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## PERSPECTIVE ON CLONING

# Assembly-Line Life Begins With the Mouse



The meaning of life will change as an experiment produces mice that are the Model A Ford of the bioindustrial era.

By JEREMY RIFKIN

The announcement of the cloning of successive generations of a mouse represents a turning point in economic history. The University of Hawaii research team has, for the first time, successfully introduced bioindustrial design principles into the replication of complex living organisms, creating the prototype process for mass assembly line production of life. The coming together of recombinant DNA technology and the new cloning techniques allow life science companies both to customize genetic instructions into cells and to mass produce countless copies of an original organism—or its individual parts—using the same kind of engineering principles and quality controls that were used by entrepreneurs more than 100 years ago when they perfected the processes of mass production of industrial-based products.

It is now possible to conceive of a global life science economy in which the genetic, cellular and organismic properties of life are harnessed to the exacting standards of mass production. The life science companies understand that the cloning of a mouse opens the door to the kind of processes Henry Ford and others used so efficiently on the industrial assembly line. That's why venture capital is pouring into the new field of genetics. The speed of the commercial transition from petrochemical to genetic commerce is staggering. In the past 12 months alone, four of the giants of the industrial age—Monsanto, Novartis, Dupont and Hoechst

Chemical—have made the decision to shed part or all of their chemical divisions to concentrate on genetic research and genetic-based technologies and products, signaling the dawn of the new age of genetic commerce.

The life science companies hope to mass produce customized cloned animals for a range of commercial purposes, including medical research, the harvesting of organs for xeno-transplants and improved meat production. A number of companies are readying a new generation of cloned animals—"pharm" animals—that will have designer genes customized into their genetic makeup, allowing them to serve as chemical factories to produce cheap and abundant pharmaceutical and chemical products in their milk.

Lost in the hubbub of excitement over the mouse experiment is the potential commercial bonanza waiting for ProBio, the Australian biotech company that has the license for the new cloning technique. The company has applied for a patent, which likely includes not only the cloning process it pioneered, but also any cloned animals or cloned animal parts resulting from the cloning process.

Imagine an industrial company being granted a patent monopoly on the process of mass production itself as well as the thousands of industrial products produced by that process, and we begin to comprehend the breadth and scope of the cloned mouse experiments for the future of genetic commerce. No one has bothered to ask the question of whether such unprecedented commercial power—in the form of patents on the cloning technique and the living products—should be granted to a single enterprise, allowing it to dictate much of the commercial terms of the coming genetic age.

There are also troubling environmental and ethical questions that have yet to be raised. Will the cloning and mass production of a handful of commercial animal genotypes seriously weaken the already dangerously narrow genetic diversity of existing animal species and lead to the end of nature and the substitution of a laboratory conceived second genesis?

What about the rights of our fellow creatures and our responsibilities to them? Many of the scientists and life science companies conducting the cloning research have stated publicly that they see no moral problem in cloning, customizing, mass producing and commercially exploiting animals for use as chemical factories or for organ transplants and the like. Others, however, feel that it is wrong to transform our nearest relatives in the animal kingdom—the mammals—to mass-produced, assembly-line products, stripping them of any remaining intrinsic value, for the sake of short-term commercial gains.

While human society has had a long history of exploiting other animals, a new generation is beginning to search for a more humane relationship to the many creatures with whom we coexist on Earth. Their views need to be made an integral part of any ethical discussion around the cloning and mass commercial production of animals.

Lastly, we need to ask whether our children's generation will be well-served or ill-served growing up in a world where much of the rest of the animal kingdom is

reduced to patented inventions, cloned and mass produced, in part or whole, on bioindustrial assembly lines.

Recall that history is replete with examples of human beings using the rest of nature as a testing ground for rethinking and recasting human nature and society. Similarly, the current rush to design, patent, clone and mass-produce animals and animal parts may be a precursor of an even more ominous change in the way human beings are produced in the future.

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