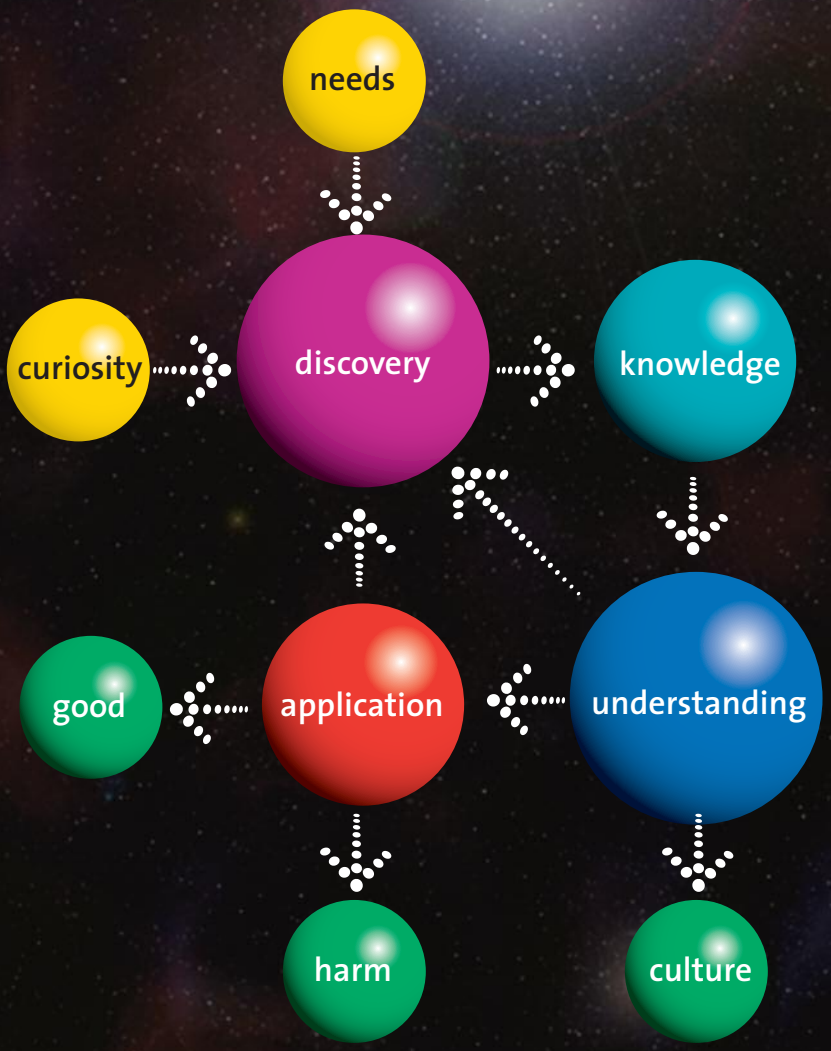
The University of Manchester
Institute for Science
Ethics and Innovation

MANCHESTER 1824



Who Owns Science?
The Manchester Manifesto

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Science, along with the innovation it generates, is a vast enterprise: commercial and pro-bono, public and private, industrial and educational, amateur and professional. It permeates our lives and shapes the world. Some say it is a defining characteristic of humanity, stimulating and harnessing our innate curiosity and, more than any other endeavour, shaping our world and, increasingly, ourselves.

For many reasons, some of which are set out below, it is increasingly important to consider the question of "Who Owns Science?". The answer to this question will have broad-ranging implications: for scientific progress, for equity of access to scientific knowledge and its fruits and for the fair distribution of the benefits and the burdens of science and innovation – in short, for global justice and human progress.

Our approach

The Manchester Manifesto Group brings together international experts from relevant disciplines to address the question of "Who Owns Science?" Led by two research institutes at The University of Manchester, the Institute for Science, Ethics and Innovation and the Brooks World Poverty Institute, chaired by John Sulston and Joseph Stiglitz, respectively, the Group represents a critical mass of research expertise that are ideally equipped to meet the challenges and problems outlined above. The Group's members are drawn from a broad range of academic disciplines and relevant sectors, including economics, science, innovation, law, philosophy, ethics and public policy. Our goal has been not only to investigate the question of "Who Owns Science?" but to present and apply our findings to maximum effect in order to make a difference in the real world as to how science is used, and hence to "build a better future for humanity".

Statement of the problem

Science is a rapidly growing industry. Beyond basic research, the commercialisation of technologies and development of new products from bench top to marketplace is a complex process. In asking "Who Owns Science?", we are concerned with all aspects of this process: scientific discovery, development, application and distribution; and the interactions between each aspect. The way in which this is managed, and in particular the way in which access to technologies is facilitated and controlled, is having and will inevitably have an increasing impact on the course of science-based technological innovation.

An important component of the innovation process has been the idea of "ownership" in science and technology. This concept has arisen partly in the context of profiting from research and development, but also has implications for much broader issues such as control of and access to scientific information and products that result from research, in terms of both the private and socio-political dimensions of ownership.

To manage the ownership of science and the fruits of research, an intricate system of intellectual property (IP) law has developed. The justifications for IP law as it exists at present include the idea that it is required in order to facilitate scientific and economic benefit from innovation, and that it provides a fair and morally justifiable way of rewarding those who invest in the process of discovery and regulating access to these benefits.

The initial meetings of the Manchester Manifesto Group in 2008-2009 established that the current method of managing innovation (and perhaps in particular IP in its present form), whilst deeply embedded in current practice and hence of practical importance, also has significant drawbacks in terms of its effects on science and economic efficiency, and raises ethical issues because of its (often adverse) effects on people and populations.

The Manchester Manifesto Group considered the core goals of science and identified various issues and problems with the current system of ownership and management of science and innovation, highlighting elements that hinder or obstruct achievement of these goals. Reflecting on these problems, we were able to articulate some broad principles and policy considerations to guide any investigation or evaluation of alternative systems of innovation. Finally, we outlined some questions that must be addressed if we are to move towards solutions to the problems identified by the group. We call for further research in these areas as a matter of great importance, in order to answer the question not only of "Who Owns Science?", but of who ought to own science and how the goals of science can best be fulfilled.

Goals, Problems and Issues in Science and Innovation

Goals

Science and the public good

Science can serve the public good by generating knowledge to meet human needs and purposes. This includes knowledge with direct application to current challenges and pure/undirected endeavour (so called "blue skies" research) that forms the essential basis for future scientific discovery.

- The pursuit of pure (unapplied) scientific research is clearly in the public interest, since curiosity expands knowledge, which is in itself a good thing. This justifies investment in such research.
- Science-based technological innovation further serves the public good by playing a key role in economic growth and development.
- There is a basic public interest in access to knowledge.

Innovation and the public good

Management of innovation has significant implications for scientific progress and human welfare. It affects the distribution of benefits, access to technology, dissemination of knowledge, and the pace and direction of research.

- Innovation should operate for the public good, amongst other goals.
- Given their efforts and investments, the scientific community and the public can also be viewed as 'shareholders' in innovation, and its benefits should remain open to them (in the form of welfare goods and knowledge).

Reciprocal responsibilities of science and society

The relationship between science and society is essentially one of reciprocity, mutual benefit, and needs to be seen to be so. Just as science has responsibilities to the public good, the public has responsibilities towards science as the collective recipient of its benefits and as a major funder of its activities – a relationship that is often mediated by policy:

- Public confidence in and engagement with science is vital; openness to public scrutiny can help to maintain trust and support. Science should be open to the public, enabling understanding of its purposes and implications.
- Society needs to provide just and effective conditions for the increase of scientific knowledge. Any management mechanisms should be justifiable, appropriate, and built on a sound understanding of both science and the systems in which it operates.
- To achieve the goals of promoting scientific progress and human welfare, the scientific community has a responsibility to facilitate reflection of scientific understanding in policy, and should seek participation in policy-making processes and debates at the national and international level.
- Policy-makers need to ensure that there are opportunities for voices from the scientific community to be heard. Scientists and policy-makers have a joint responsibility to ensure this participation occurs in a transparent manner to avoid public suspicion of undue influence.
- Policy-makers should also ensure that there are opportunities for the voices of the public to be heard.

Issues/Problems in the Current Management of Innovation

The interests and contributions of inventors and authors deserve to be recognised fairly. However the current dominant model of innovation and commercialisation of science poses a number of problems. It has potential to encourage innovation and stimulate research and development, but also to frustrate innovation and stifle research and development; and can hinder science from operating in a way consistent with the public good.

Access to benefits of research

Current models can restrict or prevent public access to the benefits of research – both the information generated by scientific endeavour and the products of innovation based on that science – and thereby hinder science from serving the public good.

- Certain licensing and commercial practices can restrict access to the products of science and innovation, particularly for those with limited market power.
- This is of particular concern in the case of those products that address basic needs (such as health care).
- The current model rewards particular kinds of creative effort, namely those which result in commercial gain. It is therefore likely to hinder innovation of products that have limited market value, but which may have huge social benefit.
- The obligation on corporate innovation to maximise profit and return for shareholders can conflict with the creation of knowledge and achievement of welfare goals.

Effect on innovation

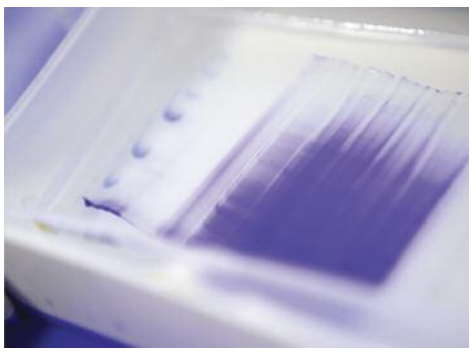
Current models can hinder innovation because:

- Certain licensing practices can have restrictive effects on innovation. These include, for example, use of very narrow or exclusive licence terms.
- The increasingly common incidence of requiring multiple licences for the use of a single technology or research tool complicates access, making it more costly and time-consuming.
- Perceptions of accessibility problems can lead to enterprises deciding not to attempt to apply for licences.
- New business entry into innovative industries is very difficult due to the high transaction costs involved in operating in an arena of multiple intellectual property rights, reducing competition and allowing large companies to dominate markets.
- Navigation and implementation of the patent system, negotiation, bargaining and litigation require costly expertise.
- The operation of the current system often prevents the holders of IP rights themselves from realising the full benefits of these rights, for example because of the costs involved in asserting them.

Scientific progress

- Restrictions on access to information at any stage of the innovative process obstruct the flow of scientific information and thereby impede scientific progress. Such restrictions are also contrary to the needs of scientific inquiry and are inimical to openness and transparency.
- Information sharing among the scientific community can be reduced or suffer from delays as a result of patent requirements (e.g. that information must not be in the public domain at time of filing).
- The complexity of the system creates uncertainty, for example over researchers' ability to obtain necessary licences, which can discourage investment in research and development.
- These access restrictions have particularly severe effects on public, not-for-profit, small and developing country enterprises, which cannot afford the expense of licences and/or the expertise required to navigate the patent system. This can obstruct, delay, or entirely shut-down valuable lines of research and innovation.

Overall, the current patent system is self-reinforcing, encouraging proliferation of patents and multiplying these problems.



Broader Issues

There are also broader issues resulting from the dominant model of innovation which should be given consideration.

- Improving systems of innovation may not be enough in itself to promote human welfare; there is also the problem of insufficient capacity, particularly in many developing countries, to access scientific information, operate and navigate innovation systems, and achieve access to innovative products e.g. because of weak health infrastructure.
- The transition from basic science to product in the clinic or marketplace is not always linear and unidirectional. The relationship between 'pure' and 'applied' research, science, technology and innovation is a complex and multi-faceted one, with interactions between actors at all stages influencing the process. The effects of action/regulation in one area may have implications extending across other aspects, and each area may have unique issues and problems associated with its management.
- Within this process, actors can have multiple roles, creating potential conflicts of interest. For example, a single individual may have both scientific and commercial interests at stake; governments may face a conflict between stimulating economic development through rewarding private investment in research and optimising the public benefits of science.
- In many cases, profit has become the primary reward for research and development – often to the point of other drivers of innovation dropping out of consideration. Greater consideration should be given to different drivers of science/ incentives for innovation beyond profit.
- It is not only the intellectual property system that restricts participation in innovation; there is also all too often a lack of strategies to encourage openness of communication, participation in research, and sharing of information and products that result from science and innovation.

Global Dynamics

The global context in which science and innovation now operate and of which they are an integral part needs to be given consideration, because it also affects their operation and effectiveness.

While states have the sovereign right to adopt their own rules, laws and procedures, they need to operate within the bounds of a variety of international rules and norms and with awareness of international dynamics. For management of innovation, these include:

- Permeable national boundaries creating high mobility of knowledge, materials, and personnel, and meaning that the impacts of national policies may be widely felt in other states.
- In areas which lack harmonised international regulation, innovative activities can migrate to territories in which regulatory regimes are weak or non-existent.
- Frequent prioritisation of national interest and economic competitiveness by states in their international relations.
- Wide disparities between rich and poor within and between states, in terms of income, opportunities, health, education, and access to science, technology and the products of innovation.

International regulation has advantages in its ability to harmonise national policies, providing clarity and reducing the costs of compliance. It must be recognised, however, that international regulation also has disadvantages. Powerful states have greater influence in rule-setting and less to fear in regard to the consequences of non-compliance. Commitments to capacity-building for developing states are inadequately fulfilled and enforcement is problematic.

Additional problems occur at the international level:

- Diverse national regulation of innovation creates complexity in compliance. This can increase costs to innovators, pushing publicly funded, not-for-profit and developing country enterprises out of international markets.
- International regulation can have the effect of privileging the interests of wealthy states over general human needs due to power imbalances.
- International regulation currently remains state focused and often reinforces state sovereign rights. It can therefore be of limited effect on transnational actors (e.g. corporations) and often promotes national interest above that of local communities.
- Bilateral agreements and 'free trade areas' are being used to impose excessive and inappropriate standards on less developed countries.

The effect of the current international rules, which set minimum standards for intellectual property protection, is that a single model of intellectual property protection dominates, and at the same time is operative in many national systems. This dominant model is intended to promote scientific and economic development, but can be radically flawed in this respect. Alternative models need to be promoted and existing flexibilities fully explored to ensure innovation can meet welfare goals.

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Principles, Policy Considerations and Progress

We recognise that innovation has an essential role in economic development, but its use for the pursuit of profit should not override, and ideally should not conflict with, achievement of welfare goals and scientific progress. Scientific information, freely and openly communicated, adds to the body of knowledge and understanding upon which the progress of humanity depends. Information must remain available to science and this depends on open communication and dissemination of information, including that used in innovation.

Management of innovation is one of the routes through which public benefits of science can be realised. This requires a range of appropriate policies and regulatory mechanisms developed in cooperation with scientists, innovators and the public, combined with awareness of the implications of pursuing particular models of innovation management.

Advantages and disadvantages of these models need to be carefully assessed in regard to their cumulative impacts on the innovative process, achievement of welfare goals and scientific progress. Current systems for managing innovation may require adaptation and incorporation of greater flexibilities. In addition, consideration of alternative systems is needed.

Principles

The regulation of frameworks of innovation should promote the following objectives:

- Provision of public benefit
- Just recognition of interests
- Facilitating progress of science and innovation
- Increasing access to fruits of research – information and products
- Addressing welfare and resource inequities both locally and globally
- Increasing trust in the relationships between scientists, innovators, corporations and public, and between nations

At times these objectives may conflict and attention must be given to the most appropriate way of balancing them in each situation.

Policy Considerations

Alternative systems

The current dominant model of intellectual property rights for innovation is not the only option available. There are existing alternatives and new models can be designed with differing cost distributions. Different systems may be appropriate in different areas; consideration must be given to the factors that affect this, including the nature of the knowledge, the method of discovery and the environment in which knowledge generation takes place.

For example, the current system can be modified through increased use of mechanisms such as patent pools, voluntary or compulsory licensing, and differential pricing. A range of alternative models is also possible: from those which are related to the current rights system such as remuneration-based patents, through prize funds, to completely open-access models.

Assessing models of innovation

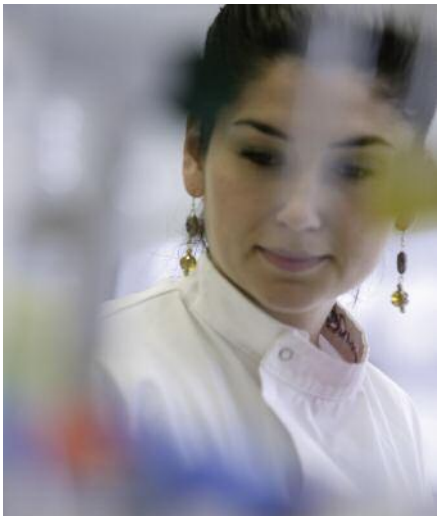
Any model of innovation is likely to have advantages and disadvantages. Consideration should be given to which is the most appropriate for particular circumstances, bearing in mind the principles above and the goals of science and innovation.

In evaluating the various possible models, the following factors should be taken into consideration:

- The extent to which it advances welfare and promotes human flourishing
- Fair and equitable distribution of benefits and burdens, with particular attention to resource providers (including the scientific community, the public, specific contributors of knowledge/biomaterials, and other contributors)
- Facilitation of safe and sustainable access to the end product
- Affordability in use of the system and of the end products
- Maintenance of free flow of scientific information
- Promotion of open communication
- The provision of adequate incentives to stimulate scientific discovery and innovation
- Ease and effectiveness of operation
- Inclusion of operational rules appropriate to achieving desired objectives
- Awareness of global dynamics

Principles and Progress in the Global context

The objectives for innovation management listed earlier also need to be achieved within the global context. Design and choice of innovation model may also, therefore, need to take into account the issues raised in the discussion of Global Dynamics (page 6).



We have considered the question of "Who Owns Science" in the context of what we believe to be the purposes of science and innovation and evaluated the way in which ownership of science currently operates with respect to these purposes. It is clear that the dominant existing model of innovation, while serving some necessary purposes for the current operation of innovation, also impedes achievement of core scientific goals in a number of ways. In many cases it restricts access to scientific knowledge and products, thereby limiting the public benefits of science; it can restrict the flow of information, thereby inhibiting the progress of science; and it may hinder innovation through the costly and complicated nature of the system. Limited improvements may be achieved through modification of the current IP system, but consideration of alternative models is urgently required.

We call for further research towards achieving more equitable innovation and enabling greater fulfilment of the goals of science as we see them.

Modified and alternative models of innovation have the potential to address problems inherent in the current system. An investigation and evaluation of these models is required in order to determine whether they are likely to be more successful in facilitating the goals of science and innovation identified above, and if so how they may be deployed. Greater cooperation between all actors is required; alongside development of theory, there is a clear need for practical engagement with actors at all stages of the innovation process.

The scope of this document is largely concerned with science that is in the public interest. More thought must be given to how we characterise what sort of science is in the public interest, and how we draw the boundaries between "public" and "private" science, in both the practical and the normative sense.

Members of the Manchester Manifesto Group have been actively pursuing research initiatives in these important areas; and the Group remains the base for practical discussion and ongoing investigations. We hope that the Manchester Manifesto will serve as a starting point for discussion, reflection and further research on these issues amongst all those concerned and involved with science and innovation.

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Royal Charter Number RC000797
J2645 02.10