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INTERNATIONAL CONFERNCE TOWARDS ARTIFICIAL PHOTOSYNTHESIS

Australian National University
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ANALOGICAL PRECEDENTS

Informatics, biotechnology and energy: This conference is concerned with radical changes in energy services that will be necessary as the finite sources of energy from fossil fuels are depleted. Whichever way our species turns, there will be challenges. Some of these will be technological and scientific. Some will be economic, environmental and social. But others will be governmental and legal. This paper seeks to explore some of the last mentioned challenges. Necessarily, at least so far as artificial photosynthesis

In medieval times, a revolution occurred in the communication of ideas following two technological changes: perfection of spectacle glasses and invention of the printing press. The former allowed the

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monks, who spent their years inscribing religious texts, to extend their working lives beyond presbyopia. The printing press then released words (and hence the ideas represented by words) from the calligraphy of the monks.

For holy men, the words were written to be said or sung. But after Caxton, printed words took on a life of their own. Their meaning could be delivered without mouthing the sounds they conjured up. In a forerunner to the urgencies of the present day email, text messages and social networks, ideas could be communicated four times faster than they could be said. A revolution in communication had begun. It continues to expand.

In addressing energy, science and technology this conference opens a new dimension for me. My past encounters with my chosen issue have been with information technology and biotechnology. These are major features of the contemporary world. From the viewpoint of law, they present a common difficulty that, no sooner is a relevant law or agreed guideline developed to address some of their features, and to regulate those deemed necessary for regulation by reference to community standards, and the technology itself has raced ahead. The law in the books is then in great danger of becoming irrelevant, in whole or part. In fast moving science and technology laws and institutions conceived at one time may have little, or no, relevance to events that happen very soon thereafter.

By describing my encounters with information technology and biotechnology, I hope to suggest possible directions in which laws and institutions may emerge to respond to the remarkable developments that are occurring in the fields of energy technology. Everyone knows that fossil fuels as a source of energy now have a limited life. Most experts also believe that fossil fuels have serious environmental disadvantages, despite their enormous efficiency for use, transmission and storage. It is these features of fossil fuels that have led to urgent endeavours to find viable alternatives. At first, it was believed that nuclear technology would be the cheap, safe and plentiful energy source for the future. However, experiences in Chernobyl and more recently in Japan have demonstrated the vulnerability of this source to accidental and natural disasters[1].

As well, the risks of nuclear terrorism have combined with accidental events to turn attention urgently to other energy sources and the technologies that will deliver them efficiently and economically for world-wide human use. It is here that solar and wind energy (often in symbiotic combination) present themselves to complement hydro sources as safe and powerful energy sources for the future. These and the developments of global artificial photosynthesis (if it can be perfected) are presented as the energy alternatives to replace fossil fuels that have dominated the past century.

[1] S. Weir, *History's Worst Decisions*, Pier 9 (Murdoch Books), Sydney 2008, 215 ("The Soviet Nuclear Legacy; Chernobyl") describing the disaster that followed a routine partial shutdown of the nuclear reactor at Chernobyl on 25-26 April 1986.

In 1975, soon after I was first appointed to federal judicial office in Australia, I was seconded to chair the Australian Law Reform Commission (ALRC). The Commission, a federal statutory body, was created after the model of Lord Scarman's Law Commissions in the United Kingdom[2]. Its task was to advise the Australian Parliament on the reform, modernisation and simplification of Australian federal law.

One of the first inquiries assigned to the ALRC concerned biotechnology. The Attorney-General required the Commission to prepare a law for the Australian Capital Territory (a federal responsibility) to deal with the legal issues of human tissue transplantation[3]. The project was initiated in July 1976. The Commission was required to report no later than 30 June 1977. The timetable was severe.

In the event, the Commission fulfilled its mandate. It produced its report on time. Within Australia, the report proved highly successful as a regulatory model. Not only did it result in the adoption of a law on the subject for the Capital Territory[4]. The draft legislation attached to the ALRC's report was soon copied in all parts of

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[2] See M D Kirby, "Law reform and human rights - Scarman's great legacy (2006) 26 *Legal Studies* 449; 80 *Australian Law Journal* 299.

[3] Australian Law Reform Commission, *Human Tissue Transplants* (Report No 7, 1977).

[4] *Transplantation and Anatomy Act* 1978 (ACT).

Australia[5]. Such was the universality of the issues that we addressed that the report was also quickly translated into languages other than English and used overseas in the development of the laws of other countries governing tissue transplantation.

The report described the then rapid advances that had occurred in tissue transplantation. The earliest attempts in this technology dated back two thousand years. Instances of the transplantation of teeth in England at the close of the eighteenth century[6], of bone transplantation at the close of the nineteenth century[7] and of transplantation of organs such as the kidney dating from the early 1950s[8], indicated that this was an area of human activity that probably required fresh thinking. One of the events that had propelled the Australian Attorney-General into action on this subject was the world-wide controversy that had surrounded the first transplantation of a human heart in South Africa in December 1967 by Dr Christiaan Barnard. The recipient died eighteen days later from pneumonia. However, successful operations quickly followed.

There were many difficult and controversial legal topics of legal regulation to be addressed. These included:

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[5] *Human Tissue Transplant Act* 1979 (NT); *Transplantation and Anatomy Act* 1979 (Qld); *Human Tissue Act* 1982 (Vic); *Human Tissue and Transplant Act* 1982 (WA); *Human Tissue Act* 1983 (NSW); *Transplantation and Anatomy Act* 1983 (SA); *Human Tissue Act* 1985 (Tas).

[6] M F A Woodruff, *The Transplantation of Tissues and Organs* (Chas. Thomas, Illinois, 1968).

[7] *Ibid*, 380.

[8] *Ibid*, 521-525.

- Whether a system of 'opting in' or 'opting out' should be accepted to permit the removal of human tissue from the source;
- Whether legal minors should be permitted to give consent, as for a sibling recipient and, if so, under what conditions;
- Whether payments for human organs should be forbidden;
- Whether organs might be taken from prisoners and other dependent persons for transplantation;
- Whether tissue might be removed from coroner's cadavers;
- Whether blood was to be treated separately or as just another human tissue; and
- How 'death' should be defined for legal purposes, as a precondition to the removal of vital organs for transplantation.

As the ALRC was producing its report, it became aware of a "major medical development … expected within the near future - possibly the next two or three years". This was described as "the fertilisation of human egg cells outside the human body"[9]. The process of *in vitro* fertilisation and embryo transplantation was therefore mentioned in the report. However, the ALRC recognised that the fertilisation of the ovum of a woman by the use of donor semen, whether *in utero* or *in vitro,* raised issues different in kind from those presented by the transplantation of particular organs and tissues. Whether or not embryo transplantation literally fell within its terms of reference, the ALRC felt bound to exclude the subject from its report

[9] ALRC 7, above n 5 at paras 18-19 [41]-[42].

and draft legislation. If there were to be an inquiry into *in vitro* fertilisation, it would require a separate reference from the Attorney-General.

The ALRC had also become aware, even at that time thirty five years ago, of the potential of transplantation of foetal tissue. It noted that work on foetal tissue transplants "may have already begun in Australia"[10]. 'Right to life' organisations and others had already made submissions calling for legal prohibitions. Reports on the topics in Britain[11], the United States[12] and New Zealand[13] were cited. Once again the subject was side-stepped.

The ALRC inquiry on tissue transplantation afforded a vivid illustration for me of how, in the regulation of any subject of technology, events rarely stand still. Even between the time that the ALRC initiated its project on human tissue transplantation law and the time it reported, the technology had advanced. Draft legislation prepared to address other topics was unsuitable, and plainly so, for the more sensitive and complicated issues emerging from *in vitro* fertilisation and foetal tissue transplants. Before long, Louise Brown was born. Eventually, special laws on *in vitro* fertilisation were

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[10] ALRC 7, *ibid* 20 [45]-[46].

[11] Great Britain, *The Uses of Fetuses and Fetal Material for Research*, HMSO, London, 1972, report by Advisory Committee established in 1970.

[12] United States, National Commission for the Protection of Human Subjects on Biomedical and Behavioural Research, *Report*, 21 May 1975.

[13] New Zealand, Royal Commission of Inquiry, *Contraception, Sterilisation and Abortion in New Zealand*, Government Printer, 1977.

adopted in Australia, as elsewhere[14]. As I later learned in my judicial capacity, such laws and the issues involving the availability of IVF for unmarried or same-sex recipients, invoke strong feelings, conflicting demands and different regulatory responses in different places[15]. Technology, whatever its form, tends to present many sensitive legal controversies and institutional challenges.

Regulating information technology: Soon after the completion of the law reform project on human tissue transplants, the ALRC was asked to prepare recommendations on reform of the Australian law governing the protection of privacy. This led to another major inquiry although, in this case, the object was the preparation of proposals for federal legislation, suitable for enactment by the national Parliament. In the result, a number of reports were delivered on the topic[16]. The major report, in 1983, dealt with many aspects of privacy protection under federal law.

As befitted the delivery of the report on privacy protection, on the brink of 1984, a major focus of the ALRC report was the new information technology. Even at that time, that technology had significantly changed the way in which information was collected and

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[14] See e.g. *Infertility Treatment Act* 1995 (Vic); *Reproductive Technology (Clinical Practices) Act* 1988 (SA); *Human Reproductive Technology Act* 1991 (WA).

[15] *Re McCain; Ex parte Australian Catholic Bishops Conference* (2002) 209 CLR 372.

[16] ALRC, *Unfair Publication: Defamation and Privacy* (ALRC 11, 1979); *Privacy and the Census* (ALRC 12, 1979); *Privacy* (ALRC 22, 1993).

distributed and stores as well as the amount of personal information that could be communicated.

Because of my involvement in the Australian inquiry on privacy protection, I participated as the Australian representative in a group of experts convened by the Organisation for Economic Cooperation and Development (OECD) in Paris. That expert group was created to make recommendations to member countries of the OECD on guidelines for the protection of privacy in the context of transborder data flows. In the event, I was elected to chair the OECD expert group. Between 1978 and 1980, it conducted its inquiry drawing upon principles already developed in relation to automated and non-automated data systems by the Nordic Council, the Council of Europe and the then European Economic Community. In the result, guidelines were agreed to by the OECD[17]. They were to prove highly influential in the development of the national laws of member states, influencing the design and contents of such laws in countries with legal systems as diverse as Australia, Canada, Japan and the Netherlands and corporate practice in the United States of America. The Australian *Privacy Act,* based on the ALRC report, was enacted by Parliament in 1988[18].

Annexed to the Australian *Privacy Act*, in Schedule 3, were "National Privacy Principles". As the Act declared in its Preamble,

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[17] Organisation for Economic Cooperation and Development, *Guidelines on the Protection of Privacy and Transborder Data Flows,* Paris, 1980.

[18] *Privacy Act* 1988 (Cth).

its purpose included compliance by Australia, as a member of the OECD, with the recommendation of the Council "that member countries take into account in their domestic legislation the principles concerning the protection of privacy and individual liberties set forth in Guidelines annexed to the recommendations". The Act recited that Australia had "informed that organisation that it will participate in the recommendation concerning those Guidelines"[19]. Hence, the National Privacy Principles adopted by the new federal law.

A difficulty quickly became apparent. It did not arise out of any defect in the understanding of the OECD expert group or of the ALRC in its recommendations to the Australian government and Parliament, concerning the technology then deployed. However, that technology quickly changed in its potential. Moreover, it did so in a way that rendered an assumption, expressed in the OECD Guidelines and the Australian national privacy principles, out of date (at best) and irrelevant (at worst). This is an object I spoke to lawyers and governments about the dangers of regulating technology

Illustrating the issue by reference to the "use and disclosure" principle, the second in the Australian National Privacy Principles, this principle stated:

> "2.1 An organisation must not use or disclose personal information about an individual for a purpose (the

[19] *Privacy Act* 1988 (Cth), Preambles 4 and 5.

secondary purpose) other than the primary purpose of collection unless:

(a) Both of the following apply:

(ii) The secondary purpose is related to the primary purpose of collection and, if the personal information is sensitive information, directly related to the primary purpose of collection;

(iii) The individual would reasonably expect the organisation to use or disclose the information for the secondary purpose; or

(b) The individual has consented to the use or disclosure; or

(c) If the information is not sensitive information and the use of the information is for the secondary purpose of direct marketing [certain provisions follow]; or

(e) The organisation reasonably believes that the use or disclosure is necessary to lessen or prevent:

(i) A serious or imminent threat to an individual's life, health or safety; or

(ii) A serious threat to public health or public safety; or

(f) The organisation has reason to suspect that unlawful activity has been, is being or may be engaged in …; or

(g) The use or disclosure is required or authorised by or under law; or

(h) The organisation reasonably believes that the use or disclosure is reasonably or necessary for one or more of the following by or on behalf of an enforcement body [Provisions on law enforcement follow]".

The basic hypothesis of the OECD Guidelines (and therefore of the ALRC recommendations) was that personal information that was collected should ordinarily be restricted to use for the purpose for which it was collected and that such purpose should be made known

to the individual at the time of the collection[20]. Then search engines, including *Google* and *Yahoo*, were invented with their capacities in access to otherwise inaccessible information. The specification of purposes of collection and the limitation of use and disclosure by reference to such purposes became effectively unworkable[21].

Accepting as paradigm instances the cases of biotechnology and information technology that I have described, the difficulty (in some cases near impossibility) of effective and efficient regulation was quickly apparent. It affected the drafting of any law of the conventional kind lest it was quickly be overtaken by events. In part, legal texts might be overtaken by advances in technology of the kind that I have described. But in part too, changes in social attitudes, (themselves often stimulated by advances in technology and a perception of the utility of the advances) make it more difficult than in other fields of law to draw a clear line in the sand.

The caravan of controversy: Take for example, a further illustration arising from *in vitro* fertilisation. In 1976, when the ALRC report on *Human Tissue Transplants* was written, many debates were conducted over the suggested ethical quandary of transplantation of ova fertilised by a husband's sperm. These

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[20] *Privacy Act* 1988 (Cth), Schedule 3. "Privacy Principle 1 (Collection)".

[21] Another illustration arises out of the enactment of provisions requiring that confessions and admissions to police, by suspects in custody, should be recorded on "videotape". See eg *Criminal Code* (WA), s 570D(2)(a). The change to digital technology necessitated amendment of such laws to substitute a requirement for "audio-visual recording". See *Criminal Investigation Act* 2006 (WA), s 118(1) and *Carr v Western Australia* (2007) 232 CLR 138; [2007] HCA 47.

debates were quickly supplanted by new ones concerned with the use of non-husband (donor) sperm. Such debates are now rarely heard, even in esoteric legal circles. Today the ethical (and legal) debates about IVF are generally concerned with the availability of the technology to single parents and to same-sex couples. Thus, the caravan of controversy has moved on.

A law drafted too early may freeze in time the resolution of earlier controversies which may later be regarded as immaterial or insignificant. Whether by default, or by design, many issues presented to the law by contemporary technology are neglected or ignored because one suspects that, in many instances, it is too complicated or seen as too sensitive.

FIVE PARADOXES

1. *Doing the best without experts*: Having laid the ground, despite my lack of previous involvement in energy technology, for a competence to provide analogical guidance for this conference, I will identify a number of paradoxes, or at least curiosities, that emerge about regulating technology generally. In fact, the first of the curiosities is a reflection not only on my own limited competence but also on the limited competence of every lawyer and every would-be regulator.

There are no real experts on the generic subject of regulating technologies. They do not exist in the United Kingdom, the United

States, Australia or elsewhere. It is much easier to find an expert on the intellectual property implications of biotechnology and information technology than it is to find someone skilled in considering what new law or institutional arrangement, if any, should be created to deal with a particular issue presented by technology and how they should be devised. Easier by far to find an expert on income tax or unjust enrichment or international human rights law than to find governmental officials, judges or even legislative drafters who can claim to be experts in the subject matters of the Lord Howe Island conference.

Each new area of technology will have its own features, relevant to the regulators and institutions appointed to the task of responding to its national and international challenges. Take, for example, the provision of intellectual property protection for computer programmes – a comparatively new technology. Lawrence Lessig was the founder of the Stanford School's Center for Internet and Society. His book *Code and Other Laws of Cyberspace* (now updated by *Code V2*) blazed a distinctive trail. He is something of a guru on the interface of cyberspace and the law. He challenges lawyers and technologists to think freshly. His thesis is that 'Code', or the architecture of technological systems, will sometimes incorporate regulatory imperatives into the information technology itself, thereby obviating or negating any real choice on the part of the user as to whether or not to conform to a particular law.

In the High Court of Australia, the judges came face to face with this reality in *Stevens v Sony Computer Entertainment*[22]. The case concerned a claim by Sony Corporation of a breach of a "technological protection measure" installed by it in the programme of its computer games. Sony asserted that the measure was protected under the Australian *Copyright Act* 1968. Sony argued that Mr Stevens had unlawfully sought to circumvent the device incorporated computer games which it produced and sold on CD-Rom for use in its PlayStation consoles.

Applying a strict interpretation to the expression "technological protection measure", the court held that Sony's device did not fall within the statute. I agreed in this analysis[23]. The case was a vivid illustration of the way in which, for copyright, contractual and other legal purposes, attempts are now often made to incorporate regulatory provisions in the relevant technological codes. It is a new development, although I suppose one might see primitive attempts directed at the same purpose in the safety provisions incorporated in the engineering designs of houses, bridges and aeroplanes. The computer PlayStations simply take this development to a higher level of sophistication and technological capability. Professor Lessig identified this new development with particularity. Inevitably, his expertise did not include all of the current major technologies such

[22] (2005) 224 CLR 193; [2005] HCA 58.

[23] (2005) 224 CLR 193 at 246 [186].

as energy technology, still less the way in which law can regulate them all.

I too am no universal expert in the design of laws. True, I participated in a final national court that sometimes declares new laws. I worked for a decade in national law reform, as I have described. True also, I have participated in the drafting of international guidelines, such as those of the OECD on privacy[24]. However, this is hardly an intensive preparation for the complex and technical task of drafting conventional laws to regulate different technologies, such as energy technologies, for, or under, a legislature. I have become rusty since, in my law reform days when I worked with trained parliamentary counsel on the draft legislation annexed to the ALRC's reports.

Likewise, none of the participants in the Lord Howe Island conference had revealed special skills in drafting statutes and subordinate regulations. Although the experience of the authentic scientists and technologists who participated was essential to an understanding of the problem, it did not necessarily provide the best guidance for the legal solutions. Different and other skills from those present were necessary.

[24] Also as chair of the UNESCO International Bioethics Committee drafting group for the *Universal Declaration on Bioethics and Human Rights*, adopted by the General Conference of UNESCO, Paris, October 2005. See R Andorno, "Global bioethics at UNESCO: in defence of the Universal Declaration on Bioethics and Human Rights" (2007) 33 *Journal of Medical Ethics*, 150.

V.I. Lenin once declared that the person who writes the minutes of an organisation usually ends up controlling it. His work as general secretary of the Soviet Communist Party obliges us to take this advice seriously. We may complain about the absence of law concerned with new cutting edge technology. We may acknowledge our own imperfections for addressing the gap. We may recognise, with Professor Lessig, that regulation in the future may not necessarily come in the form of instruments made by or under the legislature and published in the *Government Gazette*. It may take new and different forms and sometimes be grafted onto the technological set-up itself.

Nevertheless, the issue of regulating technology, including energy technology, is undoubtedly one having the greatest importance for the future of the rule of law in every society.

Despite the manifold inadequacies of those who participated in the conference, it may, in the long run, have a paradoxically disproportionate impact on perceptions of how energy technologies may be regulated and used, simply because it is one of the first meetings to tackle the issue of energy technology generically. It surveyed what is substantially a blank page. Increasingly the content of law, like the content of life, will be concerned with technology and with its many consequences for society. The importance of energy technology regulation therefore belies the comparatively little that is written, said and thought about it.

Paradoxically, those who first lay claim to expertise may thereby participate in a self-fulfilling prophesy.

2. *Too much/too little law*: The second paradox is that the failure to provide a framework for legal regulation to deal with the consequences of a particular technology is not socially neutral. Effectively, to do nothing often amounts to making a decision.

For example, for the law to say nothing about reproductive cloning of human beings (assuming that form of cloning to be technically possible) is to give a green light to experiments in that technology. In so far as law expresses prohibitions supported by sanctions that uphold the command of a relevant governmental or inter-governmental power, silence may, for once, imply consent or at least non-prohibition. If there is no law to prohibit or regulate reproductive cloning or hybridisation or xeno-transplants, scientists and technologists at their benches may decide to experiment. Nothing then exists to restrain them except their own ethical principles, any institutional ethics requirements, the availability of funding and the prospects of a market. A scientist or technologist may proceed out of sheer curiosity, as when David Baltimore so beneficially investigated a simian retrovirus a decade before the discovery of the immuno-deficiency virus in human beings.

The scientist or technologist may do this in the hope of cashing in on a potentially lucrative economic market. In the case of reproductive

cloning, one such market certainly exists in respect of therapies to overcome human infertility. Cloning might, potentially, be one such therapy. Some of its supporters treat with contempt the supposed moral objections to this form of scientific experimentation[25]. They point to earlier resistance to other reproductive technologies such as artificial insemination donor (AID), artificial insemination husband (AIH), *in vitro* fertilisation (IVF) and surrogacy arrangements[26]. Most of these objections have faded away as society becomes more accustomed to "non-natural" ways of securing a desired pregnancy in a particular patient.

The recognition that inaction in the face of significant technologies may amount to making a decision co-exists with our appreciation, as observers of the law, that premature, over-reaching or excessive lawmaking may, in some cases, be an option worse than doing nothing. It may place a needless impediment upon local scientists and technologists, obliging them to take their laboratories and experiments offshore.

In a big world with diverse cultures, religions and moral beliefs, it is generally possible to find a place offering a regulation-free zone in exchange for investment dollars. Just as bad is the possibility that

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[25] J A Robertson, "Why human reproductive cloning should not in all cases be prohibited", (2001) 4 *Legislation and Public Policy* 35; Y M Shikai, "Don't be swept away by mass hysteria: The benefits of human reproductive cloning and its future" 33 *Southwestern University Law Review* 259 (2002).

[26] The New South Wales Law Reform Commission in 1988 recommended a prohibition on surrogacy arrangements which was not implemented. However, surrogacy arrangements are regulated in some Australian jurisdictions: *Parentage Act* 2004 (ACT); *Surrogate Parenthood Act* 1988 (Qld); *Family Relationships Act* 1975 (SA); *Surrogacy Contracts Act* 1993 (Tas); and *Infertility Treatment Act* 1995 (Vic).

laws will be solemnly made and then ignored or found to be ineffective, as was temporarily the case with the "technological protection measure" considered in the Australian Sony litigation. Following the decision of the High Court of Australia in that case, and under pressure from the United States government under the *United States-Australia Free Trade Agreement*, Australian law was changed. The amended law represented an attempt to overcome the High Court's decision, although in a somewhat different way[27].

I do not doubt that many, perhaps most, of the participants in the Lord Howe Island conference on energy technologies would have signed up as legal libertarians. They would recognise that, in their own fast moving field of energy technology, premature, over-reaching and ill-targeted laws might diminish experimentation, burden innovation and cause economic and other inefficiencies. It is this attribute that reacts with anxiety about the dangers of the so-called "precautionary principle"[28] which initially emerged in an environmental context.

Whilst the precautionary principle appears to be gaining increasing widespread acceptance in the international community, particularly

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[27] The story of the change of law following the decision in the *Sony* case is told in M. de Zwart, "Technological enclosure of copyright: The end of fair dealing?" (2007) 18 *Australian Intellectual Property Journal* 7; contrast D Brennan, "What can it mean 'to prevent or inhibit the infringement of copyright?: - A critique of *Stevens v Sony*'" (2006) 17 *Australian Intellectual Property Journal* 81 at 86. See also *Copyright Amendment Act* 2006 (Cth) implementing the new scheme said to be required by art 17.4.7 of the *Australia-United States Free Trade Agreement*.

[28] R Andorno, 'The precautionary principle: a new legal standard for a technological age', (2004) *Journal of International Biotechnology Law* 1, pp. 11-19.

in respect of protection of the global environment, it carries risks of its own. If taken too far, it could instil a negative attitude towards science and technology and encourage excessive regulation in the attempt to avoid *any* risks. Life is risky. Most technological innovations carry at least some risk. An undue emphasis on precaution, for fear of *any* risks, would not be good for science or technology or for the global economy, energy sources or for innovation in thought as well as action. On the other hand, energy technologies clearly involve risks, as the accidents in connection with nuclear power plants demonstrate and as the vulnerability of large scale power grids and environmental dangers of wind, solar and hydro technology may present.

The second paradox is thus more of a contradiction or tension, difficult to resolve. At the one time we must accept that doing nothing to regulate technologies involves making a societal decision. Yet we must also recognise that sometimes doing nothing will be a better option than making laws that unduly impede innovation and burden efficiency.

3. *First Amendment and copyright law*: An early illustration of the third paradox in the installation of filters to prohibit access to materials considered "harmful to minors". Many countries now have legal regulations forbidding access to, or possession of, child pornography. Available software may prevent access to specified sites providing such images. But sometimes the law may do so at a

cost of over-reaching prohibitions. The burden on free communication may sometimes outstrip the legitimate place of legal regulation, forbidding access not only to child pornography but to lawful erotic materials or discussion about censorship itself or to websites concerned with subjects of legitimate interest, such as aspects of human sexuality, women's rights and even children's rights.

Whereas the law, at least in Western countries, will commonly afford avenues of appeal and review of decisions that purport to apply legal norms, an over-reaching "protective" software programme may afford no such rights of challenge. Those concerned with the human right of free expression are naturally anxious about the potential of 'Code' to re-institute excessive censorship in society, just when we thought we had grown out of that habit.

Experts such as Professor Lessig, coming from the United States of America, naturally approach these issues from the standpoint of the First Amendment to the United States Constitution[29]. This provision upholds a very high level of unrestricted and unregulated freedom of communication. The rest of the world tends to be less absolutist in this respect[30]. It recognises that, whilst "free" expression and access to a "free" media constitute important human rights, they are

[29] Relevantly, the First Amendment states: "Congress shall make no law … abridging the freedom of speech, or of the press".

[30] Eg *ABC v Lenah Game Meats Ltd* (2001) 208 CLR 199 at 283 [202] ([2001] HCA 63); *Dow Jones and Co Inc v Gutnick* (2002) 210 CLR 575 at 626 [115] ([2002] HCA 56).

not unlimited. They have to be harmonised with other fundamental human rights. These include the right to individual honour and reputation and to protection of privacy and family relationships[31]. They also include protection of the legitimate rights of inventors[32].

In the field of energy technology we are inevitably also influenced by United States regulatory models and traditions simply because of the very significant role of United States scientists, technologists and energy companies operating in this field. However, now there are other players, particularly China and India with their insatiable demands for energy to sustain their fast expanding economies. The influence of the regulatory traditions and economic needs of these other countries are likely to emerge as a major consideration in this field. And in so far as international treaties are needed and negotiated, they will necessarily reflect the interests of developing countries with their huge potential energy needs.

4. *Technology's democratic deficit*: A fourth paradox derives from the way in which contemporary technology at once enhances, and diminishes, our facilities of democratic governance. When it comes to legal regulation few participants, at least at a conference such as that on Lord Howe Island, will question the desirability of rendering laws, and regulation generally, available and accountable to the people from whom authority to govern society is ultimately

[31] *International Covenant on Civil and Political Rights,* (1976) arts 17.1, 17.2 and 19.3.

[32] cf *Universal Declaration of Human Rights* (1948) art 27.1; *International Covenant on Economic, Social and Cultural Rights* (1976), art 15.1(b) and (c).

derived. However, on balance, does technology enhance or reduce, encourage or discourage democratic accountability for the state of the resulting regulations?

There can be little doubting that information technology has improved communication that is essential to converting the requirements of electoral democracy into the realities of genuine accountability of the governors to the governed. Radio, television, world-wide satellite communications, the Internet, podcasts, blogs and so forth have revolutionised the distribution of information about those persons and institutions whose decisions affect the regulation of our daily lives. In this sense, democratic governance has moved from small town hall assemblies of earlier times into huge national and international forums both public and private.

Paradoxically, however, the very quantity of technological information today has resulted in its manipulation and presentation in ways that are often antithetical to real democratic accountability. The technology stimulates a demand for the simplification and visualisation of messages, the personalisation of issues, the trivialisation of conflict, the confusion between fact and opinion and the centralisation and "management" of news. So-called 'spin' and 'infotainment' are characteristics of the present age. They tend to concentrate power in a way that even George Orwell could not have imagined. This energy technology conference was mercifully free of these deficiencies. However, another deficiency was certainly

present in abundance. I refer to the complexity of the basic science and the technological controversies addressed by the scientists and technologists. The participants could speak with each other. Even then, those whose training was in physics confessed to understanding only part of the discourse of the energy chemists. In relation to such exchanges, the intelligent layperson was often left out in the cold.

Moreover, the effective incorporation of regulation in the technology itself, and the way it is rolled out, going beyond what is strictly required by local law deny effective opportunities for those affected to challenge the regulation so imposed. Who can, or would, challenge the over-inclusive software designed to bar access to Internet sites selected as "harmful to minors" but sometimes operating in an over-inclusive way?

Once, when I was serving in the High Court of Australia, I found that the website of the Archbishop of Canterbury was barred to use! My staff were unable to procure one of the Archbishop's addresses. This was presumably because an internet filter, instituted to deny access to websites deemed undesirable, had erected a bar. Presumably, this was because, in the manner of these times, one or more of the Archbishop’s addresses dealt with issues of sex, specifically homosexuality. In fact, that was exactly why I wanted the nominated speech. I was surprised to find that at the same time the Vatican website was accessible without any restriction. This

may say something either about the prudence of the Pope's choice of language, his discomfort with candid discussion of sex, the power of the Roman Catholic Church in such matters or the religion of the filter programmer. I gave directions that led to the filter being over-ridden and duly secured copy of the desired speech. Others might not have been so lucky.

Given the importance of technology generally to the current age, how do we render those who design, install and enforce such programmes accountable to the democratic values of our society? As information technology, such as 'Code', enlarges and replaces the old style legal regulation of technology, how do we render its architects answerable to the majority views of the people? How, if at all, are transnational corporations, like Sony or Esso or BP or Shell for instance, rendered responsible to the democratic values of the nations in which their products are used? How do we render the inescapably complex discourse of energy scientist and technologists – and their large implications for peace, justice, economic advancement and human rights understandable to democratic legislations, the officials who advise them, the judges who supervise them and, especially, the citizens who elect them?

These are legitimate questions because the fourth paradox is the coincidence, at the one time of history, of technologies that took notions of freedom over the Berlin Wall and the energy technologies that may promise an end to poverty and inequality in our world

sometimes diminish genuine debate, enlarge unreviewable 'technological' and corporate decisions and expand the potential of relatively few decision-makers to 'manage' news in a way inconsistent with real transparency and accountability of decision-making to the people most affected.

5. *Vital but neglected topics:* I reach my fifth, and final, paradox. This is one of the most important issues for the future health of the rule of law in every country. Because of the elusiveness of much contemporary technology to effective regulation, large and increasing areas of activity in society find themselves beyond the traditional reach of law as we have hitherto known it. When regulation is attempted, as I have shown, it will often be quickly rendered ineffective because the target of the law has already shifted. Typically, in the past, the drawing up laws has been a slow and painstaking process. Consulting governments and those primarily affected, not to say the people more generally, takes much time. In that time, the technology may itself change, as I have demonstrated from my experience in the design of human tissue transplantation and privacy laws. Now new forms of regulation are being developed in the form of what Professor Lessig calls 'Code'. Yet this form of regulation is not so readily susceptible, if susceptible at all, as conventional laws have been, to democratic values and to the participation (or even appreciation) of most of those affected in the moral choices that determine the point at which the regulation is pitched.

It sometimes falls to small groups, particularly in professions, to lead the way and to bring enlightenment to the many. This, then, is the fifth paradox - at least it is an oddity. Such an important topic as the regulation of burgeoning technologies in modern society should engage the interest and attention of all who claim to be lawyers, sociologists and philosophers and express an interest in the health of the rule of law. Yet, for the moment, and for most such observers, this is *terra incognita*. The contributions at the Lord Howe Island conference suggest that it will, and should, not be so for long.

SEVEN LESSONS

1. *Recognise a basic dilemma*: Certain general lessons stand out from the presentations at the Lord Howe Island conference. Some of them have already been touched on.

The first is that the regulation of technology faces a fundamental dilemma, hitherto uncommon in the law. This is that, of its character, technology is normally global. Law, being the command of an organised community is traditionally tied to a particular geographical jurisdiction. Whereas in recent years the need for extra-territorial operation of municipal law has been recognised, and upheld[33], the fact remains that the focus of most national law is the

[33] *Re Aird; Ex parte Alpert* (2004) 220 CLR 308 at 344-350 [114]-[133]; [2004] HCA 44, referring to the case of the *SS "Lotus*" (1927) Permanent Court of International Justice, Series A, No 10, Judgment No 9, pp 18-19 and J Martinez, "Towards an International Judicial System", 56 *Stanford Law Review* 429 (2003).

territory of the nation. By way of contrast, the focus of regulating technology must be the technology itself[34]. Sometimes, that feature of the technology will make effective regulation by national law difficult, or even impossible.

It is into this context that direct enforcement of certain laws by 'Code', written into software programmes or otherwise imposed, adds a new dimension to global technology. The values and objectives of transnational corporations may be even more unresponsive to national regulation than the rules of municipal legal system are. Moreover, 'Code' of this kind may opt for caution and over-inclusion so as to avoid dangers to markets in the least right-respecting countries.

The contractual arrangements entered between the government of the People's Republic of China and the corporations selling access to *Yahoo* and *Google* in China illustrated the willingness of the latter to succumb to the demands of the former so as to avoid endangering a lucrative economic market for their products. In this way the provider, but also the users, are subjected to forms of censorship that might not be tolerated in other societies. A smaller country, with a smaller market, is unlikely to exert the same clout. Considerations of economics rather than of legal principle, ethical rules or democratic values may come to predominate in such cases

[34] *Dow Jones* (2002) 210 CLR 575 at 615-619 [78]-[92].

and especially in respect of energy technology, with its distinctive transnational features and needs.

2. *Recognise that inaction is a decision*: In the past, proponents of technological innovation have often favoured containment of law and a generally 'libertarian' approach to developments of technology. Yet most lawyers recognise that there are limits. Unless such limits are clearly expressed, and upheld in an effective way, the absence of regulation will mean, effectively, that the society in question has effectively made a decision to permit the technological advances to occur, without democratic and leg impediments.

Those who are hesitant about adopting any form of the precautionary principle may nonetheless recognise the need for some restraints. Thus, unlimited access to child pornography will probably offend most people and sustain the need for regulation of the Internet to prohibit, or restrict, access to such sites. However, that will still leave room for debate about the detailed content of the regulation: the age of the subjects depicted; any permissible (computer graphic rather than human) images; the means of enforcing the law; and the provision of effective sanctions[35]. Cases on these issues, and on any constitutional questions that they present, are now quite common[36].

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[35] *Bounds v The Queen* (2006) 228 ALR 190 at 197 [26], 211 [94]; ([2006] HCA 39).

[36] *The Queen v Fellows and Arnold* [1997] 2 All ER 548; *The Queen v Oliver* [2003] 1 Cr App R 28 at 466-467 [10]; cf *Lawrence v Texas* 539 US 558 at 590 (2003).

Likewise biotechnology. Views may differ over whether regulation is necessary, or even desirable, to prohibit therapeutic cloning, reproductive cloning or the use of human embryonic stem cells. Yet non-binding prohibitory resolutions and declarations have been adopted in the organs of the United Nations on this subject[37]. Even those nations, like the United Kingdom, that have not favoured prohibitions or moratoriums on experiments with human cloning for therapeutic purposes might well accept the need to prohibit, or restrict, some bio-technological experiments. Hybridisation and xeno-transplantation of tissue across species clearly require, at the very least, restrictions and safeguards so as to prevent cross-species transmission of endogenous viruses. To do nothing is therefore effectively to decide that nothing should be done. It does not necessarily amount to a decision to 'wait and see'.

Nuclear energy obviously requires strict regulation because of the risks inherent in the technology itself and in the site and vulnerability to nature and man-made disasters having a huge potential for human life and well-being. A hydro-electrical development may have significant environmental and cultural hazards. A huge oil spill, occasioned by the search for ever more remote sources of fossil fuels, will necessitate national and international regulation.

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[37] K L Macintosh, "Human Clones and International Human Rights" (2005) 7 *University of Technology, Sydney Review* 134 at 135-136 describing the resolution of the General Assembly of the United Nations of 8 March 2005. This approved a Declaration, proposed by the Sixth Committee, to "prohibit all forms of human cloning inasmuch as they are incompatible with human dignity and the protection of human life". The General Assembly vote was 84 to 34 in favour with 37 abstentions.

This is why the regulation of technology is such an important topic. It is not a subject that can be ignored, simply because the subject matter, and the available regulatory techniques, is difficult, uncertain and controversial.

3. *Recognise the limited power to regulate*: A third lesson, derived from the first two, is that the normal organs of legal regulation often appear powerless in the face of new technology. This is clear in the case of attempts to regulate new information technology. So far as the Internet is concerned, the regulatory values of the United States inevitably exert the greatest influence on the way the Internet operates and what it may include. This means that both First Amendment and copyright protection values, established by the law of the United States, profoundly influence the Internet's present design and operation. An attempt by another nation's laws (such as those of France) to prohibit transnational publication offensive to that country's values (such as advertising Nazi memorabilia) may face difficulties of acceptance and enforcement in the Internet[38].

The same is true of biotechnology. The Australian Parliament initially enacted the *Prohibition of Human Cloning Act* 2002 (Cth) and the *Research Involving Human Embryos Act* 2002 (Cth). These were part of a package of laws aimed at the consistent prohibition in

[38] *League Against Racism and Anti-Semitism (LICRA), French Union of Jewish Students, v Yahoo! Inc. (USA), Yahoo France* [2--1] *Electronic Business Law Reports*, 1(3) 110-120 (The County Court of Paris).

Australia of human cloning and other practices deemed unacceptable at the time. Both Acts were adopted on the basis of the promise of an independent review two years after the enactment. Such a review was duly established. It was chaired by a retired federal judge, the Hon John Lockhart. The review presented its report on December 2005. It recommended an end to the strict prohibitions of the 2002 legislation; the redefinition for legal purposes of the "human embryo"; and the introduction of a system of licensing for the creation of embryos for use for therapeutic purposes[39].

Initially, the Australian government rejected the recommendations of the Lockhart review. However, following political, scientific and media reaction, a conscience vote on an amending Act, introduced by a previous Health Minister, was allowed. In the outcome, the amendments were enacted. They passed the Senate with only a tiny majority[40].

The main arguments that promoted this outcome in Australia were the recognition of the pluralistic nature of the society; the availability of widespread reports on the potential utility of the research and experimentation; and the expressed conviction that experimentation would proceed in overseas countries with results that, if they proved

[39] Australian Government Legislation Review: *Prohibition of Human Cloning Act* 2002 and the *Research Involving Human Embryos Act* 2002, *Report*, Canberra, December 2005.

[40] In the Australian House of Representatives, the vote was 82:62. See *Commonwealth Parliamentary Debates (House of Representatives)*, 6 December 2006, 127. In the Senate the vote was 34:31. See *Commonwealth Parliamentary Debates (Senate)*, 7 November 2006, 48.

successful, would necessarily be adopted and utilised in Australia[41]. Interestingly, both the then Prime Minister and the then Leader of the Federal Opposition in Australia voted against the amending Act[42].

The global debates on the regulation of experiments using embryonic stem cells have often been driven by countries that, to put it politely, are not at the cutting edge of the applicable technology[43]. On the other hand, the United States has also often adopted a conservative position on these topics in United Nations forums. As happened in Australia, this may change in time.

4. *Recognise differentiating technologies*: So far as regulation of technologies is concerned, the Lord Howe Island conference established the need to differentiate technologies for the purpose of regulation. It is not a case of one response fits all. Self-evidently, some forms of technology are highly sensitive and urgently in need of regulation. Thus, unless the proliferation of nuclear weapons is effectively regulated, the massive destructive power that they present has the potential to render all other topics, including of

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41 See eg "Let the debate begin: Australia should lead, not lag, in regenerative medicine", *The Australian*, 7 August 2006, p 15 and B Finkel and L Cannold, "Day for Stem Cells and the Hope of Finding Cures", *Sydney Morning Herald,* 7 August 2006, p 9; L Skene and Ors, "A Greater Moralilty at Stake on the Decision of Stem-Cells Research", *Sydney Morning Herald,* 14 August 2006, 11; B Carr, "Age-Old Objections Must not be Allowed to Delay this Revolution", *Sydney Morning Herald,* 25 July 2006, 13.

42 Mr Howard spoke at *Commonwealth Parliamentary Debates (House of Representatives),* 6 December 2006, 117. Mr Rudd spoke, *ibid*, p 119.

43 Thus, Honduras was the national sponsor of the United Nations ban on human cloning, reproductive and therapeutic. See Macintosh (2005) 7 *University of Technology Sydney Law Review*, 134.

regulation, hypothetical. Similarly, some aspects of the regulation of biotechnology are sensitive, including the use of embryonic stem cells and germline modification. For some, the sensitivity derives from deep religious or other beliefs concerning the starting point of human existence. For others, it arises out of fears of irreversible experiments that go wrong.

Somewhat less sensitive is the regulation of information technology. Yet this technology too presents questions about values concerning which people may have strong differences of opinion. To outsiders, Americans seem to imbibe First Amendment values with their mother's milk. United States lawyers sometimes have to be reminded that their balance between free speech and other human rights is viewed in most of the world as extreme and disproportionate.

The regulation of energy technology may be less controversial still. However, as regulations are adopted, they will exert influence on national and regional tendencies to shift from one energy source to another. In such shifts, it cannot be expected that corporations selling current forms of energy will be altruistic over decisions that may profoundly affect national, corporate, local and individual interests. Such debates are the stuff of politics and cannot be expected to follow a course of plain sailing.

5. *Recognise different cultures*: Most of the participants in the Lord Howe Island conference came from the developed world. They therefore reflected general attitudes of optimism and confidence about the outcome of rational dialogue, scientific research, technological inventiveness and the capacity of human beings ultimately to arrive at reasonable responses to regulating technologies, on the basis of calm debate. However, as present energy sources are depleted and change, it cannot be expected that experts, investors and other citizens from developing countries will be quite so dispassionate.

6. *Basing regulation on good science*: In the early days of the HIV pandemic, I served on the Global Commission on AIDS of the World Health Organisation. One of the members, June Osborn, then a professor of public health in the University of Michigan, taught us all the importance of basing all regulatory responses to the epidemic upon good science. The danger of responses based on assumptions, religious dogmas, intuitive beliefs, perceived national self-interest or popular opinion were such that they would not address the target of regulation effectively.

The intervening decades have suggested that the countries that have been most successful in responding to HIV/AIDS have been those that have observed June Osborn's dictum[44]. The same is true

[44] D Plummer and L Irwin, "Grassroots activities, national initiatives and HIV prevention: Clues to explain Australia's dramatic early success in controlling the HIV epidemic", (2006) 17 *International Journal of STD and AIDS*, 1.

of the subjects of biotechnology, information technology and energy technology examined at the Lord Howe Island conference. All too often, science and technology shatter earlier assumptions and intuitions.

For example, the long-held judicial assumption that jurors, and judges themselves, may safely rest conclusions concerning the truth of witness testimony on the basis of the appearance of witnesses and courtroom demeanour has gradually evaporated because scientific experiments shatter this illusion[45]. One day, by subjecting witnesses to brain scans, it may be possible to demonstrate objectively the truthfulness or falsity of their evidence. If, and when, the day arrives, other issues will doubtless be presented for regulators. We are not there yet. But any regulation must recognise the need to remain constantly abreast of scientific knowledge and technological advances.

7. *Addressing the democratic deficit*: This brings me to the last, and most pervasive, of the lessons of the Lord Howe Island conference. Technology races ahead. Its innovations quickly become out of date. Laws addressed to a particular technology are overtaken and rendered irrelevant or even obstructive. Nowadays scientific knowledge, technological inventions and community values change radically in a very short space of time.

[45] See eg *Fox v Percy* (2003) 214 CLR 118 at 129 [31]; ([2003] HCA 22).

Within less than two years, demands were made for reversal to the Australian federal prohibition on therapeutic cloning. Within five years, the prohibition was repealed. In such an environment, there is an obvious danger for the rule of law. It is impossible to expect of legislatures, with their many responsibilities, that they will address all of the technological developments for regulatory purposes. The average legislator finds such issues complex and impenetrable. They are rarely political vote-winners. They struggle to find a place in the entertainment and personality politics of the present age as well as with the many other competing questions awaiting political decision-making. This leaves a gap in democratic involvement in this sphere of regulation. It is a gap that is being filled, in part, by 'Code' which incorporates regulations designed by inventors of information systems themselves in the structure of such systems but without a democratic input or the necessity of individual moral judgment.

The democratic deficit presented by contemporary technology is thus the largest potential lesson from the Lord Howe Island conference. In an age when technology is so important to society, yet so complex and fast moving that it often defies lay understanding, how can we adapt our accountable law-making institutions to keep pace with such changes? One means, ventured in Australia, is by the use of consultative mechanisms such as the ALRC[46] or independent inquiries, such as the Lockhart committee[47].

[46] D Chalmers, "Science, Medicine and Health in the Work of the Australian Law Reform Commission" in D Weisbrot and B Opeskin, *The Promise of Law Reform* (Federation Press, 2005), 374. Important recent

In such cases, the very process of consultation and public debate promotes a broad community understanding of the issues, an appreciation of the competing viewpoints and an acceptance of any regulations adopted, even when they may give effect to conclusions different from one's own.

Adapting the legislative timetable and machinery of regulating energy sources to the challenges of modern governance is a subject that has engaged law reform bodies and executive government for decades. In Australia, proposals for some form of delegated legislation have been made to increase the implementation of such reports. Often they lie unattended for years, or indefinitely, not because of any real objections to their proposals but because of the legislative logjam[48]. In the United Kingdom, suggestions for a fast track system for implementing reports of the Law Commissions have been under review for some time[49].

In the face of radically changing technologies and the danger of a growing democratic deficit, it will obviously be necessary to adapt and supplement the lawmaking processes we have hitherto followed

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reports of the ALRC in the field have included *Essentially Yours: The Regulation of Human Genetic Information in Australia* (ALRC 96, 2003).

47 D Cooper, "The Lockhart Review: Where Now for Australia?" (2006) 14 *Journal of Law and Medicine* 27; N Stobbs, "Lockhart Review into Human Cloning and Research Involving Human Embryo - Closing the Gap" (2006) 26 *Queensland Lawyer* 247; I Karpin, "The Uncanny Embryos: Legal Limits to Human Reproduction without Women" (2006) 28 *Sydney Law Review* 599.

48 A. F. Mason, "Law Reform in Australia" (1971) 4 *Federal Law Review* 197.

49 See M D Kirby, "Law reform and human rights - Scarman's great legacy" (2006) 26 *Legal Studies* 26, 449–474 at 466.

in most countries. Different types of delegated legislation may need to be considered. So may the enactment of over-arching laws, expressed in general terms, which will not be quickly reduced to irrelevancy by further technological change[50]. So may the adoption of international principles (such as the OECD Guidelines on Privacy) that prove so influential in helping individual countries to act on the needs for regulation. And to do so in a way that is broadly consistent with a common approach chosen internationally.

Addressing the weaknesses in democratic accountability of large and complex modern government is an important challenge to legal and political theory[51]. The Lord Howe Island conference demonstrated once again the particular ingredients and substantial urgency of the problem. It will take more conferences to provide the solutions appropriate to the differing systems of government operating in different countries. But the urgent need is for leadership in the United Nations to bring together all those working in the complementary and competing sources of future energy so that a global approach to the challenges may be adopted for the whole world. That approach should seek to minimise the risks to the biosphere and to the human species. It should seek to harmonise the national and transnational economic interests at stake. And it should help maximise the contribution that future energy sources

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[50] Issues considered in *R v Quintaralle (on behalf of Reproductive Ethics) v Human Fertilisation and Embryology Authority* [2005] UKHL 28 at [25]; cf R Brownsword, 'Interpretive Re-connection, the Reproductive Revolution and the Rule of law', unpublished, p 20f.

[51] *Ibid*.

may provide to reducing the toll of poverty on humanity, increasing the sustainable pace of economic and social development and protect the universal human rights of all human beings for all time into the future.

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