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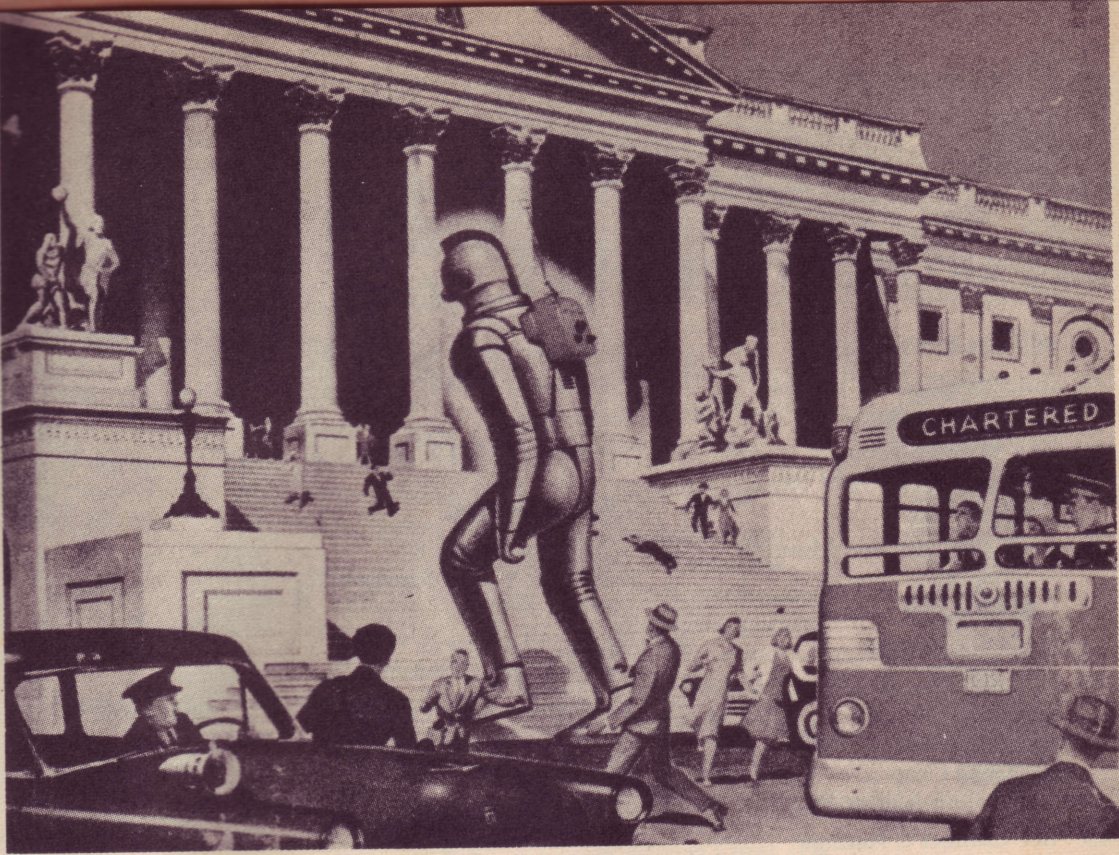
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THE RIGHTS OF ROBOTS

BY PHIL McNALLY AND SOHAIL INAYATULLAH

THE PREDICTABLE response to the question, "Should robots have rights?" has been one of disbelief. Those in government often question the intent or credibility of such research. Many futurists, too, especially those concerned with environmental or humanistic futures, react unfavorably. They assume that we are unaware of the second- and third-order effects of robotics — the potential economic dislocations, the strengthening of the world capitalist system, and the development of belief systems that view the human brain as only a special type of computer.

Why then, in the face of constant cynicism, should we pursue such a topic? We believe that the development of robots and their emerging rights are compelling issues which will significantly and dramatically affect not only the judicial and criminal justice system, but also the philosophical and political ideas that govern our societal institutions.

In the coming decades, and perhaps even within a few years, sophisticated thinking devices will be developed and installed in self-propelled casings which will be called "robots." Presently, robots are typically viewed as machines — as inanimate objects and, therefore, devoid of rights. Since robots have restricted mobility, must be artificially programmed for "thought," lack senses as well as the emotions associated with them, and most importantly cannot experience suffering or fear, it is argued that they lack the essential attributes to be considered "alive." However, the robot of tomorrow will undoubtedly have many of these characteristics and may perhaps become an intimate companion to its human counterpart.

We believe that robots will one day have rights. This will undoubtedly be a historically significant event. Such an extension of rights obviously presupposes a future that will be fundamentally different from the present. The expansion of rights to robots may promote a new appreciation of the interrelated rights and responsibilities of humans, machines and nature.

Phil McNally and Sohail Inayatullah are employed by the Hawaii Judiciary (and other public and private agencies) as strategic planners/futurists. They presented a heftier, more legally complete version of this report to the Hawaii Supreme Court. The full document and correspondence are available from them at P. O. Box 2650, Honolulu, HI 96804. —Kevin Kelly

With such an holistic extension of rights to all things in nature, from animals and trees to oceans, comes a renewed sense of responsibility, obligation and respect for all things. Certainly these concepts are foreign to the worldview of most of us today. The burden of this article is then to convince the reader that there is strong possibility that, within the next 25 to 50 years, robots will have rights.

Cultural Perspectives

Historically, humanity has developed ethnocentric and egocentric views of rights. Many notions of "rights" reflect the 16th-century views of Newton's clockwork universe and Descartes' rationality as well as the emerging Protestant ethic. The impact of such views upon thinkers of the Enlightenment like John Locke, Jean Jacques Rousseau and Thomas Hobbes was profound. In *Leviathan*, Hobbes vividly illustrated the problem of existence. For Hobbes, life without legal rights (as provided by governing institutions) was one of "continual fear, of violent death; with the life of man, solitary, poor, nasty, brutish and short."¹ With the development of Western capitalism and rationality, suddenly man assumed dominance over nature and replaced God as the center of the universe. Thus, natural rights of man became institutionalized, bureaucratized and formalized and, like legal systems, developed along rational lines so as to provide the necessary stability and predictability for the growth of market capitalism.

In addition, this Western capitalistic notion of governance led to the loss of individual efficacy as well as the elimination or subjugation of rights of nature, women, non-whites, and religious groups. For capitalism to thrive, for surplus to be appropriated, a division of capital, labor and resources must exist; that is, there must be capitalists who exploit and an underclass — the environment, the internal proletariat and the external colonies — which must be exploited. To provide an ideological justification of exploitation, it was necessary to perceive the exploited as the "other," as less than human, as less than the agents of dominance. Thus, nature, those in the colonies and the underclass within industrialized nations (women and the proletariat) had to be denied certain rights. The denial of rights for nature, in addition, found its ideological justification in Christianity and the classical Cartesian separation in Western thought between mind/body, self/environment and self/nature. Similarly and unfortunately, from our perspective, the possibility of robotic rights in the future is tied to the expansion of the world capitalist system. Robots will gain rights only insofar as such an event will lead to the further strengthening of the capitalist system. Most likely they will gain rights during a system crisis, when the system is threatened by anarchy and legal unpredictability — a condition that paradoxically may result from developments in artificial intelligence and robotics.

Other cultures, however, provide a different if not

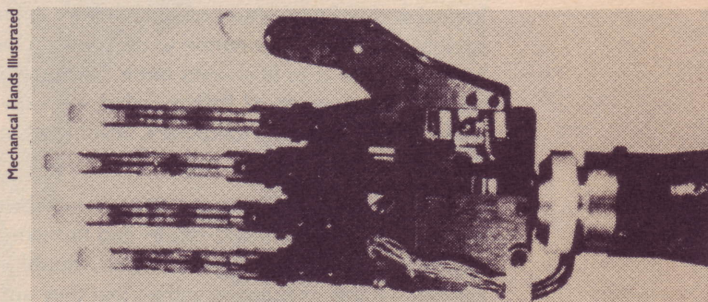
fresh perception of the meaning and purpose of rights that is in marked contrast to the historical and present Western position. For example, American Indian Jamake Highwater states in *The Primal Mind*, "whites are extremely devoted to limiting the rights of individuals and preventing anarchy, which is greatly feared in individualized cultures . . . by contrast the Indian, generally speaking, does not recognize the individual and therefore has not formulated strict regulations for its control."²

The Indian recognizes the collective. This collective is more than the aggregate of individuals in his tribe. It is rocks, trees, sacred grounds, animals — the universe itself. Thus, for the Indian, there exists a harmony between Nature and the individual; a relationship characterized by sharing, caring and gratitude, not dominance.

Chinese cultural attitudes toward the notion of rights also offer a decidedly different approach from that of the West. From this perspective, the legal norms of rights, established by man, are held as secondary to natural rights. Clarence Morris, in *The Justification of the Law*, argues that for the Chinese, harmony is more important than dominance. For example, "few Chinese scholars prize law in general or the imperial codes in particular: most of them hold that proper conduct is consonant with the cosmic order and therefore is determined not by law but by natural propriety."³

Morris continues in the vein of natural law noting that "we live in an unsuperstitious world — in which enforceable legal obligations (are) human artifices, and the laws of nature, in themselves, (do) not indicate where earthly rights (lie) — man inevitably (has given) up the primitive practice of prosecuting brutes and things. So beasts and trees no longer (have) any legal duties. *Westerners who gave up the conceit that nature had no legal duties also became convinced that nature has no legal rights.*"

Morris believes that nature should be a party to any case, not for man's purpose but for its purpose. Nature should have rights. "Nature should no longer be dislocated on whim or without forethought about the harm that may ensue; he who proposes dislocation should justify it before he starts." Certain authorities



Mechanical Hands Illustrated

In this all-electric mechanical hand, every finger has a motor and cooperative operation is possible. Ranges for fingers are 90° for thumb internal and external rotation, 90° for thumb grasping, and 180° for other fingers grasping. Fingers open and shut the same as human fingers.

should then be designated as nature's guardians in the same way that children who cannot represent themselves have guardians. In addition, Morris writes: "When legal rights are, by statute, conferred on feral beasts, green forests, outcroppings of stone, and sweet air, and when these legal rights are taken seriously, men will respect these duties in much the same way as they respect their other legal obligations."

Nature and Robots

This neo-humanistic type of thinking can and, we believe, should apply to robots as well. Eventually humans may see robots in their own right, not only as our mechanical slaves, not only as our products, as ours to buy and sell, but also entities in their own right. Of course, at present the notion of robots with rights is unthinkable, whether one argues from an "everything is alive" Eastern perspective or "only man is alive" Western perspective. Yet as Christopher Stone argues in *Should Trees Have Standing? — Toward Legal Rights for Natural Objects*, "throughout legal history, each successive extension of rights to some new entity has been, theretofore, a bit unthinkable. We are inclined to suppose the rightlessness of rightless 'things' to be a decree of Nature, not a legal convention acting in support of some status quo."⁴

Stone reminds us of the obvious but easily forgotten. Human history is the history of exclusion and power. Humans have defined numerous groups as less than human: slaves, women, the "other races," children and foreigners. These are the wretched who have been defined as stateless, as personless, as suspect, as rightless. This is the present realm of robotic rights.

The concept of extending rights to nature represents a dialectical return to a holistic sense of natural rights. Once a renewed respect for the rights of all things to exist is established, then an understanding of the legal dimensions of human-made creations, such as robots, can emerge.

As we enter a postindustrial, technology-driven society, we need to reassess our interconnected relationship with nature and machines as well as the notions of rights associated with this new relationship. Presently, the foundation of the American Constitution and the Bill of Rights "obviously reflects the technological and political issues of 18th-century English society . . . what we continue to do is restructure and reinterpret it to fit an ever more rapidly evolving technological society."⁵ Perhaps what we really need to do is to rewrite (or video) the Constitution in the light of future trends and issues.

The Constitution could be rewritten to include the rights of trees and streams, robots and humans. Of course, we are not arguing that robots should have the same rights as humans; rather, that they are seen as an integral part of the known universe. In addition, although we are not advocating the worship of technology, yet with "the genie of technology having been let out of the bottle and (as it) can't be

forced back in,"⁶ social planning for robots must be attempted.

Robot Technology

At the vanguard of computer technology is the development of artificial intelligence (AI) and the creation of living computer circuitry called "biochips." The development of AI requires the computer to make a jump in inference, a quantum leap over miscellaneous data, something a programmed machine has been unable to do. Literally, the computer must skip variables rather than measure each one. It is not quite a mirror of the human "Eureka!"; but similar.

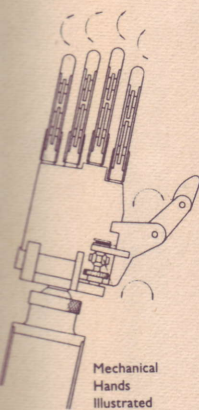
The development of living biochips will further blur the definition of a living machine. By synthesizing living bacteria, scientists have found a way to program the bacteria's genetic development to mimic the on-and-off switching of electronic circuitry. Many scientists currently feel silicon miniaturization has reached its limit because of the internal heat that the chips generate. The biochip is expected to greatly expand the capabilities of computerization by reaching the ultimate in miniaturization. Biochips will also have the unique ability to correct design flaws. Moreover, James McAlear of Gentronix Labs notes, "because proteins have the ability to assemble themselves the (organic) computer would more or less put itself together."⁷

In the creation of a living computer system "we are," according to Kevin Ulmer of The Genex Corporation, "making a computer from the very stuff of life." It is expected that eventually these systems will be so miniaturized that they may be planted in humans so as to regulate chemical and systemic imbalances. As these chips are used to operate mechanical arms, or negate brain or nerve damage, the issue of man-robots, cyborgs, will arise. The development of such organic computers is expected in the early 1990s. This new technological development will force a redefinition of our concept of life.

During this explosive era of high-tech innovation, contact between machines with artificial intelligence and humans will rapidly increase. Computer-intelligent devices, especially expert systems, are now making decisions in medicine, oil exploration, space travel, air traffic control, train conduction, and graphic design, to mention a few areas of impact.

The greatest attribute of an expert system is its infinite ability to store the most minute information and its tremendous speed at recalling and cross-referencing information to make instantaneous conclusions. The greatest drawback will be in convincing people to trust the computers' decisions. This mistrust, however, will be significantly reduced as robots in human form (voice, smell, sight, shape) — androids — are developed.

In deciding if computers can make experts' decisions, we must first delineate the attributes of an expert. Randall Davis of MIT provides the following defini-



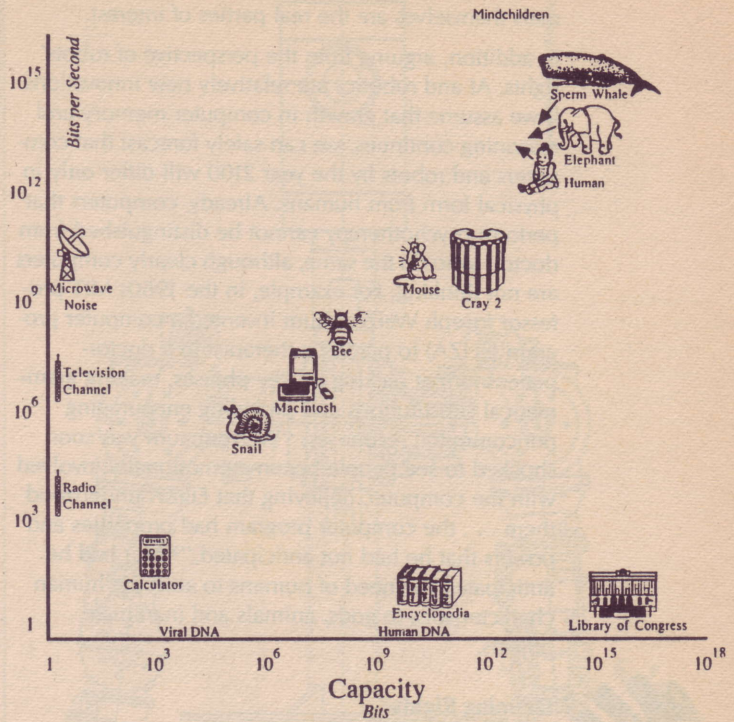
Mechanical Hands Illustrated

tion: "(1) they can solve problems; (2) they can explain results; (3) they can learn by experience; (4) they can restructure their knowledge; (5) they are able to break rules when necessary; (6) they can determine relevance; and (7) their performing degrades gracefully as they reach the limits of their knowledge." Presently computers are capable of achieving the first three stages but cannot reprogram themselves or break rules, a decidedly human trait.

Are Robots Alive?

AI enthusiasts seriously argue that not only do robots have the theoretical possibility of "life" but inevitably will be perceived as alive. It is only our anthropocentric worldview, our insistence that life must be judged strictly on human terms as evidenced, for instance, by the structural bias in our language, that prevents us from understanding the similarity of robots — now and in the future — to humans. Of course, there are numerous arguments against this perspective. From the Western religious view, Man's soul is given directly to God; robots are soulless, thus, dead and thereby rightless. From a humanistic perspective, only by the clever use of language — comparing our brains to robots' memories, and other reductionist arguments — can it be argued that robots are alive. Aliveness is flesh and bones, aliveness is blood. Thus, robots remain dead, complex machines that can be made to act and look like humans, but will always remain as robots, not humans. As in the case of B. F. Skinner's pigeons which were trained to hit a ping-pong ball back and forth, we should not be fooled to believe that they are really "playing" ping-pong.

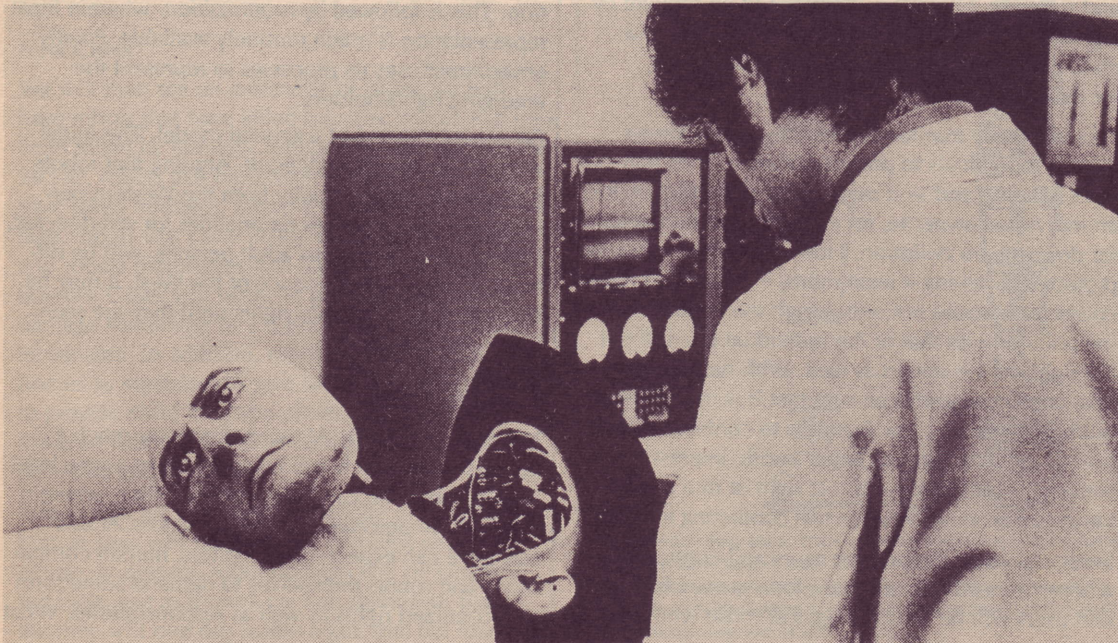
However compelling these arguments against robots-as-humans, they may lose some of their instinctive truth once computers and robots increasingly become



The intelligence of organisms, graphed as the intersection of their calculating speed versus capacity of information.

a part of our life, as we slowly renegotiate the boundaries between us and them. We have seen this with household pets, who certainly are perceived as having human traits and who have certain rights. Of course, the notion that dogs and cats have rights is contentious, since it can be argued that cruelty-to-animal statutes only confer a right on the human public, represented by the State, to have a culprit punished. Conversely, it can be argued that humans

Robots



Robots are mended at night in the laboratory in *Westworld*, a film depicting people living out their fantasies in a robot Disneyland.

are simply acting as agents of interest and that animals themselves are the real parties of interest.

In addition, arguing from the perspective of robots' rights, AI and robotics are relatively new innovations. If we assume that growth in computer memory and reasoning continues, we can safely forecast that computers and robots by the year 2100 will differ only in physical form from humans. Already, computers that perform psychotherapy cannot be distinguished from doctors who do the same, although clearly computers are not thinking. For example, in the 1960s MIT professor Joseph Weizenbaum invented a computer program (ELIZA) to parody a therapist in a doctor-patient format picking up key phrases, making grammatical substitutions and providing encouraging noncommittal responses. "Weizenbaum was soon shocked to see people become emotionally involved with the computer, believing that ELIZA understood them . . . the computer program had properties and powers that he had not anticipated."⁸ Nor had he anticipated the need of humans to attribute human characteristics to gods, animals and inanimate objects.

Defining Rights

According to Christopher Stone, for a thing to be a holder of legal rights, the following criteria must be satisfied: (1) the thing can institute legal actions *at its behest*; (2) that in determining the granting of legal relief, the Court must take *injury to it* into account; and the relief must run to the *benefit of it*. If these conditions are satisfied, then the thing counts jurally; it has legally recognized worth and dignity for its own sake.

For example, writes Stone, the action of an owner suing and collecting damages if his slave is beaten is quite different from the slave instituting legal actions himself, for his own recovery, because of his pain and suffering. Of course, a suit could be brought by a guardian in the subject's name in the case of a child or a robot, for the child's or robot's sake, for damages to it.

This is equally true for nature. We cannot always rely on individuals to protect nature, as they may not have standing and as it may not be cost-effective for an individual owner to, for example, sue for damages for downstream pollution. However, a stream may be protected by giving it legal rights. If nature had rights, courts then would not only weigh the concerns of the polluter with that of the individual plaintiff but the rights of the stream as well. With nature rightless, courts presently can rule that it is in the greater public interest to allow Business to continue pollution as Industry serves a larger public interest. "The stream," writes Stone, "is lost sight of in a quantitative compromise between two conflicting interests."

Similarly, we can anticipate cases and controversies where the needs of robot developers, manufacturers and users will be weighed against those who are

against robots (either because they have been injured by a robot, because of their religious perspectives or because of their labor interests). Judges will have to weigh the issues and decide between parties. But, unless robots themselves have rights, they will not be a party to the decision. They will not have standing. They will not be legally real.

Emergence of Rights

Neal Milner has developed a useful theory on the emergence of rights from a synthesis of literature on children's rights, women's rights, rights of the physically and mentally handicapped, rights to health, legal mobilization and legal socialization.⁹

His first stage in this theory is *imagery*. Here imagery stressing rationality of the potential rights-holder is necessary. From this perspective, the robot must be defined as a rational actor, an actor with intent. This, however, is only true from the Western perspective. From the Eastern perspective, previously outlined, rationality does not define life.

The next stage of rights emergence requires a justifying *ideology*. Ideologies justifying changes in imagery develop. These, according to Milner, include ideologies by agents of social control and those on the part of potential rights-holders or their representatives. These ideologies would be developed by scientists, science fiction writers, philosophers and perhaps even futurists. They would have to argue that robots are a legitimate category of life.

Stage Three is one of *changing authority patterns*. Here authority patterns of the institutions governing the emerging rights-holders begin to change. Milner next sees the development of "*social networks* that reinforce the new ideology and that form ties among potential clients, attorneys and intermediaries. We would see the emergence of support groups for robots with leading scientists joining political organizations. The next stage involves *access to legal representation*. This is followed by *routinization*, wherein legal representation is made routinely available. Finally *government* uses its processes to represent the emerging rights-holders.

Of course, this is just a general model. The initial step will be the most difficult. Arguing that robots have rationality, especially from the Western perspective which reserves rationalities for self-directed, individual, autonomous adult persons, will be difficult. Given the dominance of the West, it may be that robots will not gain rights until they are seen in the above manner.

Economic Issues

However, eventually AI technology may reach a genesis stage which will bring robots to a new level of awareness that can be considered alive, wherein they will be perceived as rational actors. At this stage, we can expect robot creators, human companions and robots themselves to demand some form of recognized rights as well as responsibilities. What



Mechanical
Hands
Illustrated

types of rights will be demanded? Basic human rights of life, friendship and caring? The right to reproduce? The right to self-programming (self-expression)? The right to be wrong? The right to intermarry with humans? The right to an income? The right to time off from the job? The right to a trial by its peers (computers)? The right to be recognized as a victim of crime? The right to protection from unwarranted search and seizure of its memory bank? The right to protection from cruel and unusual punishments such as the termination of its power supply?

In a potential world without work, some form of redistribution of wealth will be necessary. In Sweden employers pay the same taxes for robots that they do for human employees. In Japan some companies pay union dues for robots. Supporters of robotic rights might say that computers are paying these taxes and dues from their labor and should derive rights for such labor.

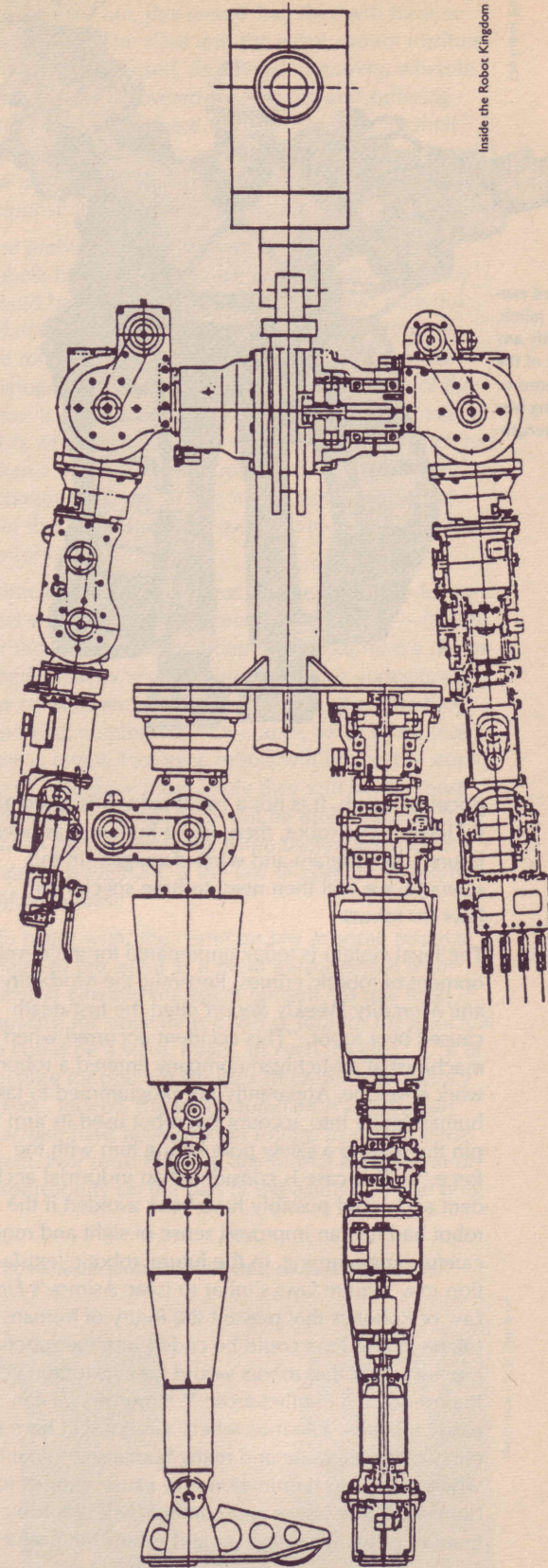
Following questions of distribution of wealth come questions of ownership. In the very near future it is expected that computers will begin to design their own software programs. Considering the fact that "the Copyright Act limits copyright protection to the author's lifetime, which is clearly inappropriate for a computer, it would then seem that a change in the law may be needed to provide proper *protection for programs with non-human authors.*"¹⁰

Legal rights and responsibilities will then be needed to protect humans and robots alike. This need should give rise to a new legal specialty, like environmental law — robotic law. With this new specialty we may find lawyers defending the civil rights of self-aware robots, which could take the following form: "to protect the super-robot from total irreversible loss of power (*life*); to free the robot from slave labor (*liberty*); and allow it to choose how it spends its time (*the pursuit of happiness*)."¹¹

New Cases

We will then see an avalanche of cases: we will have robots that have killed humans, robots that have been killed by humans, robots that have stolen state secrets, robots that have been stolen; robots that have taken hostages, robots that have been held hostage, robots that carry illegal drugs across borders, and robots themselves that illegally cross national borders. Cases will occur in general when robots damage something or a robot itself is damaged or terminated. In addition, robots will soon enter our homes as machines to save labor, and as machines to provide child care and protection. Eventually these entities will become companions to be loved, defended and protected.

Robots that are damaged or damage or break other human laws will raise various complex issues. Of course, at present, robot damage will be simply a tort case, just as if one's car was damaged. But an attorney will one day surely argue that the robot has



Inside the Robot Kingdom

An assembly diagram of Wabot, the organ-playing robot created by Ichiro Kato, Japan's most famous roboticist. Designed to accompany a human vocalist, it can vary its tempo and tuning to adjust to individual singers, even out-of-tune ones, for the most euphonious ensemble effect.

This powered exoskeleton will mimic and amplify any movement of the operator's arms or legs, giving him superstrength.



priceless worth. It is not a car. It talks, it is loved and it "loves." The robot, then, like a human, has been injured. Its program and wires damaged. In this scenario, we will then need to have special tort laws for robots.

The legal system is today unprepared for the development of robotic crimes. Recently, the *Morbidity and Mortality Weekly Report* cited the first death caused by a robot. "This accident occurred when a machinist at a Michigan company entered a robot's work envelope. Apparently not programmed to take human frailty into account the robot used its arm to pin the man to a safety pole killing him with the force."¹² This case is considered an industrial accident and could possibly have been avoided if the robot had had an improved sense of sight and more careful programming. In the future, robotic legislation may require laws similar to Isaac Asimov's *First Law of Robotics* that prevent the injury of humans by robots. These laws could be coded into the robots' memory such that robots would have to terminate themselves if a conflict arose.¹³ However, we can easily imagine scenarios where a robot will have to choose between one and many humans or situations wherein its own termination may cause injuries to humans. These issues and conflicts will task programmers, the legal system, and robots themselves.

Once the computers within robots begin to program themselves according to external stimuli, the robot may begin to commit crimes completely independent of earlier human programming. If a robot can commit a crime, then a number of problematical questions

will arise. "Can a robot intend to commit a crime? How is a robot to be punished? Is it sufficient to re-program it? To take it apart? To penalize its owner? Its designer? Its manufacturer? Its programmer?"¹⁴

Such questions also raise problems concerning criminal trials that involve robots. Many court procedures will need to be adapted to accommodate the needs of such cases. This situation will be exacerbated by the development of robots which serve as witnesses for robots or provide expert testimony. Certainly, "a trial by a jury of peers seems inappropriate and certainly the 6th and 14th amendments guarantees to such a trial do not apply to robots."¹⁵

The Electronic Judiciary

To understand the legal principles that can be applied to robots, we must first have an understanding of the emerging electronic Judiciary. Courts themselves in the next 50 years may be robot-computer run.

The first step will be judges using computers to aid in searching out the most appropriate precedent to fit the case. The development of a legal reasoning robot could serve as a valuable adjunct to a judge's ability to render fair decisions. "As computers grow more elaborate and versatile (they) can better cope with the complexities of law, judgments and precedence."¹⁶ A legal reasoning robot could "serve as a repository of knowledge outlining the general parameters of the law . . . assisting in the reasoning process necessary to reach a conclusion."¹⁷ As a logic-oriented companion and a massive knowledge bank with the ability to instantly recall legal facts, precedent and procedure, a legal robot would greatly assist the judicial system by speeding up court procedure, minimizing appeals based on court error, and preventing legal maneuvering, thereby resulting in fewer cases brought to court.

Eventually, as enough statistics are compiled, judges may not be that necessary except at the appellate level. Judges could then be free to vigorously pursue the legal and philosophical dimensions of societal problems.

Of course, fairness is not a given; it is a political issue. Law, unlike mathematics, is laden with assumptions and biases. Decision-making is an act of power. Initially the use of computers will shift power in the court system from judges to programmers. Judges, of course, if they allow AI to enter their courtrooms, will do their best to keep control of the law and programmers. However, given the anticipated development of robotics, eventually we may see computers changing the programming and developing novel solutions to cases.

Legal Principles

To understand in more concrete terms the legal future of robots, we must understand what legal principles will be applied to conflicts that involve robots. Lehman-Wilzig's article on the legal definition of artificial intelligence is extremely useful. He

presents various legal principles which may be of relevance to robot cases. They include: product liability, dangerous animals, slavery, diminished capacity, children, and agency.¹⁸

Product liability would be applied as long as robots are believed to be complex machines. Not only will the manufacturer be liable, say in the case when a robot guard shoots an intruder, but so will "importers, wholesalers, and retailers (and their individual employees if personally negligent); repairers, installers, inspectors, and certifiers."¹⁹ Thus those that produce, regulate, transport, and use the robot will be liable to some degree. Certainly, as caseloads for robot liability cases mount, insurance companies will be cautious about insuring robots. Moreover, we can imagine the day when manufacturers will argue that the robot is alive and that the company is not liable. Although the company may have manufactured the robot, they will argue that since then the robot has either reprogrammed itself or the new owner has reprogrammed it.

Product liability will be especially problematic for AI because of the present distinction between hardware and software. For the robot that kills, is the manufacturer of the arms liable, or the software designer, the owner, or is there no liability — Human beware, computer around! Will we see no-fault computer insurance law?

The danger that robots may cause would logically increase as they become auto-locomotive, that is, once they can move. At this stage law relating to *dangerous animals* may be applicable to robots. Like animals, they move and like animals they give a sense of intelligence, although whether they actually are intelligent is a political-philosophical question. Lehman-Wilzeg writes:

"While the difference in tort responsibility between product liability and dangerous animals is relatively small, the transition does involve a quantum jump from a metaphysical standpoint. As long as AI robots are considered mere *machines* no controversial evaluative connotations are placed on their essence — they are inorganic matter pure and simple. However, applying the legal principle of dangerous animals (among others) opens a jurisprudential and definitional Pandora's Box, for *ipso facto* the "machine" will have been transformed into a legal entity with properties of consciousness, if not some semblance of free will. Once begun, the legal development towards the "higher" categories will be as inexorable as the physical expansion of robotic powers. In short, the move from the previous legal category to the present one is the most critical step; afterwards, further jurisprudential evolution becomes inevitable."²⁰

Given the structure of dominance in the world today, between nations, peoples, races, and sexes, the most likely body of legal theory that will be applied to robots will be that which sees robots as slaves. They will be ours to use and abuse. Of course, as Stone

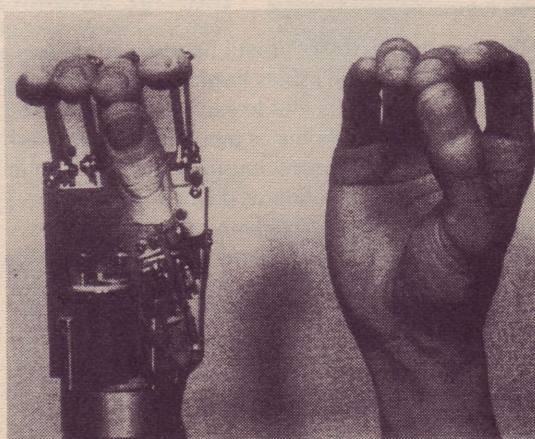
has pointed out, this means that they will have no legal status. The slave and the robot cannot institute proceedings himself, for his own recovery, wherein damages are recovered for his pain and suffering. Will errant robots have to be responsible for their actions? Owners may argue that the slave understood the intent of his or her actions, and make the slave responsible.

The problem of punishment is also problematic. Robots have neither money nor property. One way would be to give the robot to the injured party for his economic use. Another would be to eliminate the robot or to reprogram the robot. This may be analogous to the present debate on the right of the fetus: is it alive, do we have the right to terminate it? Also, who has the right to terminate a robot which has taken a human life, or a robot which is no longer economically useful? We would not be surprised if in the 21 century we have right-to-life groups for robots.

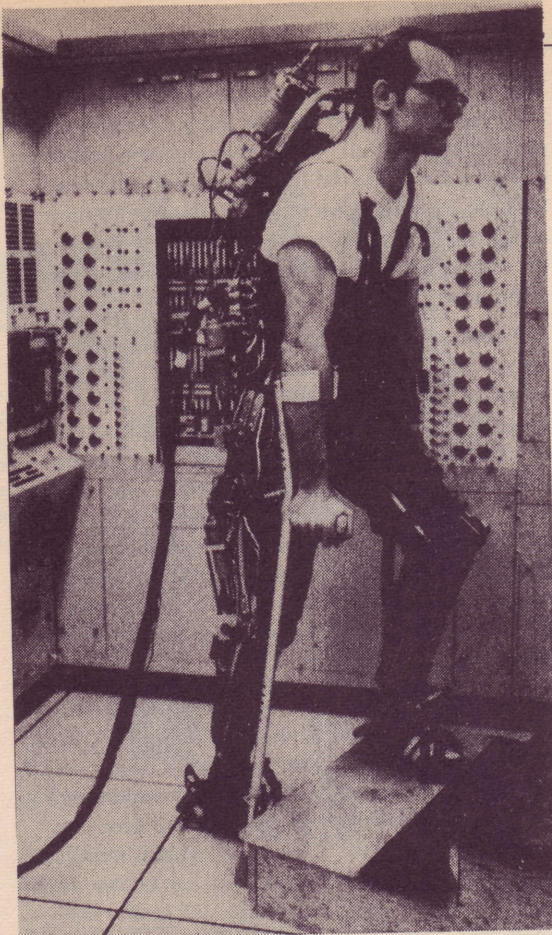
Lehman-Wilzeg argues that another category for robots would be that of *diminished capacity* — "used for those individually independent but have a diminished capacity for initiating actions or understanding the consequences of such actions at the time they are being committed." Of course, what is important here is intent. However, robots will not be the stupidest of species — more likely they will be the most intelligent — at question will be their morality, their ethical decision-making. More useful, yet also ultimately problematic is the law of *agency*. As Lehman-Wilzeg writes:

"To begin with, the common law in some respects relates to the agent as a mere instrument. It is immaterial whether the agent himself has any legal capacity, for since he is a sort of tool for his principal he could be a slave, infant, or even insane. . . . 'It is possible for one not *sui juris* to exercise an agency power.' Indeed, the terms *automaton* and *human machine* have been used in rulings to describe the agent. Nor must there be any formal acceptance of responsibility on the part of the agent. . . . The only

A 1979 forearm prosthesis, WH-11E2, could pinch and grip.



Mechanical Hands Illustrated



Walking shell for paraplegics, consisting of 60 pounds of motorized, battery-powered tubing and hydraulic joint actuators. The exoskeleton can walk with or without a human load, move forward, backward, turn and walk up stairs. Developed at the Department of Mechanical Engineering, University of Wisconsin, Madison, 1976.

element required for authority to do acts or conduct transactions . . . is the communication by one person or another that the other is to act on his account and subject to his orders. Acceptance by the other is unnecessary. Thus, . . . generally speaking, anyone can be an agent who is in fact capable of performing the actions involved. Here, then, is a legal category already tailor-made for such a historical novelty as the humanoid."

Although the legal categories presented — from product liability to agency — are useful heuristics, the fantastic notion of robotic rights behooves us to remember that development in robots may result in (or may need) entirely new legal principles and futures.

Another perspective and useful heuristic in understanding the rights of robots involves developing two continuums at right angles to each other. At one end of the x-axis would be life as presently defined: flesh and bones, reflective consciousness and soul. At the other end would be robots as defined in much the way that many see them today — mechanical-electronic gadgets that run programs designed by humans. Along this continuum we can imagine humans with a majority of robotic parts (artificial limbs, heart, eyes) and robots with human-like responses and reactions (creativity, ability to learn). We would also have robots that look like humans and humans that increasingly look like robots.

On the y-axis we can also develop a rights dimension. At one end of this continuum would be a condition of total "human rights" and at the other end, a state of rightlessness. Along this continuum, we can visualize robots representing themselves and robots represented by guardians. Finally we can develop a moving-stationary dimension as well as various economic dimensions (household robots to military robots). By juxtaposing these dimensions (flesh-mechanical; rights-rightless; moving-stationary) and visualizing them across time, we can develop various alternative scenarios of the future of robots.

We can imagine the day when a bold lawyer rewrites history and argues that a robot should be treated legally as a person. On that day an entirely new future will emerge. ■

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