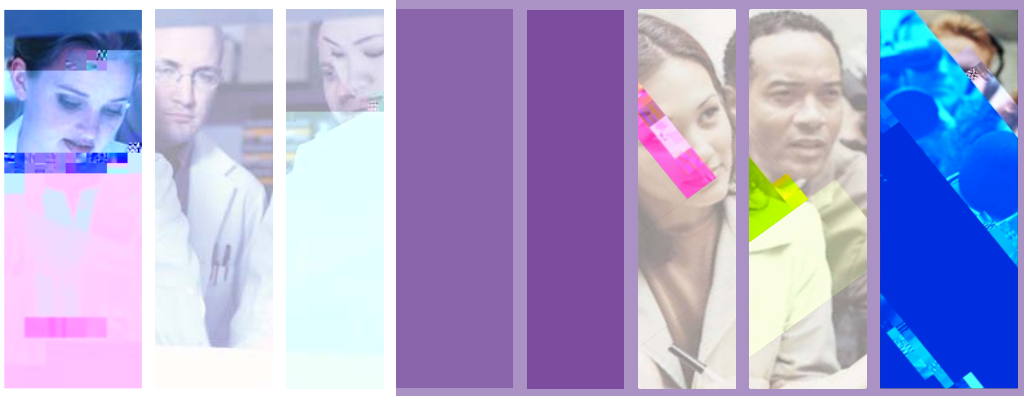
THE ROYAL SOCIETY

Science and the public interest



Communicating the results of new scientific research to the public

excellence in science

Page

Foreword

Lord Rees of Ludlow, President of the Royal Society 2
Sir Patrick Bateson, Chair of the working group 3

Summary.....4

Science.....0c1j0 Tr0.598 0 TD(c)Tj1 TrT(c)Tj0 Tr0.4862228an6 TD(

Foreword

Lord Rees of Ludlow,
President of the Royal Society

The vast majority of scientific papers are of direct interest only to specialists, even if they report research of long-term importance. However, a few journal papers are published every week that have immediate relevance – perhaps for health and safety, or for public policy.

Usually, new research results are disseminated within the research community via conference presentations and journal papers; wider communication is usually an afterthought. However, the way this is done – by, for instance, press conferences or media releases – can strongly colour public reactions and attitudes, especially if there are immediate implications for people's health or way of life. Recent episodes such as the high-profile discrediting of papers on cloning are likely to bring the

Foreword

Sir Patrick Bateson, Chair of the working group

This report has resulted from three years of investigation by the Royal Society into best practice in communicating the results of new scientific research to the public, carried out as party of the Society's 'Science in Society' programme with generous support from the Kohn Foundation. The study was carried out by a working group drawn from science in academia and industry, scientific publishing and groups representing consumer and patient interests.

Throughout the study, the working group focused on identifying practical measures that would represent improvements for both the public and researchers. We hope that this document will help researchers to understand and be aware of the importance of the key public interest issues. It is they who are largely responsible for how and when their results are communicated.

The Royal Society will be disseminating the content of this report widely to the research community both within universities and within private companies, as well as among the publishers and policy-makers. Although we have focused on this issue from the perspective of the UK, we believe that it will be relevant to researchers in other countries. These are issues that every researcher needs to consider, from postgraduate to professorial level.

Ultimately, the timely and appropriate communication of research results to the public is key to maintaining public confidence, and one in which both the public and the research community hold stakes. Many of the challenges we have outlined in this report can only be tackled through a change in culture among researchers – we hope that this report provides impetus to that change.

Summary

Many of the biggest controversies in science over the past few years have arisen at least partly from problems in the process of communicating research results to the public. Although the number of problems has been relatively small compared to the overall output of research, they nevertheless can potentially affect tens if not hundreds of millions of people worldwide. Although most problems appear in fields directly relating to human health, they have occurred in a wide range of other areas as well.

In response to these controversies, the Royal Society established a small working group with a broad membership to consider whether improvements could be made in the way that researchers communicate their results to the public. This report, which has been endorsed by the Council of the Royal Society, presents the conclusions of the working group. The main thrust is that researchers need to think deliberately about whether and how to communicate their results to the public and that, in this, a prime consideration should be how the public interest is best served. The report is designed to help researchers whose imminent publications might merit broader communication.

Using the UK Freedom of Information Act (2002) as a guide, the public interest is served where the communication of research results would:

- further the public's understanding of, and participation in, the debate of issues of the day;
- facilitate accountability and transparency of researchers, their funders and their employers;
- allow individuals to understand how the results of research affect their lives and, in some cases, assist individuals in making informed decisions in light of the results; and
- bring to light information affecting public well-being and safety.

Research results can have implications for the public in terms of matters such as eating habits, life-style, patient welfare, personal security and well-being, the state of human society and the state of the environment. The likely impact of research results on the public needs to be carefully assessed by the research community. The public interest is involved not only in publicly funded research but also when funds come from private or commercial sources, thereby raising issues of corporate social responsibility.

Factors such as national security, commercial confidentiality and intellectual property rights are recognised as major interests that can compete with the public interest. These can apply in cases such as research carried out by companies, or research carried out under contract from the private sector, or

Summary

research carried out by universities that wish to protect and exploit intellectual property rights. The information provided by the Department for Trade

Science and the public interest

1.

The communication of research results can have significant impact on members of the public, leading to changes in their views, attitudes and behaviour. These changes can have the effect of improving people's lives, by helping them, for instance, to avoid potential dangers to their health. In some cases, however, poor quality checks before publication or misreporting of research results may damage people's lives by, for instance, exposing them to higher risks to their health.

Problems in the communication of results to the public are relatively infrequent compared to the total output of research across all disciplines. Where problems do occur, it is more often, but not exclusively, in those disciplines such as medical research that have the most direct link to human health and well-being. However, enough instances of problems, across a wide range of disciplines, give cause for concern by the research community as a whole. Poor research, suppressed findings and misleading reporting of results all contribute to such concern.

It is difficult to quantify the extent of the problems that occur in relation to the communication of research results to the public, as there is no systematic monitoring of them. However, some sense of the scale can be gained in other ways. For instance, a recent survey published in the journal Nature [1] found that small but significant proportions of a sample of 3,247 US-based researchers funded by the National Institutes of Health admitted that they had engaged in "questionable research practices" within the previous three years that directly affected the integrity of their results. For instance, 6.0 per cent owned up to failing to present data that contradicted their own previous research and 10.8 per cent said they had withheld details of methodology or results in papers or proposals.

Although few instances of these sorts of activities have significant direct consequences for the public, some well known cases have sparked major controversies. These have included research on the health risks of tobacco smoking, the safety of the MMR vaccine, the impact of genetically-modified foods, and the effect of human activities on global climate. These issues affect potentially tens of millions, if not hundreds of millions, of people worldwide, and although controversies may be relatively infrequent compared to the total volume of research, their impact can be very great. Not only do they have potentially negative consequences for the public, they can also damage the reputation and funding prospects of the researchers themselves, as well as reducing public confidence in science in general.

The role of the media in such controversies has been the subject of much discussion and a number of initiatives have focused on how journalists can serve the public better by improving their reporting of research results. For example, the King's Fund [2] has published a guide for the media that covers the communication of health risks that have been determined through research. The Social Issues Research Centre, Royal Institution of Great Britain and Royal Society also jointly published 'Guidelines on science and health communication' [3]. While that document included guidelines aimed at print and broadcast journalists, who largely did not welcome offers of such help, it also included a checklist for science and health professionals. It recognised that a common factor in many of the controversies has been concern about whether researchers have acted in the best interests of the public in relation to the communication of their results. The present report is

These exemptions also include trade secrets and prejudice to the commercial interests of any person. Three major science journals, Nature, Science and the Proceedings of the National Academy of Sciences, published a joint statement by journal editors on scientific publication and security [7]. The statement included the following commitment about scientific papers that are submitted to them for publication:

"We recognize that on occasion an editor may conclude that the potential harm of publication outweighs the potential societal benefits. Under such circumstances, the paper should be modified, or not be published. Scientific information is also communicated by other means: seminars, meetings, electronic posting, etc. Journals and scientific societies can play an important role in encouraging investigators to communicate results of research in ways that maximize public benefits and minimize risks of misuse."

Questions are rightly asked about the integrity of the communication process when interests are present that appear to compete with the public interest. Some researchers have been bound by the terms of contracts that specify non-disclosure of research results to anybody, or disclosure only with the permission of an employer or funder [8]. As a result, research results have sometimes been suppressed to satisfy commercial interests, to the clear detriment of the public interest. This has particularly been true of some research carried out and funded by the tobacco industry into the health effects of

want to commercialise, but it is also important that any deal on intellectual property should not unreasonably constrain the university from publishing the results in a timely fashion, from doing further research in the same area, or from developing other applications of the same intellectual property in different fields of use."

Among its recommendations was the following: "The Association for University Research Industry Links (AURIL), the Confederation of British Industry (CBI) and the Small Business Service (SBS) should produce a small set of model research collaboration contracts, for voluntary use by industry and universities." In response the Lambert Working Group

"The Government sees CSR as the business contribution to our sustainable development goals. Essentially it is about how business takes account of its economic, social and environmental impacts in the way it operates – maximising the benefits and minimising the downsides."

"Specifically, we see CSR as the voluntary actions that business can take, over and above compliance with minimum legal requirements, to address both its own competitive interests and those of wider society."

Special difficulties can arise when exploiting new findings for commercial production when a company has a natural interest in protecting its investment. Also, special issues to do with confidentiality will usually apply in research relating to security and defence. Nevertheless, considerations of intellectual property rights, commercial confidentiality and security, whilst important, should not invariably prevent the research community within the private sector from meeting their responsibilities with respect to the communication of research results that have implications for the public.

Listed companies are faced with a particular dilemma.

In accordance with the guidance from the UK Listing Authority on the disclosure of price sensitive information, announcements about research results made by listed companies must take account of the financial interests of parties such as shareholders. However, such announcements ought to be accompanied by the disclosure of enough information to allow other researchers to make an assessment of the implications for the public. The disclosure of 'price sensitive information' in the form of research results is also likely to be covered in the United States by the terms of the Sarbanes-Oxley Act of 2002, which seeks to protect investors by improving the accuracy and reliability of corporate disclosures. The disclosure of results that are subject to the laws of other countries in addition to the UK will need special consideration by researchers.

Some current 'normal' practices within the research community are not consistent with public interest.

One example is the tendency not to communicate results that are negative, in the sense that they do not show a difference between an experimental or treatment group, on the one hand, and a control or comparison group on the other, or that they do not show an association between two variables. Where the disclosure of negative results is in the public interest, for instance because they relate to the safety of products or services, it is important that they be published. In relation to medicines, a joint position statement by four major international pharmaceutical trade associations makes a commitment to the principle of making public the results of post-market clinical trials within 12 months of completion [17].

The research community, within both the public and private sectors, needs to shoulder two main responsibilities in relation to public interest matters.

provides the best way of demonstrating to the public, as well as to scientific colleagues, the accuracy,

larger population. Making clear the limitations of extrapolations to human populations is also essential, for instance when the results are derived from research using non-human species, or mathematical models, rather than being directly drawn from the populations to which the conclusions are generalised.

9.

The process of the communication of new results between researchers is subject to continuous innovation in order to serve the research community more satisfactorily.

A number of online repositories and archives are already in operation on the world wide web, allowing reports of research results to be posted before they have been subjected to the full independent peer review process [21]. While this practice has clearly developed for the benefit of the researchers, little consideration appears to have been given to the consequences of this practice for the public. It is true that research results, later shown after peer review to be erroneous, have rarely been communicated to the public after appearing on a pre-print server. Nevertheless, the potential for great damage clearly exists. The same point applies to the process of so-called 'open review' [22]. At the very least researchers and editors should consider their responsibilities before making the material openly available before peer review.

10.

Scientific conferences raise special concerns. Presentations made at conferences may include preliminary results and other findings that may not have been subjected beforehand to independent peer review. However, the organisers of a conference may promote research results as a form of advertising for their event.

Whilst such practice is not inherently wrong, it does raise the question of whether the public interest is best served if the results that are being communicated are later shown to be wrong after they are subjected to a quality check. One estimate is that about half of the presentations of new research results at conferences never appear in peer-reviewed journal papers [23]. The participants and organisers of scientific conferences should recognise their responsibilities by making clear the extent to which the contents of presentations have been subjected to a quality check. Indeed, the research community has even greater responsibility for considering the public interest when the research results in conference presentations have not been subjected to rigorous quality checks.

11.

While researchers should recognise their responsibilities in considering the wider context of their results, they may not necessarily be best placed to consider, for instance, the implications for public policy.

Researchers should seek advice, when needed, about what the appropriate context for their results is and should be alert to how their results may be used by other individuals and organisations, such as campaigners or policy-makers. If research results are considered to have implications for the public, researchers would be well advised to notify relevant regulatory bodies (e.g. Food Standards Agency, Medicines and Healthcare Products Regulatory Agency) before communication of the results to the public. Most regulatory bodies have well-established mechanisms for assessing the implications of research

results, and the research community should be aware of these bodies, and be prepared to interact with them. For their part, funders, sponsors and employers of researchers should be ready to offer advice about how to assess the implications for the public and provide guidance about whether the disclosure of results would be in the public interest.

The results of research can be communicated to the public in a number of ways. They may be presented in public fora, such as lectures, workshops and meetings. They can appear in a 'lay' style, either in a publication or on the web. However, the main way in which research results are communicated to a wide public audience at present is through the national and local print, broadcast and online media. Usually this is achieved through a media release prepared to coincide with the publication of a peer-reviewed journal paper. Some journals also produce lay summaries that may be prepared in consultation with the authors. For instance the journal Annals of Internal Medicine publishes a 'Summary for Patients' on its website [24] for any paper which the editor believes has implications that need to be presented in a 'lay' form. The Summary is written by the editor who oversaw the review of the paper. It is sent to the authors for comment and is informally reviewed by staff at the journal.

Lay summaries need to be subjected to the same level of review as technical papers before publication. As journal papers generally do not provide appropriate context for the public, the review process for lay summaries may be different to that of technical papers. It may also mean that a journal editor consults a reviewer who has specific expertise in identifying implications for the public.

Misleading media reports have occurred because of

The mood has been changing, particularly in relation to medical research. The Medical Research Council [26] and the Wellcome Trust [27] have introduced codes of practice, including guidelines for the communication of research results. The UK Panel for Research Integrity in Health and Biomedical Sciences and the UK Research Integrity Office were launched in April 2006, with the aim of eliminating malpractice in research within universities, the National Health

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20. See also: Godlee, F. 2002. Making reviewers visible: openness, accountability and credit. Journal of the American Medical Association, vol 287, p 2762-2765.

21. For example, http://arxiv.org/ is a fully automated electronic archive and distribution server for research papers in physics and related disciplines of mathematics, nonlinear sciences, computer science and quantitative biology.

22. For example, the journal Atmospheric Chemistry and Physics (http://www.copernicus.org/EGU/acp) involves a two stage review process, with an initial "rapid access peer-review" of a paper after which it is published on a website, Atmospheric Chemistry and Physics Discussions, along with referees' comments, additional short comments by other researchers and authors' responses.

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Annex

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Checklist for researchers

These questions may help researchers to take the public interest into account when considering the communication of their results to the public.

1. What implications, if any, do your research results have for the public, for instance in terms of:

- the eating or life-style habits of consumers;
- the well-being of patients;
- personal security or other issues affecting the well-being of individuals;
- the state of human society in general;
- the state of the environment; or
- public policy?

2. Would the communication of your results be in the public interest, in terms of:

- furthering the understanding of, and participation in, the debate of issues of the day;
- facilitating accountability and transparency of researchers, their funders and their employers;
- allowing individuals to understand how the results of research affect their lives and, in some cases, assist individuals in making informed decisions in light of the results; or
- bringing to light information affecting public well-being and safety?

3. Do you need any advice to help you to decide whether communication of your research results would be in the public interest, and if so whom do you need to assist you?

4. Are there any reasons why disclosure of your research results might not be in the public interest, such as national security considerations?

5. Are there any other interests, such as commercial confidentiality, stock market regulations or intellectual property rights, competing with the public interest in terms of the communication of your results?

6. Are you able to provide the appropriate context for your research results, such as:

- indicators of the accuracy of the results (eg statistical significance);
- indicators of the integrity and credibility of the results;
- information about the ethical conduct of the research;
- indicators of uncertainty in the interpretation of results;
- expressions of risk that are meaningful; and
- comparison of the new results with public perceptions, 'accepted wisdom', previous results and official advice?

7. Do you need any advice to help you to provide appropriate context for your results, and if so whom do you need to assist you?

8. How might your results be used by other individuals or organisations, such as campaigners or policy-makers?

9. To what extent have your results and their context been subjected to a review of their accuracy, integrity and credibility, for instance through a peer-reviewed journal?

10. In terms of the public interest, when would it be best to communicate your results to the public?

11. In terms of the public interest, what would be the best way for you to communicate your results to the public?

12. If you are presenting results at a scientific conference, is it in the public interest for them to be communicated to the public at this stage?

13. Is there a regulatory body which you should contact about your results?

14. Do you need to provide a 'lay summary' of your results and their implications for the public?

15. Have you checked any materials prepared for the media about your results?

Members of the Royal Society working group on communicating the results of new scientific research to the public

Sir Patrick Bateson FRS (Chair): Emeritus Professor of Ethology, University of Cambridge, and former Vice-President and Biological Secretary, Royal Society

Dr Philip Campbell: Editor of Nature

Dr Linda Cummings: Royal Society Dorothy Hodgkin

Annex

List of individuals and organisations that submitted written evidence

Scott Armstrong, University of Pennsylvania

Ms Gundula Azeez, Policy Manager, Soil Association, Bristol

Antony Barrington Brown

John Barwise, Sustainable Projects

Grace Baynes, Marketing Communication Manager, BioMed Central, London

Professor Peter Belton, President, Institute of Food Science & Technology, London

Allan Berry, Chairman, Society for the Protection of Salmon & Sea Trout, Perthshire

Dr Rachel Bishop, Public Awareness Programme Manager, Engineering and Physical Sciences Research Council, Swindon

Petra Boynton, Lecturer, Primary Care & Population Sciences, University College London

Dr Tim Bradshaw, Senior Policy Advisor, Confederation of British Industry, London

Professor Tony Bradshaw FRS, Professor of Botany, University of Liverpool

Collin Breen, KineMatik, Ireland

Jenny Buckland, Secretariat, National Teacher Research Panel, London

Dr Robin Clegg, Head, 'Science in Society' Programme, Particle Physics and Astronomy Research Council, Swindon

Professor DJ Clements-Croome, Professor of Construction Engineering, University of Reading

Fiona Godlee, BMJ, London

Alan Gomersall, Associate Director, Evidence Network, London

James Greenhalgh

Dr Russell Hamilton, Department of Health, Research & Development Division, London

Professor Stevan Harnad, Professor of Cognitive Science, University of Southampton, Department of Electronics & Computer Science

*David Har*p, Department for Education and Skills, London

Annex

Professor Ken Packer FRS

Mr Ian Panton

Sir John Pattison, Director of Research & Development, Department of Health, London

Jeremy Pearson, Associate Medical Director, British Heart Foundation, London

Nicola Perrin, Public Liaison Officer, Nuffield Council on Bioethics, London

Professor Richard Peto FRS, Professor of Medical Statistics & Epidemiology, University of Oxford

Miss JM Pick

Professor John Pickett FRS, Head, Rothamsted Reseach, Biological Chemistry Division, Harpenden

Professor Gordon Plotkin FRS, Professor of Computer Science, University of Edinburgh

JW Pollitt

Bud Pomeranz, President, Global Public Affairs Institute, USA

Dr Arpad Pusztai

Professor Steve Raynor, Director, Science in Society Programme, Economic and Social Research Council, Oxford

Neville Reed, General Manager, Royal Society of Chemistry, London

Michael Rice

Nick Ross

Juan Rovira, Senior Health Economist, HDNHE, The World Bank, USA

Dr J Saunders

Alistair Scott, University of Sussex, Science & Technology Policy Research, Brighton

Professor Norman Sheppard FRS, Professor of Chemistry, University of East Anglia, Norwich

Professor Graham Shimmield, Director, Scottish Association for Marine Science, Oban

Dr Alison Stewart, Chief Knowledge Officer, Strangeways Research Laboratory, Cambridge

David Stodolsky, Institute for Social Informatics, Denmark

Professor Philip Thomas, Professor of Engineering Development, City University, London

Ann Thomas

Dr Richard Tiner, Medical Director, Association of British Pharmaceutical Industries, London

Dr Robert Tucci

Dr Turner, BSPB Ltd

Professor Bill Unruh FRS, Physics & Astronomy, Canadian Institute for Advanced Research, Canada

Juliet Upton, Chair, Science, Technology, Engineering and Medicine Public Relations Association (STEMPRA), London

Atam Vetta

Professor Michael Vicker, Professor of Cell Biology, University of Bremen, Denmark

Richard Wakeford, Principal Research Scientist, British Nuclear Fuels Ltd, Cheshire

Dr Helen Wallace, Genewatch, Buxton

Professor David Walland, Radiation Protection Adviser, University of Bristol

Dr John Waller

Julian Warner, Queen's University, Belfast

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