerely is limited. In turn, then, if opinion or official advice changes, the public might recognise what has occurred, and adjust their future assessment of scientists' sincerity accordingly.[xliv]

This topic relates back to the comments in the previous section: areas involving risk and uncertainty seem often to involve a combination of technical complexity, uncertain science, and easy conflation of the scientific and the ethical. In such areas, it should be no surprise that it is exceptionally difficult to decide whether scientists are competent, and whether to accept their judgments. Unfortunately, these areas are also

precisely the areas in which scientists are most likely to be involved with government agencies, and, therefore, where issues of sincerity are also most complicated.

In both the cases of industry scientists and government scientists, then, there is a possibility that, because of their institutional affiliation, the public will not trust these individuals to speak as scientists "should". Is there a more general fear that the institution of science itself cannot be trusted to generate knowledge at all? (Here we place to one side the rather different question of whether scientists can be trusted to generate knowledge that is *useful*.) The evidence suggests not. Rather, an interesting feature of many of controversial cases is precisely that "both sides" of the debate appeal to scientific experts. Indeed, in both the MMR controversy and the GM controversy, figures such as Andrew Wakefield or Arpad Pusztai seemed to gain credibility by stressing that they were "true" scientists, willing to speak up against the corrupted majority.[xlv] Furthermore, increasingly, environmentalist groups do not attack the institutions of science, but instead claim that they have science on their side.[xlvi] Therefore, it seems plausible to suppose that even if the public do not trust the institutions of science to generate *useful* or *non-harmful* knowledge, all sides of political debate seem to agree that scientific institutions can and do generate knowledge. The background trust in science as a way of generating knowledge might, however, be a source of long-term problems. As we noted above, scientific claims may seem tainted when they are offered in a policy context. A related problem is that the general social power of appeals to science may lead to a situation where those on differing sides of argument all aim to appeal to scientific experts to bolster their case. In turn, it has been suggested that this form of politicisation (which it is useful to keep

separate from the use of science in policy-making), might, over time, lead to a more general problem of perceived lack of sincerity.[xlvii]

§2 Conclusion

In this section, we have looked in more detail at two particular issues in relationships between the public and scientists: problems of deciding when scientists are competent, and problems of deciding when they are sincere. It is useful to note how these two issues relate: as philosophers and sociologists of science are aware, scientific work, particularly in cutting-edge areas, is often characterised by high levels of disagreement and uncertainty. Presenting this uncertainty and disagreement to the public might be the best way in which to act sincerely. Unfortunately, it may also be the best way in which to appear incompetent. This tension between appearing competent and being sincere is particularly complicated in cases with a social or political dimension, where there might be a demand both for cutting-edge research and for definite answers from policy-makers, or attempts by both sides of political debates to appeal to scientists. It is precisely in the cases where it might seem most important that the public can trust scientists that the conditions for placing trust are likely to be hardest to identify.

It is important to stress that these issues are most pressing for discussion of what we have called trust-in-testimony, that is to say, the public's willingness to believe scientific claims or to take advice from scientists. The topics we have described are, probably, less pressing in discussion of trust in scientists to undertake socially beneficial (or, at least, non-harmful) research. However, it is clear that more general

suspicion of the competence or sincerity of scientists in politically or socially-charged areas is likely to breed concerns over their trustworthiness to carry out beneficial research. Furthermore, as we noted above, even when research is not in socially or politically charged areas, there may be a more general public worry about proper use of government funds (whether directly, through research funding, or indirectly, as when scientists are trained at public expense, but work in industry), which might, broadly, fall under a concern about the "goodwill" of the scientific community. Therefore, although less pressing than the concerns over trust-in-testimony, the task of ensuring that the public trust researchers to generate useful or non-harmful knowledge is also complicated.

§3. The Universal Ethical Code for Scientists

The question in this section is whether the UECS can do anything to create or restore particular kinds of trust between particular constituencies. It should be stressed that there are many valuable functions the UECS might serve other than to create or restore trust: in focussing on the issue of trust, we overlook these other issues.

§3.1 The UECS and its functions

The UECS consists of seven principles, described as a "public statement of the values and responsibilities of scientists", which has three main aims: "to foster ethical research; to encourage active reflection among scientists on the implications and impacts of their work;" and to "support communication between scientists and the public on complex and challenging issues".

There are at least two, inter-related problems with understanding the code. First, it is unclear whether the code makes explicit what are assumed to be the values of the scientific community or whether it is intended as a statement of values which the scientific community should adopt. Certain aspects of the code read more like the former (for example, that scientists should "act with skill and care in all scientific work"), and the code is described as intended to "capture a small number of principles that are shared across disciplinary and institutional boundaries". However, other aspects of the code read more like normative prescriptions which go beyond standard understandings of the responsibilities of scientists (for example, that scientists should "seek to discuss the issues that science raises for society"). Second, and related, it is unclear exactly whether the code is intended to *express* to the world at large what scientists already do, or whether it is intended to *change* what scientists currently do. The description of the Code as a "public statement", and as "meeting the challenge" of renewing the "relationship of trust between scientists and society" suggests the more outward-looking perspective; however, the claim that the code is intended to "foster" research and "encourage" reflection suggests the more-inward looking approach. Perhaps it aims to achieve both at once.

These two distinctions are important for our current purpose, because a more normative inward-looking understanding of the code might suggest that its aim is to *make* scientists trustworthy, whereas a more descriptive, outward-looking understanding of the code might suggest that its aim is to convince the public that scientists *are* trustworthy. On the latter reading, it is difficult to see what impact promulgation of the Code could have on public attitudes towards science: if members

of the public believe that at least some kinds of scientists are either incompetent or insincere/lacking in goodwill, then they are unlikely to be convinced otherwise by being told that this is not how scientists perceive themselves.

The more promising alternative, then, is that the code is an attempt to set out a new professional ethic for scientists. In turn, this understanding of the code fits well with recent arguments made by Onora O'Neill, one of the authors of the code, that creating strong professional cultures, rather than increased regulation and managerial forms of accountability, is the best way in which to enable non-experts to place "intelligent trust" in relevant experts.[xlviii] From this analytical perspective, it should be stressed that promulgating a code can only be a minor aspect of, and certainly not sufficient for, construction of a professional culture. A further range of training regimes and practices of education and enculturation are essential. We shall, however, overlook this problem and assume that the Code might play part of a role of reshaping scientific culture, partly through its intended use in science education, and ask what impact such reconstruction might have on issues of trust in science.

§3.2 The UECS and trust

In §1.1, we distinguished between trust in testimony and trust in action: that is to say, between trusting scientists to tell us the truth, and trusting them to undertake research which is socially beneficial (or, at least, not harmful). One interesting feature of the code is that it seems concerned with both of these issues: the code tells scientists both that they should not "mislead" about scientific matters and that in their research they should show "respect for life, law and the public good", and is concerned with their

"social licence" to practice. In principle, these goals are compatible. However, as discussed above, creating the conditions in which the public will believe that research will further the public good may be in tension with the demand for honesty. It is unclear how any code could resolve this dilemma; rather, we might need to reconsider the social and economic pressures which generate this tension.

In §1.1, and throughout this paper, we also stressed a distinction between trust in individual scientists and trust in science. It is important to note that the code is likely to do very little to remove distrust in the institution of science itself. If theorists such as Beck and Giddens are correct that the emergence of a risk society has radically altered the public's attitude towards science as a source of benefits, or theorists such as Wynne are correct that scientific expertise is often not trusted because of resistance towards the normative models of human behaviour it implicitly assumes, then encouraging scientists to act with skill or to present results honestly is unlikely to do much good. For those who do not trust the institution of science, the suggestion that scientists should "minimise any adverse effect your work may have on people, animals and the natural environment" are likely to ring hollow.

In §2.1, we discussed several cases where it seems that the public might view scientists as incompetent (even while retaining trust in the institution of science). With regard to competence concerns, the Code does also enjoin scientists to act "with skill and care in all scientific work"; however, it is hard to see that worries over competence are so straightforward. Rather, the cases discussed in §2.1 seemed to have two complex features: first, a failure by scientists to take full account of lay knowledge or to rely on over-simplified sociological models; second, a conflation of

scientific considerations with value considerations. The Code does not discuss the problems associated with confusing fact and value when making scientific claims. It does, however, recommend that scientists "seek to discuss the issues that science raises for society" and that they should "listen to the aspirations and concerns of others". It seems that these recommendations are steps towards a model where there is greater public engagement in the practice of science. However, the modes of interaction suggested in the Code (discussion and listening) seem weaker than the modes of public engagement in science, such as "citizen juries" or "extended peer review", which, it has been claimed, might be necessary to recreate trusting relationships, particularly in cases in which complex social and political concerns are also present, and where "facts are uncertain, values in dispute, stakes high and decisions urgent".[xlix]

Of course, as we noted above, concerns about citizen juries and so on may be most appropriate in discussion of the issues of trust in the testimony of scientists, rather than in discussion over allowing scientists a "space" to do research. It may well be that discussion with the public will create greater public trust in scientists to do beneficial research, thereby creating an environment more conducive to research (even if it has less impact on the testimony problems which arise in more politicised settings). However, it is well worth remembering that the public can understand what scientists do, but disagree with scientists that what they do is of public value. To put it another way, it is important not to remake the mistakes of the "Public Understanding of Science" movement and to assume that once the public have science explained to them, they will necessarily be willing for scientists to do whatever they want to do (particularly when public money is involved).

In §2.2, we discussed issues of sincerity. The code is very clear that scientists should not "knowingly mislead, or allow others to be misled, about scientific matters". We might hope, then, that adoption of the code as the basis for a robust professional ethic would at least create the conditions in which members of the public would view scientists as sincere testifiers (at least, on scientific, if not on more broadly ethical, matters).

The key message of §2.2, however, was that worries over scientific sincerity might be most potent in cases where scientists are seen as acting as the agents of other institutions, such as government, industry or in support of a political cause, and, as such, as committed to that institution's aims. Although the Code does not discuss this problem directly, it might seem that the UECS should be understood as an indirect answer to this challenge; describing the code as a *universal* one might seem to imply that the obligations scientists have *qua* scientists should outweigh their obligations *qua* government employees or *qua* industrial employees or *qua* partisans for some political cause (and, perhaps, this is the reasoning behind the demand to "declare conflicts of interest").

Although this may seem an appealing ideal, however, it may be deeply problematic in practical terms. First, there are clearly difficulties in understanding how we might build structures where the professional obligations of scientists *qua* scientists might outweigh their other obligations; for example, a scientist working in industry might find it hard to balance a strong obligation not to allow others to be misled in scientific matters with his obligation not to divulge trade secrets.[1] Second, given that there

often *are* different viewpoints on scientific matters, the problem of politicisation might remain: differing sides of debate might still be able to find sincere scientists to support different claims, thereby leading to continued public confusion. Third, in some policy-making circumstances, there may remain a tension between the demands of policy-makers for yes/no answers or to provide clear guidance to the public and the demands of good scientific practice. Scientists may still find, then, that they are called upon to produce results and make claims which are not exactly misleading, but which might easily appear so *post hoc*.

§3.3 Conclusion

In conclusion, we suggest that if the UECS were to lead to a robust professional culture of science, then maybe certain kinds of failures of trust would, for good reason, disappear. However, this does not mean that all failures of trust would, or should, disappear; for example, the UECS does not imply that there is an obligation to be aware of how scientific recommendations might sometimes be based on normative pre-suppositions, which is, it seems, a key issue in thinking through trust in science. Furthermore, the UECS seems premised on the assumption that scientists can and do operate in a social and political sphere where there is no pressure on them to do or to say anything other than what they want to do or say, and where discriminating publics will be able to distinguish between pure scientists and their contingent institutional affiliations. This does not seem very likely. This is not a criticism of the UECS as such; rather, it is a problem for any attempt to create or rebuild public trust by means of a code alone.

[i] http://www.parliament.the-stationery-office.co.uk/pa/ld199900/ldselect/ldsctech/38/3803.htm#a1, Sec1.1

[ii] See, for example, *The public value of science* (Wynne, Stilgoe, Wilsdon, 2005) published by Demos; the RCUK funded *Public Attitudes to Science Reports*, published in 2001, 2004, and 2008; the ESRC funded *Towards a better map* (Hargreaves, I, Lewis, J and Speers, T, 2003). Interestingly, such concerns seem to have been expressed in other EU contexts (see Nolle-Neumann for discussion of Germany and Gonclaves on Portugal, both in *Between Understanding and Trust* ed. Dierkes, M and von Grote, C (Amsterdam: Harwood, 2000).

[iii] For useful discussion, see Baier, A (1986) "Trust and Anti-Trust", *Ethics* 96(2); Holton, R (1994) "Deciding to Trust, Coming to Believe." *Australasian Journal of Philosophy* 72; O'Neill, O (2002), *A question of trust* (Cambridge, Cambridge University Press); and Korczynski, M (1996), "The political economy of trust", *Journal of Management studies* 37(1)

[iv] This is closely related to Hardin's "encapsulated interest" view of trust (see, for example, his "Conceptions and Explanations of Trust", in *Trust in Society*, ed, K. Cook (New York: Russell Sage Foundation, 2001)).

[v] See O'Neill (2002), *op. cit*.

[vi] For example, the *Public Attitudes to Science Report* 2008 asks respondents both whether science contributes to the common good and whether they believe what scientists tell them, as if these are fundamentally the same concern.

[vii] See Baier 1986, *op. cit.*, for more on this topic.

[viii] For some discussion, see Jones, K (1996) "Trust as an Affective Attitude." *Ethics* 107. Anthony Giddens provides a detailed account of the second kind of trust ('the development of faith in symbolic tokens, or expert systems . . . [which are both] abstract systems') in his *Consequences of Modernity* (1990: Cambridge: Polity Press, quotation at p.80).

[ix] See Korczynski (1996) *op. cit.* for a useful overview and discussion of accounts of the value of trust.

[x] See O'Neill, 2002, *op.cit.* p.6 on for discussion of ways in which trust can be justified.

[xi] See Korcynski, 1996, *op. cit*. for accounts of the economic value of trust.

[xii] These distinctions are taken from the literature on testimony. See, for example, Goldman, A (1999), *Knowledge in a Social World* (Oxford: Oxford University Press).

[xiii] This case is based on a presentation made by Brian Wynne at the Nuffield Council on Bioethics.

[xiv] For example, by social class and by gender and ethnicity

[xv] Yearley, S (2004) *Making Sense of Science* (London: Sage), p118

[xvi] One interesting result of the *Public Attitudes survey* is that it is clear that the "promise" of science is associated with medicine, but the greatest fears are also about communicating medically relevant data.

[xvii] *Public Attitudes Towards Science*, 3.85

[xviii] For in-depth discussion, see Evans, R and Collins, H (2007) *Rethinking Expertise* (Chicago: Chicago University Press).

[xix] Strictly, of course, scientists also often have to go on such data: see Kitcher, P (1995) *The advancement of science* (Oxford: Oxford University Press).

[xx] Wynne, B (1996) "May the sheep safely graze?" in Lash, S Szerszynski, B and Wynne, B (eds) *Risk, Environment and Modernity* (London: Sage), p.57.

[xxi] See Pielke, R (2007) *The honest broker* (Cambridge: Cambridge University Press) for useful discussion of the relevant possible images of science.

[xxii] Goldacre, B (2009) *Bad Science* (London: Harper Perrenial), p16, cites this research from the *Jounal of Cognitive Neurosceince.*

[xxiii] See Hargreaves, Lewis and Speers, 2003, *op.cit.*, for these figures.

[xxiv] For a useful overview, see Yearley, 2004, *op.cit.*, esp. Chapter 8.

[xxv] Quoted and discussed in Wynne, B and Irwin, A (1996) "Introduction" in Wynn, B and Irwin, A (eds.) *Misunderstanding Science?* (Cambridge: Cambridge University Press)

[xxvi] There is extensive discussion of these issues in the literature. See, for example, Wolff, J (2006) 'Risk, Fear, Blame, Shame and the Regulation of Public Safety', *Economics and Philosophy* 22

[xxvii] See O'Neill, 2002, *op.cit*

[xxviii] See Wynne, 1996, *op.cit* p.48 for a criticism of the assumption that "the earlier, ostensibly public uncontested nature of expertise equalled public trust".

[xxix] See Beck, U (1992) *Risk Society* (London: Sage); also, see Giddens, A (1990) *The consequences of modernity* (Cambridge: Polity).

[xxx] See Wynne, 1996a, *op.cit.* Also, see his "Misunderstood Misunderstandings" (Wynne, 1996b) in Irwin and Wynne (1996) *op.cit.* See also Pinch, T and Collins, H (2002) *The Golem at Large* (Cambridge: Cambridge University Press) for useful discussion of Wynne's work.
[xxxi] See, for example, the discussion in Wynne, Stilgoe and Wilsdon, *op.cit.*
[xxxii] See Yearley, *op.cit.* and Allan, S (2002) *Media, Risk and Society* (Open University Press) for discussion of BSE
[xxxiii] See, for example, the DEMOS report by Wynne, Stilgoe and Wilsdon; Funtowicz and Ravetz, 1990. *Uncertainty and Quality in Science for Policy* (Kluwer); Schnedier "Is the citizen scientist an oxymoron?" in Kleinman (ed) (2000) *Science, technology and Democracy* (SUNY Press); Jasanoff, S "Conclusion" in Jasanoff, S (ed) *States of Knowledge* (Routledge)
[xxxiv] See Pielke *op.cit.* for discussion of post-normal science in general.
[xxxv] This sentiment is most strongly expressed in his *Risk and ritual* (BSHS Monographs, 1982), but see also his 1996a. As an illustrative example, for Wynne, scientific models "tacitly and furtively impose prescriptive models of the human and the social upon lay people, and these are implicitly found wanting in human terms" (p.57 of Wynne, 1996a)
[xxxvi] Yearley, 2004, 121
[xxxvii] For relevant accounts of change in funding, see Pielke, *op.cit.*
[xxxviii] Ziman, J, 2007, *Science in Civil Society*, p60
[xxxix] See Goldacre, 2009, *op.cit.* for trenchant discussion.
[xl] For a fascinating account of how these problems emerge see Pielke, *op.cit.* and Schneider, *op.cit.*
[xli] See Fisher, E (2008) *Risk, regulation and administrative constitutionalism* (Hart Publishing) for further discussion.
[xlii] See Allan, 2002, *op.cit.* for discussion of BSE
[xliii] p124 of Collins and Pinch, 2002, *op.cit.*
[xliv] Fisher, 2008, *op.cit* provides a useful guide to some of the larger issues here about the aims of regulation.
[xlv] For Wakefield, see Boyce, for Puzstai, see Allan. For this general phenomenon, see Allan
[xlvi] See Yearley, S (1996) "Nature's advocates" in Irwin and Wynne *op.cit.* for discussion of the emergence of this phenomenon.
[xlvii] See Pielke, *op.cit.* for a useful discussion of the differences between science in policy and science in politics.
[xlviii] See O'Neill, 2002; Also, see O'Neill, O "Justice, trust and accountability" (unpublished ms).
[xlix] See Funcowitz and Ravetz, *op.cit*, for this characterisation of the conditions of "post normal science".
[l] It is notable that in response to the code, some seemed to suggest that it should not govern industry scientists, which would rather undercut calling it a "universal" code.