

PANEL 9**DO WE REALLY NEED INTELLECTUAL PROPERTY RIGHTS?
CONSIDERATIONS FROM POLITICAL PHILOSOPHY, POLITICAL ECONOMY
AND TECHNOLOGICAL CHANGE**

Alex Rosenberg
Duke University, USA

**1. CONSIDERATIONS FAVORING A STRONG INTERNATIONAL REGIME
OF PROPERTY RIGHTS IN GOOD IDEAS**

There is a well known welfarist argument for intellectual property rights, to which I have added a second argument that I will briefly review here: In a competitive market among economically rational agents that lacks property rights in good ideas there must inevitably be an undersupply of good ideas: discovering and testing good ideas is costly and risky. Consider the obvious example of crop rotation. Establishing its enhancement of agricultural yields takes several growing seasons, during which some fields are removed from production altogether. No one has an incentive to undertake the experiment, but everyone has an incentive to watch others undertake it and copy the early adopters should the innovation work. But if no one has the appropriate incentive, there are no early adopters and crop-rotation is unlikely ever to be invented. Ergo, the absence of property rights in good ideas leads to underinvestment in and undersupply of them.

But what if a good idea is hit upon by accident without investment and risk. To pursue an agricultural example, suppose as must have been the case that one farmer discovers the effectiveness of animal waste as fertilizer. In a competitive market such an idea will provide an advantage and so it is in the interest of the discoverer to keep the idea a trade secret. It is obvious in the present example that keeping the idea secret will be difficult, costly and will introduce suboptimal outcomes for the discoverer and for the economy as a whole. Fertilizing only fields distant from others' sights or doing so at night may preserve the secret, but fields in the sight of competitors will have to forego treatment, and many parts of the fields manured in the dark will be missed, the fertilizer will not be evenly spread, and periods of full moon will interfere; one might build a high fence around ones field but this will impose a

heavy cost of secrecy keeping. So, the discoverer will have to incur significant costs to keep the secret and accept significant opportunity costs of keeping the idea secret. Moreover, the whole farming economy could profit from the good idea, owing to the increase in every farmers' yield if the idea were not kept secret. Whence the conclusion that in the absence of intellectual property rights there is undersupply of good ideas and overinvestment in those which are chanced upon!

The two features of good ideas that produce this result make them very similar to public goods: they are nonrivalrous in consumption: my using crop rotation in no way reduces the amount of crop rotation available to you to use, and yours has no impact on the amount available to a third farmer. So far, good ideas are just like public goods: the street light that makes my evening stroll safe makes yours just as safe whether I take my walk or not. Good ideas differ from public goods in that the latter are not excludable—I can't prevent you from consuming my street light except by making it impossible for me to benefit from it too. As our example shows, ideas are excludable, at least to the extent that you can keep them secret. But as our example also showed, keeping them secret imposes costs even when it is feasible at all. So, good ideas differ from public goods insofar as they are excludable and in fact it will often be difficult effectively to make them excludable.

The close similarity of good ideas to public goods suggests that the means employed to approach optimum provision of public goods might be employed to do the same for good ideas: governmental central planning and coercion. The only thing that ensures the optimum provision of a good—public or private—is presumably free exchange on a competitive market. This is not possible for a public good—non-rivalrousness and nonexcludability breed deceptive demand-revelation and free-riders. So, we must leave to the government to estimate how much to provide and permit the government to exact from consumers the amount necessary to pay for the public good. In the case of a good idea, we cannot expect free-exchange on a competitive market to work either. Nonrivalrousness means that any one who buys the use of a good idea can sell it to others without any reduction in their use of it. If copy costs are low enough, the original owner will reap few market-exchange rewards from her good idea. And the high costs of excludability will depress even resellers's returns. The solution most widely hit upon is governmental coercion and limited monopoly: The inventor/discoverer is forced by the government to disclose the idea to all, so that all can decide whether it will enhance their production (of market goods or household goods), but the government requires all to pay a license to the discovered/inventor, thus according her a time-limited monopolistic property right. As with other second best solutions, this solution

does not attain an optimal level of good new ideas but it approaches it more closely than other institutional arrangements. Optima here are of course understood in welfarist terms. The competitive market is a Pareto optimum and second best approaches to it such as those provided by intellectual property rights are supposed to be welfare improvements.

It is worth adding here that owing to technological change over the last fifty years and the increased economic importance of good ideas about information-technology and pharmaceutical technology in particular, the absence of an internationally enforceable patent right is close to the same as no patent right at all. This consequence follows from the difficulty of effective excludability in consumption of good ideas. When the cost of copying a piece of software became only slightly more than the price of a floppy disk, excluding non-purchasers from access to the good rests on the willingness of purchasers or their agents to refrain from reselling or giving away a non-rivalrous good. It is well known that no such willingness can be relied on and that consequently the protection afforded by nationally enforceable patents is quite inadequate. When ease and undetectability of copying good ideas dropped further owing to the availability of high bandwidth to transmit digital copies of information, these protections become nonexistent.

In the case of pharmaceuticals the marginal cost of a single dose may be less than the price of a packet of refined sugar, while the average cost may be thousands of dollars. When, owing to the ability to reverse engineer a drug and synthesize it cheaply the good idea that a drug realizes can be implemented almost anywhere at very low cost, the absence of internationally enforced intellectual property rights may make the nationally enforced ones actually welfare reducing in their home economies. (Consider the impact of Indian or Brazilian pharmaceutical purchases by US residents). It is no surprise that TRIPS--trade related intellectual property rights—are at the top of the agenda of the World Trade Organization. For the issue of international enforcement has become tantamount to the existence of intellectual property rights altogether. Any political philosophy that has no room for enforceable inter- or transnational human rights no longer has room for intellectual property rights. In political philosophy the issue of intellectual property rights ends up being held hostage to the debate between cosmopolitan and non-cosmopolitan theories of justice. (Cf. Nagel, 2007, Sen, 2006) Perhaps more to the practical point, the impediments to the enforcement of financial obligations that national sovereignty imposes are so formidable that from the point of view of international law, property rights in good ideas are transnationally enforceable only with the consent of the governmental jurisdiction in which they are alleged to have been violated.

To the standard welfarist “second best” arguments for intellectual property rights I have added another one [Rosenberg, 2004]. It is well known that among the three standard factors of production—land, labor and capital—each suffers from diminishing marginal productivity. Holding the other two constant, increases in any one of them will eventually cease to result in increases in output proportional to the increase in the input. And the proportionate increase is widely supposed to move towards zero as the amount of the single factor added is increased. Insofar as welfare is contingent on the total amount of output—the size of the pie, holding shares in it constant—increases in welfare will be subject to diminishing marginal productivity. In particular as increases in labor-supply impose welfare costs—assuming most people are better off if they work less, and increases in capital impose postponement of consumption and so some immediate opportunity cost in welfare-consumption, diminishing marginal productivity will have an impact on human welfare.

The only inputs to production that does not seem to suffer from diminishing marginal productivity are good new ideas. Holding land, labor and capital constant, the provision of good new ideas appears to have been subject to large and persistent gains in productivity, and in many cases increasing marginal productivity. As is well known, the main factor in economic growth has always been technological change, and in general what has stood between mankind and a Malthusian fate has been the ever increasing productivity of the other factors of production owing to the persistent provision of good new ideas. What is more good ideas do not appear themselves to be decreasing in number or in productive effect. Consider Moore’s law according to which the amount of information storable on a microchip doubles every 18 months. There are few such well established empirical generalizations in the arena of technological change, but there are also few areas in which deceleration in the provision of productive new ideas appears to be secular.

Suppose, as seems reasonable that, holding proportions constant, each individual’s total welfare increases as production of goods and services increases. Then the provision of good ideas will always increase individual welfare; it will continue to do so at higher rates than increases in land, labor and capital; when increases in the amounts of these inputs are not available, it will continue to be available to increase output and thus welfare; finally, insofar as good ideas enable an economy to persistently produce new goods and services with the same physical inputs of land, labor and capital, the continual provision of good new ideas may even produce welfare increases without significant declines in marginal utility! For consider, a constant flow of new goods and services, as opposed to a constant flow of the

same goods and services, won't be subject to the psychological and physiological processes that lead to satiation.

So, as an input to production, good new ideas seem to have some important welfare-relevant advantages over all other factors of production. In Rosenberg (2004) this conclusion led me to suggest that from a welfarist point of view, intellectual property rights should be entrenched, never trumped, established as side constraints on other social and especially tax-policies. The reasoning was straight forward: if good new ideas are the best and sometimes the only reliable sources of welfare improvements in production of goods and services, then every effort should be made to maximize their provision, no obstacle to their provision should be erected—including disincentives to investment in good ideas such as taxes. In a regime that taxes in order to provide welfare-increasing goods and services which the market might under-produce, such as public goods, taxation of income and wealth generated by intellectual property should never be taxed, nor should such property ever be expropriated, owing to the chilling effect of such state-takings on the future provision of good new ideas. Of course this argument was subject to qualifications—immediate emergencies of various sources may warrant abrogation of property rights in good ideas in order to avoid catastrophic outcomes, for example, preventing or ending epidemics may require expropriation of pharmaceutical patents. But in the long run, the welfarist case for making ownership of good ideas a right untrumpable by considerations of welfare may appear attractive. This will, as mentioned above, be surprising if only because welfarism is inimical to untrumpable rights.

We can make this sort of consideration more concrete by considering the array of problems on the agenda of governments throughout the world and the apparent practical infeasibility of policies that might solve them, or the political obstacles to their implementation. Global warming is an obvious example. The production of green-house gasses continues to grow, and the political will to enact policies to reduce them, or even to reduce their rate of growth appears to be weak. Nothing short of a revolution in private ownership, tax-policy, and administered prices can deal with the problem and even these may already be too late. What might not be too late is some sort of “technological fix.”

This prospect is held out especially by those overwhelmed by the magnitude of any policy that that could work to address the problem, combined with great anxiety about its costs in living standards and other sacrifices. These opponents of environmental regulation point to the threat, evident at the end of the 19th century, that the continued increase in the demand for horses would by 1920 result in an insoluble waste disposal problem. At that time, petroleum was selling for almost nothing, as many cities in the developed world had switched

its lighting from natural gas and kerosene to electricity, and the advent of the mass-produced inexpensive automobile was some years off. The problem disappeared owing to technical change. A horse-manure catastrophe is not the only such threat to civilization so dissipated. Exponents of the do-nothing response to the problem of global warming may well point to this history, arguing that what we require to solve the problem is a technical change, one that we can neither predict nor call into existence, but which we can incentivize: A change in energy production, or in nuclear waste storage, or a change in consumption-efficiencies such as co-generation, or some other innovation as yet undreamed of (cold-fusion?) may yet prevent, abate, or mitigate the consequences of global warming and, the argument goes, we need to do everything in our powers to make sure such good ideas are produced and implemented. How can we do this? By removing obstacles to inventiveness and disincentives to it. One such disincentive is the ever-present threat to abrogate intellectual property rights; another is to subject them to taxation of any kind. If good ideas are the only thing that can save the modern world from destruction, it would be foolish to take steps that might slow, or stop the emergence of such innovations. Even those not so pessimistic about the power of social policy to limit the human impact on the human environment will appreciate the attractions of a technological fix if it can be secured in time. This is another argument for untrumpable intellectual property rights.

2. A LOCKEAN ARGUMENT FOR STRONG INTELLECTUAL PROPERTY RIGHTS

To this argument those who adopt a Lockean theory of chattel property rights may add another in favor of giving intellectual property particularly strong protections. The Lockean theory holds that chattel property and real property are morally permissible if they have been acquired in morally permissible ways, and that these include exchange, gift and “original acquisition.” Property is acquired by original acquisition when the acquirer “mixes his labor with nature”, subject to the well known proviso that “he leave as much and as good for others.” This last proviso can strictly speaking never be satisfied, since the earth and the fullness thereof are finite! Accordingly there is no permissible original acquisition, and all subsequent acquisition by exchange or gift is tainted by the impermissibility of original acquisition. Locke’s attempt to circumvent this problem was fatuous and subsequent theorists have not improved matters. Few have noticed however, that intellectual property rights can make good this lacuna in Locke’s theory. After all, when it comes to good new ideas, there

seems to be no trouble satisfying the Lockean proviso: Good ideas are the result of mixing one's labor with nature: what you do is think about nature—its concrete aspects and its abstract ones, to come up with good ideas, ones that enhance the production of goods and services. And when you come up with a good idea, you have left as good and as much for others. For the number of good ideas is indenumerable. If ideas can be property, then you have satisfied the Lockean proviso. You may give or trade these ideas as you like, confident that you have created property that will satisfy a high moral standard.

What is more, the satisfaction by good ideas of this standard may be sufficient to reconcile every one to the moral permissibility of chattel property and real property as satisfying Locke's demand on acquisition. After all, if we assimilate chattel, real and intellectual property to the class of exchangeable property *tout court*, then intellectual property can lend its cover so to speak to the other classes of property. If the number of good ideas is indefinitely if not infinitely large, and good ideas can be made into property, then the number of items—abstract and concrete—with which labor can be mixed is also indefinite, and this “amount” can only be increased if we add chattel and real property to intellectual property. When we do so, the whole class of items open to permissible private property-creation will satisfy the Lockean proviso: when you include good ideas as part of nature, enclosing a field or throwing a pot on a potter's wheel does leave as good and as much for others—not always as good a field or as much clay, but enough other things that will result in property of equal or greater value when they are the result of mixing labor and nature. And it not just that since land and things can be exchanged for ownership rights in originally acquired intellectual property that satisfies Lockean proviso, the halo of moral permissibility that hovers over good ideas will spread to other kinds of property too. Chattel and real property were always acquired in a way that satisfies the Lockean proviso, it's just that no one ever noticed, until they realized that besides things and land, there are good ideas to privatize!

Welfarist theories of private property will have no truck with a Lockean theory of natural rights, especially one which includes property, but they may find the standard for distribution of property it implicitly provides attractive. One of the institution design problems facing welfarism is how to deal with various indivisibility and scarcity problems that arise when we set out to distribute property in a welfare enhancing or optimizing way. Some items are not easy to divide up for equal distribution, other properties cannot be divided up without destroying their welfare enhancing potential, and of course any scheme of distribution will have substantial incentive effects with knock-on consequences for the

subsequent welfare of recipients and others. The Lockean proviso sets an implicit distributional standard that has attractive incentive effects, and may also reconcile those dissatisfied with their share of property to the original distribution. But it will only do so if it can unarguably be satisfied by original acquirers. The infinitude of nature open to being turned into intellectual property may go some distance towards allaying complaints that Locke's proviso has never been and is not now being satisfied anywhere.

3. CONSIDERATIONS AGAINST A REGIME OF STRONG INTERNATIONAL PATENT RIGHTS

The argument against patent protection for good new ideas begins with the alleged solution to the under-provision/over-investment argument for them. The patent is a limited monopoly given to the inventor/discoverer of a good new idea in exchange for full disclosure of the idea to all potential users, together with an implicit assumption that the market will establish a price for the good idea that will compensate the inventor/discoverer for risk, investment- and production-costs while at the same time being low enough that the idea's implementation by purchasers will enhance their productivity, income and/or welfare in the case of direct consumption.

But monopolies are always market failures, ones in which the market cannot set a market clearing Pareto-optimal price, or at least cannot be known to do so, and in which there are incentives to the supplier not to offer goods at a market clearing price. In the case of the patent, there is a further want of information about how many years the monopoly should be enforced in the interests of the inventor/discoverer. This should vary as the kind of activity the good idea is to be put to, the difficulty of inventing around the good idea, the costs of discovery/invention, the risks to the inventor/discoverer, the benefits to potential buyers of the license to employ the good idea, etc. It is unlikely that these variables will be very similar in magnitude over ideas and times. At the same time it is difficult to implement a regime that allows monopoly time to vary in a way that is sensitive to these factors and so ensures optimal provision of good new ideas in the many different areas of innovation. It is no surprise that estimates of the time required for a monopoly to repay innovator's costs are pretty close to the number of years at present granted to patent rights. Altogether too convenient.

Above I noted that owing to the nature of good ideas and to developments in technology and communication, a purely national regime of patent rights is increasingly

unlikely to provide adequate incentives to the provision of good ideas that such rights were introduced to provide. Since the establishment of enforceable intellectual property rights in good ideas is highly improbable, the question of whether there should be such rights is, from a welfarist point of view, moot to say the least. Ought implies can, and therefore can't implies not obliged to. Since we cannot protect good ideas by making them property, we are under no obligation to.

If there is to be an effective scheme of international intellectual property rights, it must be incentive compatible—it must harness individual self-interest to securing the socially beneficial outcome, unlike patent rights, which require supernational enforcement. In the absence of an agency capable of maintaining enforceable international patent right regime, each individual user of a good idea must have an incentive to pay the license fee, and neither to engage in, abet, or condone the cheap and effective piracy that contemporary technology makes possible. Is there such a system? One proposal suggests itself: each consumer that purchases the license to employ a good idea from the patent holder, purchases along with it the rights to a stream of income from all subsequent purchasers of the idea. This right will not include access to a stream of income from previous purchasers, only subsequent ones. Thus, the earlier one purchased a license, the greater the future revenue stream, the greater the disincentive to resell the idea or give it away, and the greater the incentive to report intellectual property piracy and support its prosecution. Such a scheme requires patent holders to forgo some of their potential income stream, but is effectively a form of insurance against piracy losses. It would also lead to strategic behavior by arbitrageurs and others making bets on which good ideas will be most profitable through early purchase or repurchase from others, and this may in fact further incentivize antipiracy coalitions. Notice that this scheme requires only limited international enforcement apparatus since it will be in each individual users' interest to minimize violations of intellectual property rights. And it has a chance of solving the problem of detecting violations since the most well informed agents in a market or industry will include those who have paid license fees, compete against those who have not, and have an incentive to keep playing fields level. One problem with this scheme is keeping track of the stream of income accruing to each patented good idea and keeping track of the division and distribution of the income. This seems a problem no more difficult in principle than that already solved by other intellectual property institutions, such as ASCAP and other copyright collectives. Innovators have strong incentives to join such collectives which distribute license fees in accordance with popularity of the ideas they manage, consumers will have an incentive to pay for the ideas they use and not give them

away since they will profit from later users' payments. The information collection, storage, calculation and transmission problems raised by this arrangement are solved by the very technology that makes international enforcement of intellectual property rights indispensable and unattainable.

But this proposal does not solve another potentially more serious problem, indeed it may exacerbate it. If an intellectual property regime modeled on copyright collectives were actually effective, it would thereby increase the likelihood of market failure through increasing concentrations of economic power resulting from increasing returns to scale. This is a feature such a proposal shares with the patent right. We may well be prepared to scheme that rewards innovators if we have reason to suppose that it more nearly approaches a Pareto optimum that might otherwise be achieved. However, there is reason to think that any privatization of good ideas results in a market failure, one more serious and more cumulative than that produced even by the temporary monopoly of the patent. Recall the argument that good ideas are the only inputs to production which do not suffer from diminishing marginal productivity. This is part of an argument for not placing any barriers to their emergence. But the way in which good ideas always increase productivity is crucial in the present connection. They do so almost always by increasing the returns to scale of the other components of production either individually or as a package. We know from the proofs of the existence, uniqueness and stability of general equilibrium that markets do not generally clear at Pareto optimal prices when returns to scale are not constant. Less formally, it is well known that when a small number of producers can effect economies of scale in production, they cease to be price-takers. They can cut prices and drive competitors out of the market and effect market failures of monopolistic competition, and even sometimes complete monopoly with substantial barriers to entry for potential competitors owing to the high returns to scale of their production.

Here we have a phenomenon related to but much more serious than the "anticommons effect" that commentators on the patent right in scientific research have noticed. The anticommons effect is the problem generated for researchers in pure science by the intellectual property rights granted to others which obstruct their access to further new ideas. For instance, the patenting of certain reagents, techniques and machines required for basic scientific research in certain fields means that any one pursuing research in these fields, even without a pecuniary interest in the research's outcome, may have to spend substantial sums to acquire licenses to make use of these tools of basic research. (Cf. the Wisconsin Alumni Research Foundation patents on stem-cell creation methods at <http://www.wicell.org/>)

sometimes the licenses are available only on the condition that the licensor can secure some portion of the stream of income if any from the new research. In effect, the established patent rights erect a barrier to entry to the good idea commons, that region of thought and experimentation free to all, in which the innovator seeks to mix his labor with nature. Much has been made of the prospect of this “anticommons effect” and a certain amount of research has been devoted to determining whether it exists or not. The barrier to entry that patent rights create may turn out to be much more extensive if as seems unarguable they generally make for increasing returns to scale in whatever productive process they have a role.

The owner of a good idea is either in a position to exploit it immediately in production of some good or service directly or indirectly consumed, or in a position to sell it to some one so positioned. The resulting increase in returns to scale enables the owner of the idea to cease being a price taker and to begin securing the “rents” associated with increased returns, monopolistic competition, and the resulting market failure. When the costs of creating new ideas and putting them to use are so high that only firms already very large are in a position to pay them, by employing the creators of these ideas, the resulting impact in creating Pareto-inferior market outcomes is evident and ever increasing. Starting with the slightest enhancement in production and the advantage in rents it secures, canny and fortunate businesses can secure ownership of a continuing stream of good ideas, each built on the last, and all tending to the same suboptimal market outcome.

The impact of good ideas on increasing returns to scale is the “flip side” of the impact of good ideas on decreasing marginal productivity. After a certain point the potential benefit to welfare which good ideas confer at least in principle may be cancelled out, or more likely, swamped by the potential costs to welfare which they confer. And the trouble is it is very difficult to see how the benefit can be secured without the cost, for they are inextricably linked. It is almost always only because they produce increased returns to scale that good ideas don't suffer from decreasing marginal productivity. At any rate it is hard to see how we can arrange matters to have the benefit of good new ideas without the cost, so long as we operate within a market economy.

This problem becomes increasingly serious as business becomes transnational. One standard way of dealing with the market failures that increasing returns to scale enable monopolists to exploit is of course to break up the monopolists. A similar response requires that a strong regime of international intellectual property protection will have to go hand in hand with equally strong international enforcement of regulations governing competition and restriction on it. Such an interventionist policy is even less likely to be adopted by mutual

reduction of sovereignty among advanced industrial nations than they are likely to allow for the effective international enforcement of patent- rights. The conclusion is that even if a strong international agency effectively policing intellectual property rights is feasible, the much lower feasibility of an international antitrust or anti-combines policy is by itself something of an argument against the former policy.

Besides these problems that undermine confidence that a regime of patent protection for good ideas will solve the undersupply/overinvestment problem in ways that are net enhancements to human welfare, there is the further suspicion that such protections may not be necessary at all. The argument that without property rights for good ideas they will not be produced by risk-avoiding rational agents and that when hit upon will be hidden by such agents to enhance their competitive advantage, starts from very strong assumptions about rationality and/or about preferences. But the whole history of science shows us that agents are prepared to take risks without the assurance of financial reward in order to make discoveries and produce inventions, and that they are willing, indeed eager to make their successes public as opposed to keeping them secret for private exploitation.

4. THE NON-INTELLECTUAL PROPERTY RIGHT REGIME OF SCIENCE

The non-governmental institutions that have emerged since the scientific revolution provide a structure in which innovation has been fostered by the incentives of fame, indeed immortality of one's achievements, opportunities to engage in more innovation, and shaping the future direction of research, in return for complete public "ownership" of good new ideas—something easy to accomplish in light of their quasi-public goods character.

The question may arise about whether the institutional system of science does as good, worse or better a job of producing good ideas than does the system of patent rights in a competitive market. No answer to this question is available owing to the nature of scientific innovation. Indeed, its nature is the most serious obstacle to any attempt to explain or predict the direction of economic change over time scales longer than a business cycle. This means that comparisons of the effectiveness of a system without intellectual property rights like science versus a market rights system cannot turn on such issues.

Good ideas are quintessentially unpredictable. There is no logic of discovery, nor a psychology or sociology of innovation, still less an economic theory that identifies the conditions that maximize the appearance of good ideas. Economists recognize that growth depends largely on good ideas, a.k.a. technological change, but they are compelled to treat it

as the exogenous, “residual” component economic growth which they cannot explain (Cf. Solow, 1957). Endogenous growth theory introduces forces familiar to economists (e.g., imperfect competition, human capital, levels of R and D investment by government and firms, international trade barriers, von Neumann/Morgenstern uncertainty) that treat good ideas as a desired outcome—a component of the “objective function” (See Roemer, 1998).

Karl Popper appreciated that good ideas are unpredictable and used this fact to argue that a predictively powerful social science is impossible. Besides Popper’s (1957) (“logical” and controversial) argument for the unpredictability of an innovation, there is the fact that good ideas interact “strategically”, not parametrically, and there is no stable equilibrium towards which the production of such ideas moves. Like a move in a strategic game without a Nash equilibrium, one good idea generates a cascade of interacting improvements that, if any thing, increase the unpredictability of subsequent good ideas.

We don’t need a proof that no predictively powerful social science is possible to appreciate that identifying conditions sufficient or even interestingly necessary for the optimal provision of good ideas is fraught with difficulties, and that in many cases good ideas have arisen in the complete absence of property rights, indeed in a context in which claims to such rights or to secrecy about them are treated as morally wrong. What we do know about the institutional arrangements of pure science provides some reason to think that actual system of awarding fame/immortality/ scientific influence is the optimal one for resource allocation in the provision of good ideas in pure science. What is more it provides for a permanent monopoly on credit without any control over other material rewards, and so no market failure consequences.

As we have seen good ideas are not easily excludable and are nonrivalrous in consumption. Because of this the first hard copy of a good idea is almost all that is needed to confer its benefit on society. Cheap copying makes another hard copy very easy to provide and so the price that it fetches will be low. In pure science this means that if two or more individuals or groups are seeking a new idea, once one of them has secured it and made a hard copy of the good idea, the second individual or group to have secured it adds almost nothing to the good idea’s social benefit. The success of the first innovator makes the investment of the second place innovator a sunk cost, though of course, this can only be known retrospectively. Thus, for example A.R. Wallace’ years of discomfort in collecting the data to formulate the theory of natural selection turned out to be an almost total waste since Darwin had already hit upon the idea. In spite of his best efforts to share the credit for independent discovery, Darwin got almost all of it. We call it Darwinian theory, not the

Darwinian/Wallacian theory, and the reason is not just euphony. Why? Because in science the norm is that almost all the fame and influence, distinction and merit accrues to the first innovator or innovating group, no matter how close in time the runners up achieve the same result.

As Michael Strevens (2003) has shown, the fact that in science the first discovery confers all the social benefit and that the first discovery gets all the scientific credit is no accident. Stevens shows how, from a rational choice perspective the uniqueness of the social benefit makes the norm of awarding sole credit to first discoverer a resource optimizing rule. Stevens writes:

A scientific reward scheme such as the priority rule acts as a system of incentives, encouraging researchers to devote their time and energy to some research programs in preference to others. Different reward schemes, then, may result in different allocations of resources among competing research programs. Society has an interest in adopting a reward scheme that promotes an allocation with a relatively high expected payoff.

The priority system [to the first discoverer goes all the credit] promotes an especially efficient allocation of resources in winner-confers-all situations, that is, in situations where almost all benefit is extracted from a goal the very first time it is reached.

Like other rational choice models, Strevens's makes some assumptions, including the following, plus the stipulation that individuals are risk averse:

1. Every research program has a single goal. There are only two possible outcomes of the program's endeavors: total success, if it realizes the goal, or total failure, if it does not.
2. Different research programs have different intrinsic potentials.
3. A program's chance of success – that is, the probability that it will achieve its goal – depends on two things, its intrinsic potential and the resources invested in the program.

Strevens shows that on these conditions, the rule that all credit for a discovery attends the first discoverer results in individual scientists choosing to devote themselves to the research program with the highest potential of success. Which of course is just what is wanted by way of institution design.

What is the relevance of Strevens modeling here is besides providing an attractive explanation of the actual institutions of scientific credit as they emerged over the last 400 years, one which suggests that the institution is rational or optimal from a social point of view. First, it underwrites according discoverers of good ideas in science at least a permanent monopoly, not on sale of their ideas, but on the fame, influence, admiration, respect, kudos, etc acquired as a result of the benefits to society of their ideas. Second, insofar as this scheme has worked well to provide a constant flow of good ideas over the last half millennium, it has done so without the need for a market-failure producing second best.

Now there are significant differences between pure and applied scientific discoveries and practical inventions that will lead some to the conclusion that the scientific model has little of relevance to the problem of institution design that patent rights attempt to solve. In particular the schedule of practical invention is driven by perceived immediate direct or indirect benefit that consumers will pay for, while the agenda of scientific discovery is driven by curiosity and perhaps the desire for fame, instead of material gain. But these differences should lead us to contemplate how the reward system of science, which avoids the market failures of patent rights, might be adapted to provide an alternative to them that is closer to a welfare optimum.

5. ADAPTING THE REGIME OF SCIENTIFIC DISCOVERY TO THE DOMAIN OF INVENTION

Let us consider introducing a modified version of the reward system of pure science to the applied arts of practical invention. If it works, we will have no need of an institution of private property in good ideas in order to produce and optimally exploit them. Recall the reward structure of science: all credit to the first discoverer, none to any other, no matter how close on the heels they follow, along with full early disclosure and completely free exploitation of the discovery by any one else. Remember also Strevens' argument that this system optimizes the resource allocation of science and scientists to the problems that most combine solubility and importance. The following multi-component scheme will enable us to adapt these attractive features from pure scientific discovery to practical applied innovation and invention. The central feature of this scheme is that it makes intellectual property rights unnecessary.

1. Government sponsored prizes. The establishment by national government science agencies boards, modeled on peer-review panels, of single-winner prizes for specific

inventions and the selection of winners. The NSF, NIH, DOE in the US, the Medical Research Council in the UK, the CNRS in France, the MITI in Japan and the German Science Ministry currently distribute funding on a fairly impartial and largely objective basis without significant “rent seeking” by any party to their policies. The success of these agencies suggests that they can be trusted with the quasi-political task of identifying targets of applied science and calculating the size of prizes that will elicit investments in solutions that then will be made freely available to all. To some extent such decisions will be political and thus may become matters of democratic electoral debate, a desirable outcome in the opinion of many. This practice exploits a device long ago put in place and effective in the invention of reliable chronometers and the calculation of longitude at sea. Different countries can be expected to identify a range of prize-targets depending on their national needs—industrial, agricultural, environmental, medical, even cultural. It is safe to assume that the details of any invention that wins a national prize will be difficult to keep secret even by nations eager to do so.

2. Privately sponsored prizes. Individuals and groups will be allowed and encouraged to pool funds for publically announced single winner prizes for specific inventions of their choice. Notice that this practice has already been put in place to encourage the building of private reusable space vehicles, for example. If the prizes were considered untaxable charitable contributions, national tax authorities would have an incentive to monitor these competitions for openness, and to enforce public disclosure of the inventions where there is any reluctance to do so. The availability of the internet makes it feasible easily and cheaply to put together large coalitions of small contributors to establish prizes for particular inventions. The low barriers to entry into this arena and the low transaction costs of establishing prizes should result in a proliferation of them across a wide range of needs, interests, and desires. The feasibility of this proposal turns on the willingness of large numbers of people to provide others with a quasi-public good even when these others free-ride on the costs of the good. Evidence from experiments in game theory suggests that when the amounts individuals pay are low, the number of cooperating individuals is very large, and the benefit is great and non-rivalrous, the participants are prepared to tolerate free-riders even when exclusion is feasible. When as in these cases it will not be possible, the willingness to participate in these prize-establishing collectives should be considerable.

3. Inventors will register their innovations with an appropriate international agency modeled on the copyright collectives for licensed use on payment by anyone. Licensed users will be entitled to a stream of income from licenses to later users but not earlier ones, thus incentivizing self-policing and enforcement of anti-piracy. The stream of income will accrue

to the inventor until research and development costs plus a fixed amount of further reward is provided and then all payments to all parties will cease. The amounts will have to be subject to some experimentation and variation over time to fine tune them for optimal impact in provision of good new ideas. Note that even if research and development costs are so great they can only be borne by very large concerns, such as Big Pharma, there will be sufficient incentive to undertake the investment and no monopolistic impact or additional barrier to entry created by the invention itself.

4. **Celebrity.** Popular culture has made celebrities of many scientists, engineers and inventors, from Einstein and Hawkins to Bill Gates and Steve Jobs. The celebrity itself has been a reward to these innovators and it has been exploited by some of them for income and wealth. The Andy Warhol 15 minutes of fame effect is well known and public relations agencies are adept at making it pay for those subject to it. Thus the contemporary ability to capitalize on celebrity can be exploited to provide no- or low cost incentives to inventors to invest in the creation of good new ideas that immediately become public property. Indeed, their celebrity and the opportunity to turn it to material advantage will be an incentive to make their inventions known and adopted.

5. **First mover advantages.** These are increasing important in an information-technology economy. By making a discovery that sets a standard, provides a head start in satisfying it while imposing engineering constraints on competitors, inventors can reap substantial rewards not only in the absence of property rights in the invention but because they have waived them through free disclosure. When we add to these first-mover advantages those associated with brand name, celebrity, fashion, and other nonmonetary advantages of first movers in an environment with cheap, fast and international communication to potential customers who seek more than just a product, but alas also an image, the incentives to inventors even in the absence of prizes will be considerable.

6. CONCLUSION

Whether patent rights really have been necessary to optimize the provision of good ideas in the past is probably difficult to establish, owing in some part to the unpredictability of scientific innovation. Whether in the past patent rights have on balance contributed to human welfare is equally debatable. But that the technological environment in which good new ideas emerge has changed radically over the last generation seems unarguable. Since these changes have been due largely to changes in the ability to store and transmit

information – ideas – it is extremely likely that when it comes to the provision of good ideas what worked in the past may not work in the future, and what didn't work in the past may well work in the future. It's at least probably worth a try.

REFERENCES

- Nagel, 2007, "The problem of Global Justice," *Philosophy & Public Affairs*, 33, p. 113 – 147
- Nozick, R., 1974, *Anarchy, State and Utopia*, New York, Basic Books
- Popper, K., 1957. *The Poverty of Historicism*, Routledge, London, pp. vii-viii.
- Roemer, P., 1998, "Endogenous technical change", *Journal of Political Economy*, 98.
- Rosenberg, A., 2004, "On the priority of Intellectual Property Rights, Especially in Biotechnology," *Politics, Philosophy & Economics*, Vol. 3, No. 1, 77-95
- Sen, A., 2006, "What do we want from a theory of justice?" *The Journal of Philosophy* 103:55, 215-238.
- Solow, R., "Technical change and the aggregate production function", *Review of Economic Statistics*, 30 (1957): 214-231
- Strevens, M., 2003, "The Role of the Priority Rule in Science", *Journal of Philosophy*, 100:2, 55–79