Centre for Transformative Innovation

Global Prosperity Through Knowledge and Innovation

Tom Spurling Oration

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The Challenges Facing IP Systems: Researching for the Future

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Thank you, Beth Webster, for inviting me to spend part of my sabbatical at Swinburne University and for giving me the honor of delivering the inaugural Tom Spurling Oration. It's been wonderful to get to know the university, Melbourne, and Hawthorn and to spend time with my friends "down under." It's also been terrific to meet Tom himself. I've given named lectures before. But the person who is named is usually not, shall we say, in a position to converse. So this oration is really special because Tom's alive and kicking—and has told me many great stories about Australian politics.

Beth suggested that for the lecture, I "think big" and offer my vision of the intellectual property regime of the future; that I write on a clean slate and describe the law that would best convert the creativity of future authors, scientists and technologists into products and processes that improve social welfare. That is a fitting topic for a lecture honoring Tom, who has spent his career promoting science, and thinking about ways to efficiently transform innovative ideas into real-world applications. In some ways, I'm qualified to make good on the request. Like Tom, I started my career as a chemist (in the firm that is now Novartis) and saw first-hand the difficulty of moving ideas off the lab bench and into the market place—in my case, taking medical research and turning it into pharmaceuticals that consumers can take safely and effectively. I found that job frustrating. It's why I decamped to law school. I now teach intellectual property law (IP law—patents, copyrights, trademarks and trade secrecy law). My fascination with the topic stems from its role in the transformation process so central for Tom.

Sadly, however, I'm not quite up to Beth's challenge. I can't see enough of the technological future to opine on how the legal landscape should be constructed. Politics also plays a large role in shaping the law, and—as we all now certainly know—it's really hard to predict what will happen in that arena. What I can do is consider the trouble spots that are emerging, how they might be handled, and what we need to know more about in order to be prepared for whatever future eventuates. This oration is, in short, more research agenda and less new world order.

Mostly, it's about substantive law, but institutions are also crucial, so I've included a few words on them as well.

I. SUBSTANCE

Let's start with the elephant in the room. Will we actually need intellectual property in the future? IP rights create scarcity: they authorize an inventor, an author, a trader to exclude everyone else from using what he or she created. Without competition, the right holder can then charge higher prices. Of course, that system produces deadweight loss in that there are people who would benefit from the innovation, but can't afford the higher price, so they don't buy it and the right holder doesn't sell it. Look what happens: everyone loses! However, the extra profit (the transfer of consumer surplus into producer surplus) enables the inventor to capture a return roughly commensurate with the value created.

In that way, IP rights produce incentives—financial encouragement to invest in costly and risky creative activities. It also encourages the development of manufacturing techniques and distribution channels, putting resources into consumer education concerning the product and how to use it, and investment in creating a signal of the source of the product and reason to maintain its quality. In the short term, there are higher prices and deadweight loss. But in the long term, the incentives spur innovation: we sacrifice static efficiency in order to enjoy dynamic efficiency.

There are, however, problems with this basic story, and they are getting worse as new technologies come on board and we move into the Information Age and the Knowledge Economy. The most glaring problem with the story is that it ain't necessarily so. The assumption that monetary incentives are necessary to spur innovation is deeply rooted, but is it right? Always right? Given the new technologies being introduced, will is forever be right?

In many spheres, people actually produce without IP incentives. They do it for several reasons. First, creating is fun: think about all the home-made stuff—"user generated content"—that we see on the internet.[i] One example is a YouTube video of a baby dancing away to Prince's Let's Go Crazy. Second, they might create because there's something they want to do and they need to invent things to do it with. Windsurfing equipment, laboratory research tools, surgical equipment were invented in this way. It's hard to quantify "user innovation" but Eric von Hippel

of MIT has shown it accounts for a not insignificant share of the knowledge economy.[ii] Third, some inventors are driven by curiosity—think university scientists, funded by government and other organizations. Or DIY biologists, experimenting in their basements.[iii]

If not for those sorts of intrinsic rewards, then sometimes there are ways to cash out that have nothing to do with IP. Those university professors: they know that publication earns them a reputation, the reputation gets them better students, more lab space, higher salaries; maybe a medal from the Australian and New Zealand Association for the Advancement of Science, the Prime Minister's Prize, perhaps a Nobel.

So even now, we sometimes pay monopoly prices for things that might have been invented anyway. Technical journals are a poster child here—articles created and edited by scientists, and then Elsevier or another publisher uses its copyrights to extort fortunes from libraries. And that's now, when it's mainly computers and the internet that lower the costs associated with innovation. In the future, the fundamental IP story may become even less right. Consider, for example, 3D printing, bioprinting, synthetic biology, artificial intelligence (AI), and robotics. These technologies will bring costs down nearly to zero. We already enjoy computer generated music; movies and TV shows that use computer-created effects, backgrounds, and virtual actors, such as the resurrected Princess Leia. In the future, AI will do the developing; printers, robots, etc. will manufacture; and it will all happen in our homes so there will be no distribution costs.

We will in short be entering what commentators have dubbed the post-scarcity society.[iv]

That presents a general problem to the social order: will there be enough jobs to go around?[v] For IP, we must ask: What point is a trademark, which is intended to denote the source and quality of goods, if goods are typically made at home? Are patents and copyrights necessary if there's no significant investment and less risk? [vi] We could give creators regular salaries, put innovative products in the public domain, price them competitively, and let everyone who can benefit, enjoy access.

Worryingly, right holders are now pushing in exactly the opposite direction, trying to limit the use of these amazing technologies in the name of maintaining profits. For example, those holding rights in music and videos have been asserting theories of secondary liability against intermediaries—websites or internet service providers that enable uploading, downloading, and streaming. It's easy to understand why: suing the intermediary is much more efficient than suing all the end users. But it takes the fun away, makes sharing harder, and creates distribution costs that don't have to exist. And because intermediaries are risk-averse, they take things down even when under the law, the use is considered fair and not compensable. Take, for instance, that dancing baby: the video was taken down, but later held to constitute a fair use of Prince's song.[vii] The intermediaries may also benefit themselves in that the prospect of secondary liability chills others from developing superseding technologies

So one emerging issue is that new technologies could make IP rights irrelevant. Another way in which new technologies challenge the core story is that they enable creators to earn a return that is much larger than the value of their contributions, and that's true even when we take into account the hefty profits needed to compensate them for taking risks. That can happen in several ways. I'll mention a few.

One has to do with what's getting invented. At one time, upstream discoveries (basic, fundamental science) and downstream (commercial) applications were distinct, often with a long'ish temporal gap between the two.[viii] It was usually clear what was the scientific principle (say, Boyle's law), which would stay in the public domain, and what was the application (a steam engine), which could be the subject of an IP right. Now, for many technologies, that gap has disappeared. While IP rights on these "dual use technologies" may motivate research, rights over basic science give inventors control not only of what they discovered, but over follow-on prospects as well.

Gene patents are an example. Myriad owned patents on genes associated with breast cancer both in Australia and the US, and started enforcing them against researchers. These patents created more profit for Myriad (it could hold out for very high royalties), but it also meant there were fewer researchers who could work on breast cancer. To quote Justice Breyer of the US

Supreme Court, such patents "impede rather than 'promote the Progress of Science and useful Arts.'"[ix] They give the first right holder a lock on future innovation,

To understand a second reasons rewards expand, consider Facebook. If you're using it, what are the chances you'll switch to another social network site? Probably, zero. Facebook started off with IP—rights arguably justified by Mark Zuckerberg's inventive contributions. But it's not the IP that made it so powerful. That came from formidable network effects. The value to you increases as more people in your circle are also on Facebook. You won't abandon it unless your family, friends, etc. abandon it as well. Once network effects set in, no one can compete, even after the IP expires. And Facebook is not the only high tech firm enjoying this form of entrenchment.

A third technique for expanding rewards: rent rather than sell. Or as my colleague, Jason Schultz, put it in his recent book, End Ownership.[x] Consider books. Back in the day, when I bought a book, I could keep it for life. And because of copyright's first sale doctrine, the copyright holder had no say over whether I sold it, loaned it to friends, or rented it to strangers. With e-books, it's very different. There's no sale. They are licensed and alienated on a technological tether. That lets the publisher control my use. It can even make the book disappear. It's great for publishers; they can sell more books. And since there's no longer a secondary market of used books, they can also raise prices.

Of course, it's understandable that digital publishers want to maintain control: if it's easy to make copies, no one will buy. But the idea has gotten out of hand—we could see electric cars that limit how far we can drive without buying additional permission; equipment that can only be fixed by dealerships that the right holder owns (and charges for separately). Things can be made to stop working until we buy them again. If you have an iPhone, you already have a glimmer of how much a right holder can extract from your pocket.[xi]

A fourth problem is strategic licensing and litigation. Many modern products are composed of multiple patents—think, again, of the iPhone. A single patentee can hold up the development of the entire product by refusing to license until the lion's share of the profits are allocated to his contribution. In some cases, products inadvertently infringe. At that point, someone—the patentee or a purchaser of the patent—can bring suit and shut down production unless it is

paid excessive profits. Those purchasers can cause havoc to the system. They are called "patent trolls" because like trolls, they suddenly pop out of nowhere.

So what should we do about these problems? One possibility is to invalidate the IP rights. That was the US Supreme Court's solution AMP v. Myriad and the Australian High Court's in D'Arcy v. Myriad: they held that genes aren't patentable.[xii] We could also reject patents on other new technologies that threaten follow-on innovation. In the US, that's led to the denial of patents on diagnostics,[xiii] computational and networking methodologies, algorithms,[xiv] and AI inventions and machine learning protocols.[xv] On the copyright side, we have the US Supreme Court's refusal to protect databases.[xvi]

But is that the best solution? Will there be adequate incentives if we simply ban protection in emerging areas? A strong argument can be made that, despite my doubts about the relationship between innovation and IP protection, we do—still—at least sometimes—need IP to support creative production. Besides, if innovators are deprived of patents or copyrights, they might respond in ways we like even less. For example, Myriad, in anticipation of losing its patents, started keeping information about genetic mutations as trade secrets.[xvii] Algorithms are also mostly protected that way, data as well.

To be sure, patents and copyrights privatize information but they also disclose information. Eventually, the rights expire. In contrast, trade secrets are (by definition) secret and, equally important, they don't always expire. So, in a trade secrecy regime, it can be even harder for others to build on earlier work. Trade secrecy also reduces the government's ability to regulate, including to regulate the use of secret chemicals that could pollute the environment or harm employees and to regulate who owns information and how it's used.[xviii] In the latter respect, consider Google and Facebook—their businesses are largely based on monetizing user generated content. But perhaps it's the users who should own, control, and earn a profit from their posts. Even if you're OK with Google and Facebook, consider the other firms monetizing the data they collect: hook-up sites like Tinder and a company that makes a product called We-vibe.[xix] In short, trade secrets can have strong, negative social implications. Yet recent international efforts to increase trade secrecy protection suggest that as the scope of patentable subject matter shrinks, trade secrecy is becoming a dominant strategy.[xx]

So here's some of the research agenda: Can we identify where IP rights are needed? Can we safely liberate some forms of human creativity, such as scientific discoveries, into the public domain because rights aren't needed in that space, or because rights over downstream end products will be sufficient to spur upstream, fundamental discoveries?[xxi] What alternatives will innovators use if IP is not available—what's the social impact of those strategies?

Would the public be better off if we relied on strategies other than exclusive IP rights, such as government subsidies, tax incentives, and prizes?[xxii] Using public money (or tax breaks) means that the resulting products can be put in the public domain and accessed cheaply. But it also means that all taxpayers must pay, even for innovations some have no interest in supporting. So which system best enhances social welfare? Prizes are an interesting idea—think of the Longitude prize.[xxiii] But prizes require a central authority to anticipate social needs. And the authority must also know enough to determine when the need has, in fact, been met. For example, the Longitude prize was not initially conferred because no one understood how a clock could be the solution. Nonetheless, work is underway to perfect prize systems.

Now, some suggest that we stick with exclusive IP rights, but tailor each regime to individual sectors, as they emerge ("sui generis legislation"). Beth, whose team is creating many wonderful data bases asked me to talk about how they should be protected. I'm happy to do that because it's one area where we already have some empirics to consider. In 1991, after the US Supreme Court decided data bases are not copyrightable, the EU saw an opportunity to cultivate its own database industry. In 1996, it enacted a Directive requiring each member state to protect databases that involve substantial investment from unauthorized extraction.[xxiv] Rights expire 15 years after the database is "complete."[xxv] The more IP, the EU thought, the more investment.

So how has that worked out for them? Surprisingly poorly. The EU Commission conducted a review in 2005.[xxvi] It found "no clear indication [that] the "sui generis" right … helped businesses in the database sector to improve their competitiveness."[xxvii] And the database industry has certainly not shifted to Europe. Moreover, courts have had trouble deciding what constitutes a substantial investment. After all, businesses often compile databases for their own internal

operations, basically they are user innovations that don't require IP incentives.[xxviii] Furthermore, unlike with copyrights and patents, it's turning out that dababase rights are perpetual. The drafters of the EU Directive were clearly not thinking of modern dynamic databases, which continuously update and are thus never "complete" enough to trigger the end of a 15-year term.

The EU measure also includes a reciprocity provision—databases of non-EU nationals are protected in the EU only when the other countries reciprocate with database rights of their own. Tellingly, other countries have not reciprocated. On the whole, the view elsewhere is that data—f acts about the world—should be available to everyone; that rights over data create too much control over follow-on innovation; that compilers should compete not on what facts they own, but rather on how well they update, configure and annotate the database to meet the needs of their customers. [xxix]

As important, there are other techniques to ensure a return on investment. Electronic compilations are protected technologically and by laws against computer hacking;[xxx] costs and profits are captured through contractual arrangements between the compiler and its customers.[xxxi]

There's another assessment going on now in the EU.[xxxii] But there's a cautionary tale here. Even if the EU were to decide the Database Directive was a mistake, clawing back rights is close to impossible.

So my view is that moves to sui generis systems must be regarded with caution. Tying the law to a particular technology means that when the technology moves on, the law is useless or has unintended consequences. The availability of special rules encourages rent seeking. Furthermore, each new system requires new international negotiations.

To a large extent, then, I'd retain the current system, but work on various elements in it. Is a full-scale IP right needed if the main cost is in, say, commercialization? Perhaps there should be weaker, shorter commercialization patents if that is all that requires encouragement.[xxxiii] Where the costs lie not in discovering the product but in obtaining regulatory approval (a scenario for pharmaceuticals), then we might recognize IP for only the discovery. The work to generate

regulatory data could, for example, be compensated through a liability rule. It would let others use the data, as long as they pay a fair share of the cost.[xxxiv]

If (or when) we revise IP law in light of the findings on where it's needed, we could also enhance measures that further the public interest. We could develop defenses that permit experimentation, repair, and compulsory licenses or government (crown) use. We'd worry less about awarding rights that inhibit follow on innovation if we knew that tinkering and research could occur despite IP rights.

We also need to beef up rules regarding ownership: rules that clarify who owns data, that define the rights relinquished upon the sale of electronics and electronic files, and ensure that purchasers have notice of exactly what rights they have bought.

Furthermore, we should revisit the relationship between IP and competition law. In particular, we need law that factors network effects into the question whether a right holder has market power. [xxxv] We might consider fundamental discoveries to be the equivalent of essential facilities, which a right holder can protect, but is obliged to license.[xxxvi] We need law to deal with holdups and patent trolls.[xxxvii]

Trade secret protection has only recently come to the fore. While we now have internationally-agreed rights, the development of public safeguards in in its infancy. We need to ensure that we know what's being collected about us and that governments can regulate the use of trade secret information. In particular, algorithms now make decisions with significant personal impact, including about jobs, credit, bail, sentencing, and immigration.[xxxviii] They also control voting machines, the ads Facebook displays, the newsfeed subscribers see.[xxxix] The public needs a right to study these algorithms to ensure they are accurate, unbiased, and not distorting commercial outcomes or exerting improper political influence. As the NY Times recently put it, we need to ensure "algorithmic accountability."[xl]

We might also make the award of IP rights conditional on applicants using their technology or expertise to confer certain public benefits. Thus, another problem with an IP system is that it induces creative production through the ability of customers to pay. That leaves some societal needs unmet. Examples include research on neglected diseases, like dengue fever, that

uniquely afflict populations that can't pay and research on technologies that abate the sources of climate change, which everyone wants, so long as others pay for it. Patent rights could be made contingent on right holders fulfilling those needs.[xli] Prizes may also work here. Indeed, there is a new longitude prize being awarded for work on antibiotics, another area where IP generates insufficient incentives.[xlii]

We also might want to consider applying human rights doctrines to IP practice.[xliii] That might increase access to important inventions for the poor, give data subjects more control over personal information, and the public the ability to study impactful algorithms.

II. INSTITUTIONS

Living in the US, under Donald Trump, I have to believe the most important components of a governance regime are strong institutional arrangements: a court that works despite his claims about the biases of "so called" judges; a legislature that operates even when his tweets belittle congressmen; newspapers that publish despite his threats to journalists. What's interesting here for researchers is that the proliferation of IP-related institutions creates many opportunities for comparative study.

Some of the questions are about the institutions we already have. One example: specialized courts. Many countries are adopting patent (or IP) courts, on the theory that technically complex cases require specially trained judges. [xliv] But is it true that specialized judges do a better job on these cases? Emersion in narrow fields could produce bias and tunnel vision and lead to overprotection, which seems to be the US experience with the Federal Circuit.[xlv] Or it could make adjudicators skeptical about claims of inventiveness, as seems to be true in Japan and in US trial courts, where Stanford's Mark Lemley found that familiarity breeds contempt.[xlvi] Comparative work on these courts could tell us a great deal.

Another set of institutions worthy of study is universities. They have a particularly important role in technological progress because they are the locus of a great deal of government-supported research. In the early 1980's, the US decided that the best way to ensure the transformation of upstream, taxpayer-supported research, into downstream products would

be to encourage universities to hold patent rights in faculty output.[xlvii] Universities have invested heavily in technology transfer offices (TTOs), but most TTOs lose money. As a result, it isn't clear that they are the best stewards of translational activities. There are now other models for the commercialization of taxpayer-funded research.[xlviii] Australia and CSIRO are pioneers here. The US National Center for Advancing Translational Sciences is following in its footsteps.

There are also other models: the University of California's Alfred E. Mann Institute, which takes over patent rights in particular fields and then engages in full-scale commercialization efforts; the California Institute for Quantitative Biosciences (QB3), which supplies collaborative tools, funds competitions, provides advice at the proof-of-concept stage, and matches projects to commercial funders; MIT's Deshpande Center, which furnishes advice, seed money, and support in a range of technologies. Researchers—such as Swinburne's Beth Webster, Monash's Ann Monotti, UC's Brian Wright—are looking hard at tech transfer. There are many issues here to study. They include the role of patents, who should own them (the researchers or the institution), who should choose the TTO, and how it should operate.

We also need to nurture emerging institutions. I mentioned contracts in connection with data bases. More generally, contractual agreements, coupled with strong and enforceable social norms, can substitute privately ordered governance regimes for public law. These private regimes, tailored to specific problems and participants, are potentially more effective than sui generis legislation aimed at particular technologies.

Consider Knowledge Commonses. These are often used to create advances (or platforms for advances) that various entities will share. Examples include the Linux Foundation, the Gen-Bank repository of DNA and RNA sequence data, and the World Data Center for Microorganisms.[xlix] The Commons includes rules on access to the information produced and on the allocation of rights in, and profits from, the resulting projects.[l] Some also establish boundary rules to ensure the integrity of each type of contributor (be it public, private, commercial, or nonprofit).[li] Another example: Standard Setting Organizations (SSOs). In some fields, technologies are developed privately, but each firm's products are more valuable if they can interoperate.[lii] SSOs agree on standards, and then participants promise to license

standard-essential IP (mainly patents) on fair, reasonable, and nondiscriminatory (FRAND) terms.

If private ordering is a way forward, we must consider the subsidiary legal rules required to make these schemes operate effectively. Is the current contracts regime optimal from either a private or a social perspective? Do we need special protection for the weakest members in these regimes? Do we need law on what constitutes FRAND terms? How about law to protect the public from overreaching by these private parties?

Before I close, I should also mention international institutions. These include the World Intellectual Property Organization (WIPO), the World Trade Organization (WTO), regional organizations (e.g. NAFTA, the North American Free Trade Agreement), megaregionals (e.g. the TPP, the Transpacific Partnership Agreement), and bilaterals (such as AUSFTA, the trade agreement between the US and Australia). These have combined to sharply reduce national authority to formulate IP laws and norms—that is, to regulate in the ways I've suggested. The multiplicity of these arrangements allows right holders to acquire power through regime-shifting (they create what might be called opportunities for international forum shopping).[liii] That's led to increasingly close harmonization and a ratcheting up of legal protection.

This phenomenon deserves more sustained attention. Is harmonization (at high levels) increasing global welfare? With so much uncertainty about how IP should be structured for new technological environments, perhaps we are better off with heterogeneity. If each country can legislate for itself, they can, in US Justice Brandeis's words, serve as laboratories,[liv] experimenting with various approaches. Successful experiments could then be uploaded to the international arena. Or, as with the EU's Database Directive, bad approaches can be rejected.

And what about the justifications for harmonization? Are they tenable? One theory is that every country is better off with a strong IP regime to encourage local innovation. It would be good to know if that's true. It has been true for the BRICS, not so much for other developing countries. A second theory is that harmonization stems research arbitrage—the brain drain that is said to occur when scientists migrate to where the law offers the most protection.[lv] Yet everyone who lives in a WTO country benefits for the commitment to national treatment. That

means they (at least in theory) all face the identical set of incentives. Further harmonization won't change that.

Harmonization is also justified on the ground that in a global economy, it is crucial to lower the transaction costs involved in multinational exploitation and enforcement. But there are other ways to reduce transaction costs. The Hague Conference on Private International Law is working on rules to facilitate multinational litigation. The United Nations Commission on International Trade Law (UNCITRAL) is contemplating rules on transnational IP licensing.[lvi]

In the EU, there are also private memoranda of understanding (MOUs) on secondary liability that spell out the steps intermediaries must take to stop infringement. Importantly, MOUs also clarify the steps intermediaries need not take, so that avenues of distribution and communication are preserved and disincentives to invest in new sharing technologies aren't created. These arrangements are attractive because they involve all the stakeholders, who together can reach better decisions than can courts. MOUs can also be made internationally applicable.[lvii]

Another approach: an international court system. One is possibly being established as we speak. That is, just as the EU was about to create a new Unified Patent Court system to adjudicate EU patent rights and to establish a new Unitary Patent good throughout most of the EU, BREXIT occurred. The UK's exit from the EU is a major threat to this initiative in that the Unitary Patent is valuable only if it includes the UK market and the court is viable only if it includes highly experienced UK judges. To keep the UK in the deal, negotiators may turn the Unified Patent Court into an international, rather than an EU, court. Once that is created, other countries might also join. A centralized court system would avoid cases like Apple v. Samsung, where the parties sued each other over pretty much the same IP rights in something like nine different countries, which has (at astonishing cost) led to conflicting decisions and pricy outcomes. There's precedent for this approach: The Internet Corporation for Assigned Names and Numbers (ICANN) requires arbitration. As Melbourne University's Andrew Christie has shown, that system efficiently resolves international disputes over domain names.

There's another possibility here: Brexit may be a forerunner of other unravelings—Donald Trump has already pulled the US out of the TPP and may also kill NAFTA. There's even talk of the US leaving the WTO. But the IP system is likely to still need a degree of international coordination. For that, new institutions (and private ordering) are likely to become even more important.

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We live in interesting times, in an Information Age, when our economy turns on technological development, when technologies—and technologies for creating technology—are changing rapidly. We find ourselves in a world where international cooperation may be growing—but might be fading. In this new era, we face an acute need for research on how IP law should be structured to efficiently transform ideas into products and disseminate them effectively. That's the goal to which Tom Spurling has dedicated his career. It's been a pleasure to get to know the people here at Swinburne (on both the law and business faculties) who are following his splendid lead.

Discussant – Terry Healy

Ladies and Gentlemen

I am honoured to present this short commentary on the address given by Rochelle Dreyfuss.

But first I would like to add my own thoughts to the warm words already spoken tonight about Tom Spurling.

We are here to recognise the lifelong contribution made by Tom to science in Australia; and particularly to the application of forefront science to the opportunities and problems facing Australia.

As many of you know, Tom is endlessly curious about all manner of developments in science and technology. And people. And politics. And football, especially about the mighty tigers.

He is also endlessly active. He has fingers in many pies – it is a wonder he doesn't mix them up to form a giant melange. But he doesn't. He skips from one topic to another with the grace and poise of a ballet dancer – or should I say, Dustin Martin.

Tom is also a personal friend and colleague. We worked together over many years at CSIRO.

And now we work together on the CSIRO History Project – a long-term project to record the people and work of CSIRO over the period 1949 to about 2010.

Being with Tom is always interesting and enjoyable. He brings a youthful spirit of enthusiasm to everything he touches.

So, thank you Tom.

Another colleague here at Swinburne is Rochelle Dreyfuss.

Rochelle is a world-leading expert in intellectual property. She has published 100 or so books and papers on a wide variety of IP topics.

At the invitation of Beth Webster, Rochelle's address to this gathering has covered an enormous canvas.

She talked about the elephant in the room: Will we actually NEED intellectual property in future?

From there she examined areas where more research is needed to answer some pretty fundamental questions.

My own experience has forced me to think about these issues, particularly in the patent space. I put aside tonight the wombat in the IP room – copyright. It is an appallingly inefficient system, but beyond scope for these brief comments.

Rochelle asked, quite correctly, whether the world still needs IP systems in order to provide the incentives necessary to maintain the pace of invention and technological change.

I am sure this is a very important question for the US and other countries in the vanguard of IP law and practice.

But looked at from the narrow perspective of a minor player like Australia, Rochelle's question can be seen as more limited.

Mostly at the insistence of the United States, the world already has a remarkably strong and uniform set of IP systems. These systems are enforced at the national level - but strongly reinforced through international conventions and agreements, chiefly WTO and TRIPS.

Woe betide any nation, especially a smallish one like Australia, which tries to buck that system.

The best that Australia can do is to figure out where its best interests lie; and then optimise its position within the degrees of freedom open to it.

The Australian Productivity Commission last year provided thoughtful contributions on the question and concluded, inter alia, that Australia should stiffen its tests for inventive step and raise patent renewal and claim fees.

Both of these recommendations seem rational to me.

Raising fees should be uncontroversial. Other nations already have much higher fees without attracting adverse attention from the US or the WTO. These include Sweden, which charges about AU$10,000 per annum to renew a patent in the late stages of its life.

Given that more than 50% of Australian patents are abandoned within 10 years of grant, and that escalating renewal fees are standard practice, raising these fees provides an easy avenue to reduce the problem of nuisance patents – those that occupy space in the IP ether without corresponding value to anyone – to the public or to the patentee.

Indeed, my personal view is that we should think about even higher fees for patent renewals after 10 years.

Raised renewal fees would be a partial solution to present problems as outlined by Rochelle.

But they could also help with what I see as a gathering problem – a likely tsunami of patent applications coming our way from China.

In saying this, I accept that I am drawing a long bow, aimed into a very uncertain future.

However, every year China now trains more than twice as many engineers and scientists as the US. And that ratio is rising. Rapidly.

The Chinese Patent Office now receives almost twice as many applications as the US Patent and Trademark Office. That ratio is growing too.

There is evidence that the quality of Chinese patent applications from Chinese applicants is still comparatively low.

However, in my view, that is likely to be only temporary. I think the sheer volume of technical graduates will rapidly improve many things for China, including patent quality.

So why do I mention this as a challenge to the IP system?

In my view, our current strong world IP system is very much a creation of the US.

For decades, the US has been the prime originator of top value IP. To protect that IP around the world, the US has pushed nations into ever-stronger levels of IP protection.

But what happens when the balance shifts? It is easy to foresee that China, with its legions of highly educated scientists and engineers, will overtake the US in creativity. The US could even become a net importer of IP value.

Will we then see a duopoly, with the US and China competing furiously against each other - but agreeing to limit competition from upstart nations by maintaining strong IP protection everywhere?

That is, keep the upstarts in their place by filling the IP spaces in those nations with patents and other IP rights owned primarily by the US and China.

Or will that agreement break down, leaving universal world trade agreements to be gradually replaced by a plethora of tailored bi-lateral and multi-lateral agreements, each of which will include IP provisions which advance the interests of its dominant members?

Remember, an IP system can be a source of great good, promoting free trade and globalisation of supply chains for the advantage of everyone. But the system could also be exploited by a nation intent on economic dominance.

China already subsidises foreign patent applications by its citizens. It has recently pulled back on these subsidies, and Chinese-origin patent applications in other countries are still low – about 40,000 per year. But this surely will change.

In saying all this I don't mean to be alarmist. Australia, as a niche player, will have a happy and prosperous future – but only if it is smart.

One example of a space where Australia can prosper is through education and scientific research.

And here we come back again to IP.

In my view, Australia is ideally placed to become a world-leading player in the conduct of very high quality research.

We have excellent universities. We also have CSIRO.

We have a patent attorney profession that is capable of capturing and securing IP rights around the world.

We have capacity to conduct scientific research largely free of constraints from third-party IP – much more free than the US.

Together these factors provide the basis for a real opportunity for Australia to find valuable interstices between the mighty pillars of IP that will doubtless keep being built by China, the US and a lesser extent by Europe. And India, if that country can get its act together.

Of course, I would like to see a more solid statutory basis for research freedom than Australia has at present. Japan has done it. Why shouldn't we?

Turning now to some of the other specifics raised by Rochelle, I will mention first her comments about institutions.

Enforcement of IP rights is notoriously expensive – hyper-expensive!

Post-grant review of patents seems to me to offer the best solution. It can be faster and more expert than court-based systems.

We may lose some good patents, for the kinds of reasons Rochelle mentioned (familiarity breeds contempt).

But the review system will weed out a lot of bad patents, and do it more cheaply than going to court.

Rochelle also mentioned Standard Setting Organisations (SSOs).

As the world moves further towards distributed global manufacturing, standardisation may become more important, particularly for inter-operability.

We need to get a balance between adopting best-practice technologies in standards and reasonable – but not excessive – rewards for the innovators responsible for creating those technologies.

Incidentally, you may have seen that Qualcomm (a very important innovator in communications technology) is currently the target of Broadcom (a major chipmaker) for a take-over. The offer is for more than US$100B.

Qualcomm has been outstanding as a licensor of IP. If the take-over succeeds, this may see a fall in the use of standards, and a rise in the use of proprietary systems by a handful of key players (Intel, Samsung and Broadcom).

A growth in world-scale proprietary systems would raise another issue mentioned by Rochelle, trade secrets.

For all its faults, the patent system has the virtue of promoting early public disclosure of ideas.

Trade secret protection – by its very nature – tries to hide these ideas for as long as possible. Hiding is much more practical in a single corporation than where licensing between parties is involved.

Rochelle discussed the Myriad cases and related efforts to control the scope of patent protection by reference to ideas about patentable subject matter. I think that is a very fertile area for debate.

Beth Webster raised the question: "Where is science and technology heading and what regulatory environment would best bring their promise to the marketplace?"

It would be wonderful to have a crystal ball that would tell us where science and technology are headed over the next century.

Absent that, we need to make sure that we position ourselves for a wide range of possibilities.

And the best way to do that is to be smart and flexible.

And as far as possible, keep the IP system as the servant, not the master.

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