"CAPITALIZING ON THE WEALTH BURIED DEEP WITHIN LIVING MATTER,"[1] OR POLITICS AND PATENTS

by Jane Horsley

Intellectual property rights have become the mechanism of choice for "capitalizing on the wealth buried deep within living matter" by providing patents and copyrights in the products and processes of biotechnology. The most infamous of these developments was the U.S. Patent for the "Transgenic Mouse" - a mouse genetically engineered for a particular oncogene, "enabling it to get cancer on demand." That patent was granted in 1988, but the legal developments providing for such a patent had begun in the early 1980's in the United States, and have been influencing the development of Canadian law since that time. The legal recognition of intellectual property rights in biotechnology has become increasingly controversial. There have been several court challenges by the U.S. Foundation for Economic Trends to planned experiments involving release of genetically engineered organisms into the 'environment'. Public discussion and debate have followed the proposal and eventual adoption of a 'Plant Breeder's Rights' Bill here in Canada. The criticisms of biotechnology come from a wide variety of sources, and cover a range of concerns. These concerns include social and political issues such as the threat of agribusiness, unfairness and injustice in international development, and workplace safety.

There are also other, more abstract concerns about biotechnology as the latest manifestation of resourcism, as well as the concerns of so-called "biofundamentalists" about the possible moral, spiritual, and ecological implications of biotechnology. One U.N. official expressed a fear that "a bunch of patent lawyers were trying to rewrite Genesis."[2] Perhaps the national and international intellectual property lawyers are not trying to rewrite Genesis but rather trying to carry the part about "man's dominion" to its logical extension, to include the genetic basis of life as part of "man's dominion." Biotechnology, for many environmentalists, seems to represent the epitome of anthropocentric resourcism, of the view that "all of wild nature is a herd, a flock, a crop to be manipulated and controlled in the public, national and human interest."[3] This description seems particularly apt for so-called "molecular pharming,", in which universities and companies develop animals for medical research "that are genetically programmed to suffer."[4]

There are two different types of criticism, then, that have been raised against biotechnology -- anthropocentric ones, and non-anthropocentric (or at least not exclusively anthropocentric) ones. The former emphasize concerns about justice between humans, about the distribution and allocation of genetic resources. The latter emphasize concerns about relations between humans and nature, and about patenting organisms as an "affront to the sacred meaning of life."[5] It is important to situate the criticisms by providing an account of biotechnology and recent legal developments in this area.

Biotechnology refers to "techniques which involve the use and manipulation of living organisms and which can be commercially exploited."[6] Effectively, biotechnology consists of techniques that rely on living organisms as the means of production. Examples of biotechnology techniques include: cloning and fermentation, embryo transfer, cell fusion, and recombinant DNA technology, or genetic engineering. The most controversial experiments, and the ones which attract the most public scrutiny, have been the recombinant DNA ones. Examples of these experiments include: the attempt to transfer blue colouring from petunias into roses to produce blue coloured roses, the attempt to transfer fish genes into soybean varieties to produce increased cold tolerance, the introduction of human growth hormone into pigs to in-

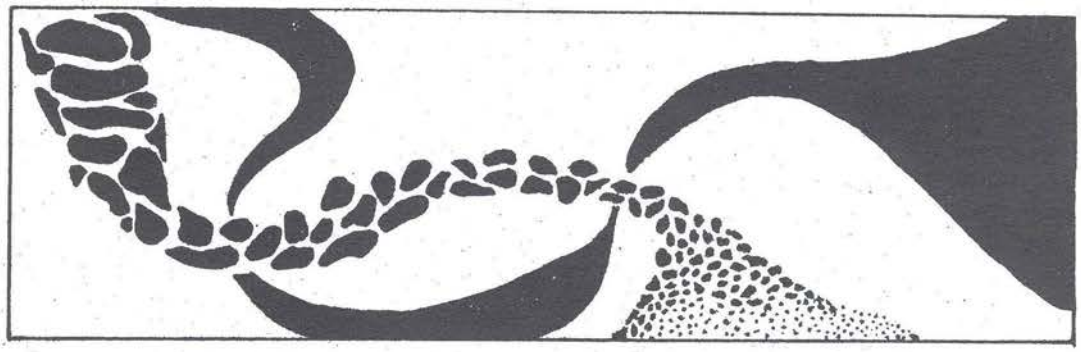
crease size which leads (unintentionally) to arthritis and immune system problems.[7] The technology has also been used in the attempt to transfer a hamster gene to a tobacco plant in order to produce plants that would remove heavy metals from soils,[8] and in the production of microbes designed to consume toxic waste products; both of which would be genetically engineered pollution control organisms. Cell fusion has been used to combine sheep and goat cells, producing a "geep" organism.

Property rights are entitlements to own, possess or dispose of objects characterized as property, and the obligations associated with such a right. Intellectual property law provides legal recognition for property rights to inventions, certain modifications of existing products, and 'products of the mind', or ideas. A patent is an exclusive right to exploit the subject matter of the patent for profit that is legally enforceable for a specified period of time against any unauthorized use by others. A patent is a monopoly -- it entitles the owner of the patent to monopolize the use of, and to profit from, an invention. Patents are intended to assist the progress of scientific and technological development by providing inventors with the prospect of exclusive property rights to exploit their inventions for a set period of time. Patents are meant to function as an incentive for the investment of time and money required by inventors to produce products.

The criteria that have to be met for a patent to be granted are as follows: the invention must be new (not known, disclosed, or used before); it must involve a genuine inventive step (it cannot be obvious to those with ordinary skill in the field in question); and it must be useful, which means in effect that it must be recognized or perceived to embody some economic potential. In addition, the invention must fall within a defined class of patentable subject matter. This is one place where controversy has arisen about biotechnology.

Genes are products of nature, and patents cannot be granted for 'mere' products of nature. An inventor cannot receive a patent for something already in the public domain, such as things that simply occur in nature. It is necessary that there have been an alteration of nature for there to be an invention. Yet, what is to constitute an appropriate alteration is continually being decided by the patent offices and courts. If a gene has been isolated and purified, and a use characterized, then a patent can now be granted under U.S. law, and probably soon under Canadian law as well. Recently, the U.S. Federal Government, specifically the National Institute of Health, has submitted applications to the U.S. Patent Office for patents on hundreds of human genes, genes which are currently being mapped as part of the Human Genome Project.[9] The U.S. Government scientists on the Genome Project have yet to discover uses for the genes they want to patent, because they don't even know yet what role is played by these genes that they have simply located. Still, they are rushing ahead on the patent applications, because of fears of losing the 'race'.

There are almost two hundred animal patent applications awaiting processing in the United States Patent and Trademark Office, which had temporarily stopped granting animal patents but has recently resumed the practice.[10] The first animal patent in the world was given to Harvard University researchers for a gene which predisposes the carrier mouse to develop cancer. Other animal patent "inventions" awaiting patents are genetically engineered mice which develop AIDS, leukemia, something akin to Alzheimer's disease, or an enlarged prostate. There are also applications for genetically altered pigs "that produce human hemoglobin for use in blood substitutes," and for a transgenic bull which sires cows "whose milk contains lactoferin, a protein unique to human mother's milk that inhibits bacteria growth and helps a baby retain iron."[11] The most recent development of biotechnology involves the genetic alteration of pigs so that their organs can be transplanted into humans without being rejected by the human immune system.[12]



The United States Supreme Court effectively paved the way for these kind of patent applications in the 1980 decision of *Diamond v. Chakrabarty*. In that decision the court had to decide whether an invention should continue to be excluded from patentability

simply because it consisted of living organisms. Chakrabarty invented a process to transfer oil degrading plasmids into bacteria, and then applied for a patent on the process and the altered bacteria.[13] Chakrabarty's discovery amounted to a "pollution eating" organism.

Prior to that case, there had been a longstanding doctrine in intellectual property law that lifeforms and living matter were not patentable. The U.S. had passed a special law, the Plant Patent Act, in 1930, to provide monopolies for asexually produced fruits, trees and ornamentals.[14] Other than plants, no living matter was deemed patentable until the Supreme Court decided in the Chakrabarty case that the Congress intended patentable subject matter to include "anything under the sun that is made by man."[15] In Canada, the patent office had continued until recently to maintain the distinction between lifeforms (non-patentable) and non living matter (patentable).[16] New developments in biotechnology which are now deemed to be patentable include yeasts, molds, fungi, bacteria, algae, viruses, germ plasm, cell lines, seed lineages, microbes and microorganisms.

Given that patents are supposed to be rewards for 'useful' products, and thus presumably to be 'beneficial' for society, it is surprising that they are difficult to justify, even on economic grounds. In 1960, Canada's Isley Royal Commission found that there is no economic evidence that the patent system is justifiable, and then advised against the extension of patents to plants[17] (as had been done in the United States). The economic rationale for patents is that patents are meant to provide incentives for invention. Yet, before the Supreme Court even decided the Chakrabarty case there were many biotechnology researchers and corporations working on other genetic engineering products. These products were being developed without any assurance of economic reward in the form of biotechnology patents.

The argument that patents should be granted to reward 'business as usual' assumes that 'business as usual' is fine. This assumption is not accepted by many of the critics of biotechnology, particularly those critics whose objections are motivated by political economy issues. It seems clear that biotechnology patents will be favoured by big business - more than half of all patents (60%) of any kind are granted to corporations, and the rates of involvement by corporations in biotechnology research will mean that the proportion will be even higher for biotechnology patents. Chakrabarty was working with General Electric when he applied for the bacterium patent, and Du Pont was involved with Harvard's application for the Transgenic Mouse patent. In Canada, about 95% of patents are granted to what are known as foreign applicants (companies that are not Canadian owned). This is no less likely to be the case in the biotechnology field.

The main area of industry in which critics fear the effects of biotechnology and related intellectual property protection is in the area of agriculture. There are two related problems: the decline of diversity, and the production of varieties designed to serve the interests of corporations rather than the needs of the public. The development of *pesticide* resistant plants rather than *pest* resistant plants is an example of the latter. The former problem, the concern for diversity, is related to the feasibility of sustainable agriculture. The argument is often made that intellectual property protection for agricultural biotechnology will bring "innova-

tion and creativity to plant breeding rather than uniformity and chemical dependence."[18] Many critics argue that this is simply a myth. Sustainable agriculture would be better promoted, critics say, by "land reform, support for regional autonomy and democracy, policies that strengthen local markets, removal of subsidies that favor global markets, and a willingness to learn from non-industrial people(s)" than by biotechnology, which requires a complex industrial infrastructure.[19]

Pat Mooney points out that ninety-five percent of human nutrition is derived from only thirty plants, and that three crops alone account for over seventy-five percent of human cereal consumption.[20] The

interdependence of food sources and supplies means that protecting diversity is crucial. If monoculture is increasingly the way of agricultural production, then increasing vulnerability to pests and diseases is unavoidable. The limited genetic base of the products controlled by multinational agribusiness corporations provides little chance for pest and disease resistance. New material is always needed to respond to "constantly mutating pests and pathogens."[21] It is important to preserve as many strains, seed lines, and varieties as possible. Subsistence farmers in nonindustrialized regions of the world have been cultivating crops for thousands of years, and have developed a remarkable range of crop variability.[22]

The distribution of resources and rewards between gene poor, industrialized countries, and gene rich, non-industrialized countries, is also a source of concern for critics of biotechnology. It is to be manifestly unfair that "developing countries have been required to pay royalties" on intellectual property rights for "varieties, the germplasm of which originated within their own boundaries."[23] Multinational corporations based in industrialized countries obtain germplasm from non-industrialized countries for free, or next to free, and then charge those same countries for the resulting products. Genetic and cultural information is extracted from the 'Third World' and then processed in the academic and corporate laboratories of the industrialized countries. Scientists collect the information as if it was the common heritage of humanity, but then use it to produce new commodities for private profit from the value added.[24] There is no recognition that value already exists in the materials collected. The legal protection of those materials is also important for preserving genetic and cultural diversity.

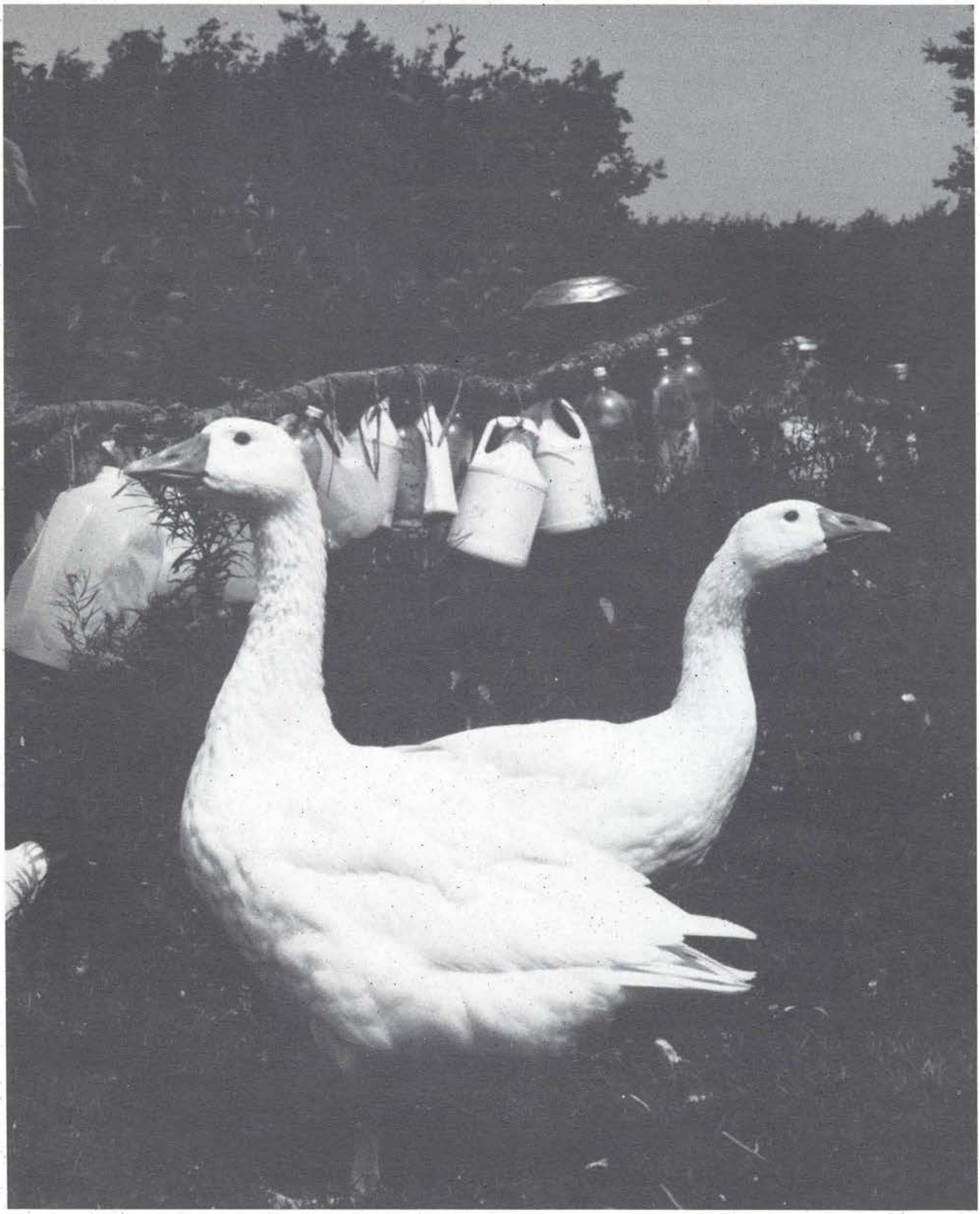
The need to address the injustice in the current system has led some people to argue for the adoption and assertion of intellectual property rights by native peoples in non-industrialized countries. The objective of claiming intellectual property rights would be to obtain some kind of "just compensation for indigenous knowledge,"[25] or some kind of compensation for peoples in tropical countries for the use of their plant genetic resources. This kind of proposal is aimed at ameliorating some of the injustice resulting from the present international distribution of resources, not at drastically altering it. It suggests extending the pool of recipients of intellectual property rights, but even that is likely to be strongly resisted by the beneficiaries of the current system.

The complaints about intellectual property rights in biotechnology that have been discussed thus far all address the political and economic conseqences. Another related concern is the risk factor. The full risks of genetic engineering, and especially of the release of genetically engineered organisms into the environment, are not known. Perhaps these risks could never be known. For environmentalists, this suggests a reason for caution, at the very least. The government in Ontario has evidenced concern about workplace safety issues involving biotechnology, and has recognized the need for regulation and public accountability in this area.[26] Yet, there are many, many unanswered and even unanswerable questions about current research and its long term effects.

The criticisms that have been discussed thus far all fall into the anthropocentric type of concerns about biotechnology, which are also resourcist. These anthropocentric concerns are quite consistent with the assumption "that society has the *right* to develop, exploit and control the environment, subject only to the *restrictions* and *regulations* that are imposed on the most unacceptable activity."[27] There is a common thread underlying these criticisms. That thread is that the problems with biotechnology have to do with *which* humans get to exploit nature, *when* they get to exploit nature, and for *whose benefit*. These concerns do not call into question the fundamental resourcism of biotechnology.

There is another critical perspective from which to register concern about biotechnology and patenting life forms -- one opposed to resourcism. From this alternative perspective, it is not sufficient to focus on the political economy of biotechnology -- the question of which humans get to exploit nature, when, and for whom. This perspective has been articulated by humanists environmentalists who have both been labelled by the popular press as"biofundamentalists."[28] The biofundamentalists have expressed concern about the potential ecological, moral, and spiritual consequences of genetic engineering. There are really two different strands of criticism which are lumped together under the same label. One of these is a version of anthropocentrism represented by humanists who primarily object to the application of genetic engineering to humans. The other is non-anthropocentric and represented by animal rights activists and some environmentalists.

Humanists are concerned about the disregard for the special status of humans, about the spiritual implications of the increasing commercialization of life. These critics claim that awarding property rights in biotechnology constitutes endorsement and encouragement of genetic engineering. This, they contend, is lamentable because it contributes to the increasing commercialization of life, and ultimately results in humans 'playing God' with evolution. Mechanisms that operate at the cellular level are identical in human and non-human organisms. Thus, if biotechnology patents are obtained for genetic material in animals, there is no reason not to obtain them for genetic mate-



rial in humans. Humanists fear that the commercialization of plant and animal life will initiate some slippery slope toward the commercialization of human life.

These critics would point to the recent applications by the U.S. Government for patents on genes located by researchers for the Human Genome Project as substantiation for their fears. Some of these critics may not object to biotechnology patents if genetic material from humans could not be patentable subject matter. Others of these critics may object to any biotechnology patents on genetic material, whether human or non-human, on the grounds that all life is sacred.

There are two different ways to characterize environmentalism -- an anthropocentric one and a non-anthropocentric one.[29] The anthropocentric, or human-interest oriented version, would identify concerns with biotechnology which would be significantly similar to those listed above. Thus, on one approach to environmentalism the problems with intellectual property in biotechnology include the threat to food crop diversity; the lack of recognition of, and renumeration for, indigenous knowledge; and the threat to worker safety and public health. Yet, to focus on these aspects of biotechnology, particularly under the guise of "environmentalism" is to perpetuate the dilemma that "environmentalism in its modern incarnation is not about nature but about people controlling nature."[30] Evernden points out where this trend leads: "[r]ather than defend wilderness, the new environmentalist defends the genetic diversity in wilderness which humans may someday need for the production of new crops."[31] Of course, it is precisely the concern for genetic diversity in human food sources that provides the impetus for the type of criticism discussed above.

The problem with this version of environmentalist discourse is what gets left out - namely, the concern for nature, for nature preservation, and for what has been called the "liberation of nature."[32] There have not been many attempts made yet to articulate a specific critique of biotechnology from the non-anthropocentric environmentalist perspective. It is only possible here to suggest what kind of approach would arise from such a perspective. One source of criticism derives from a general critique of the effects of technology. In many ways, this may be the most significant source of concern about biotechnology, yet it is the most difficult to articulate.

Biotechnology is simply an instance of technology; it is but one more example of the "dynamism of technology," the attempt to exert mastery over chance by exerting mastery over nature.[33] The concern of biofundamentalists is that biotechnology represents a stance towards nature that conceives of nature as mere 'standing reserve'. Intellectual property rights simply entrench the resourcist perspective, that all of nature exists as material for human 'invention' and 'use'. Further, biotechnology does not simply subject non-human nature to mastery. All of nature, human and non-human, is part of the same system of domination and exploitation. The "social construction of nature"[34] which underlies biotechnology is premised on the notion that nature, human and non-human, can be altered at will. The question needs to be asked, how is nature to be constructed and what kind of relationship between humans and non-humans does that construction represent.

The provision of intellectual property rights in biotechnology - as seen most acutely in the U.S. Government Human Genome patent applications and numerous animal patent applications - is but the most recent manifestation of the tendency to claim as human invention anything resulting from selection and breeding, or even simply from recognition of natural processes. Not just to claim them as inventions, but to attempt to profit from them at the expense of other humans and of non-human nature. If one thinks that all of nature, from the gene on up, is simply a source of resources for human use, then the problem with intellectual property rights in biotechnology is the distribution of ownership in those resources. The question then is: in whose interests is nature to be altered.[35] The problem with intellectual property rights in biotechnology from the perspective of anthropocentric resourcism is the system within which those property rights are granted.

The problem, however, from the perspective of non-anthropocentric, anti-resourcism is the construction of nature within which those property rights are granted. For this kind of environmentalism, it is difficult to imagine anything that is more exploitative of, or disrespectful to the integrity of, non-human beings than a patent on a genetic line producing cancer, or AIDS on demand in mice. So, what constitutes the injustice or the wrong in animal patents? The genetic engineering of the mouse in the first place, or the subsequent monopoly enabling the 'inventor' to profit from, and exclude others from, the use of the 'product'? There are two very different ways to answer this question, depending upon the position from which one asks it, or the context within which one situates it.

Notes:

1. This is the title of an article by John Woodley in the **Canadian Intellectual Property Review**, 2:1 (1985), p. 128.

2. Quote attributed to Food and Agriculture Organization Director of Forestry Dr. L.E. Huguet by Pat Roy Mooney, in"Genes, Seeds, Crops, and Patents and Politics," **Ecoforum**, 9:5 (1984), p. 1.

3. John Livingston, **The Fallacy of Wildlife Conservation** (Toronto: McClelland and Stewart, 1981), p. 26.

4. "U.S. Resumes Granting Patents on Genetically Altered Animals," **New York Times**, February 3, 1993, p. C5.

5. Jeremy Rifkin, **New York Times**, February 3, 1993, p. C5.

6. Cary Fowler, Eva Lachkovics, Pat Mooney, and Hope Shand, **The Laws of Life: Another Development and the New Biotechnologies**, Development Dialogue Numbers 1-2 (Uppsala: Daghammarskjold Foundation, 1988), p. 32.

7. Ibid., p. 43.

8. "Hamsters could help health," **Times-Colonist**, Sunday October 14, 1990, p. A6.

9. **New York Times** front page, October 21, 1992.

10. **New York Times**, February 3, 1993, p. 1.

11. **New York Times**, February 3, 1993, p. C5.

12. Ibid, p. 1.

13. See Monroe Price, "Re-Examining Intellectual Property Concepts: A Glimpse Into the Future Through the Prism of Charkrabarty," **Cardozo Arts and Entertainment Law Journal**, 6:2 (1988), p. 443. Also see Scott Rayson, "The Patentability of Living Matter: Hey Waiter, What's Chakrabarty's *Pseudomonas* Bacterium Doing Back in the Supreme Court's Soup?" **Washington and Lee Law Review**, 37 (1980), p. 183.

14. Interestingly, potatoes and other asexually produced vegetables were originally excluded, although they were later included under the **Plant Variety Protection Act** passed in 1970.

15. See U.S. Supreme Court case: **Diamond v. Chakrabarty**, p 447 U.S. 303 (1980).

16. See Eli McKhool, "Lifeform Patentability Advisory Committee Presentation," **Canadian Intellectual Property Review**, Volume 2:1 (1985), p. 121; and Anthony Creber and Eli McKhool, "Recent Developments in Protecting Plants and Seeds Under the Canadian Patent Act," **Canadian Intellectual Property Review**, 3:1(1985), p. 28.

17. Fowler et al., **Laws of Life**, p. 252.

18. Pat Roy Mooney, **Seeds of the Earth: A Public or Private Resource?** (Ottawa: Canadian Council for International Co-operation, 1979), p. 103.

19. Martha Crouch, "Is Biotechnology Compatible with Sustainable Agriculture?" **AG Bioethics Forum**, Iowa State University, 4:1 (June 1992), p. 6. It is interesting to note that Dr. Crouch previously was involved in biotechnology research, and had her own lab where she trained students to work in the biotechnology industry. She has since become a prominent critic of agricultural biotechnology.

20. Mooney, **Seeds of the Earth**, p. 3.

21. Ibid., p. 7.

22. See chart and discussion in Mooney, **Seeds of the Earth**, pp. 5-6.

23. Mooney, "Genes, Seeds, Crops, and Patents and Politics," p. 1.

24. See Jack Kloppenburg Jr., "No Hunting!" **Cultural Survival**, 15:3 (Summer 1991), p. 14.

25. Darrell Posey, "Intellectual Property Rights and Just Compensation for Indigenous Knowledge," **Anthropology Today**, 6:4 (August 1990), p. 13; and Darrell Posey, "Effecting International Change," **Cultural Survival**, 15:3 (Summer 1991), p. 29.

26. Government of Ontario Green Paper, **Biotechnology in Ontario - Growing Safely**, (September 1989). See Jane Rissler and Margaret Mellon, "Public Access to Biotechnology Applications," **Natural Resources and Environment**, 4:3 (Winter 1990), p. 29, for discussion of the problems obtaining information to ensure public accountability.

27. Paul Emond, "Cooperation in Nature: A New Foundation for Environmental Law," **Osgoode Hall Law Journal**, 22 (1984), p. 332.

28. Jeremy Rifkin, for example, has been called this in discussions of the legal actions he has undertaken with the Foundation for Economic Trends to stop certain biotechnology experiments and to protest the granting of patents to genetically engineered organisms.

29. This distinction is sometimes characterized as the difference between shallow ecology, or shallow environmentalism, and deep ecology. See Arne Naess, "The Shallow and the Deep, Long-Range Ecology Movement: A Summary," **Inquiry**, 95 (1973), p. 16.

30. Neil Evernden, "The Environmentalists' Dilemma", in **The Paradox of Environmentalism**, Symposium Proceedings published by the Faculty of Environmental Studies, York University, 1984, p. 13.

31. Ibid. p. 13.

32. This phrase is used by John Rodman in "The Liberation of Nature?," **Inquiry** 20, (1977), p. 83.

33. See George Grant, **Technology and Empire: Perspectives on North America** (Toronto: House of Anansi, 1969) and Jacques Ellul, **The Technological Society** (Trans. John Wilkinson) (New York: Vintage Books, 1964) for discussions of technique.

34. This is the title of a recent book by Neil Evernden, published in 1992 by John Hopkins Press.

35. See Donna Haraway, **Simians, Cyborgs, and Women: The Reinvention of Nature** (New York: Routledge, 1991), on the naturalization of race, sex, and class.

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