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CORPUS JURIS ROBOTICUM*

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I. INTRODUCTION

Since Unimation sold the first commercial robot in 1961[1], the production and utilization of robots has become widespread. Depending on how one defines a robot, there are between 15,000[2] and 80,000[3] robots in the world today. More than one half of these robots are in Japan. The remaining one half is divided with rough equality between the United States and Western Europe[4] and their numbers are increasing. Robot population is growing at a staggering 35 percent each year.[5]

In January 1985, the U.S. Census Bureau began to keep track of robots because of this electronic population explosion. Thomas Mesenbourg, Assistant Census Bureau Chief, explains the Bureau's interest: "It's an area that's growing rapidly and is expected to grow even more rapidly in the next five to ten years."[6]

Robots are being used in both the workplace and the home. Volkswagen has some 550 robots working in its automobile plants[7], General Electric is manufacturing seven different models for use in all types of assembly plants,[8] and the Health Company's "Hero 1 Personal Robot" is proving to be popular with Rolls Royce.[9] Most of these industrial ro-

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* *Corpus Juris Roboticum*—The Body of Robot Law. This work describes the legal status and problems for robots as of mid-MCMLXXXV.

1. ORGANIZATION FOR ECONOMIC CO-OPERATION & DEVELOPMENT, INDUSTRIAL ROBOTS: THEIR ROLE IN MANUFACTURING INDUSTRY 19, n.3 (1983) [hereinafter INDUSTRIAL ROBOTS].

2. M. THRING, ROBOTS & TELECHIRS 13 (1983).

3. INDUSTRIAL ROBOTS, *supra* note 1, at 18-28.

4. *Id.*

5. *Futurists see Growth in Robot Population*, N.Y. Times, Dec. 27, 1984, at A16, col. 6.

6. Richburn, *Census Bureau to Begin Count of U.S. Robots*, Wash. Post, Oct. 26, 1984, at A21, col.3.

7. *G.E. is About to Take a Big Step in Robotics*, BUSINESS WEEK, Mar. 8, 1982, at 31.

8. *Id.* at 32. *See* G. LANDSTROM, INDUSTRIAL ROBOTS—A SURVEY (1972) and P. BERGER, THE STATE OF THE ART ROBOT CATALOGUE (1984) for summaries of robots that are available in the Marketplace.

9. *Robots Toddling from Factories Toward Home and Office: "Dumb" Robots Selling to Rolls Royce Crowd*, Christian Scientist Monitor, Mar. 31, 1982, at 11, col. 1.

bots are simple stationary mechanical devices with electronic controls that allow them to be reprogrammed as their jobs change. Others are mobile and capable of undertaking dangerous tasks that humans need not perform.

One of the most dramatic assignments recently given a robot was the British Army's enlistment of a remote controlled robot nicknamed "Wheelbarrow". Armed with a shotgun, this unit knocked down the door of London's Libyan Embassy on April 30, 1984 and ended a two-week police siege of that building.[10]

II. THE ROBOT THREAT

While robot enthusiasts laud these mechanical wonders, others fear them. The most commonly perceived robot threat is economic in nature. More specifically, robots pose the threat of job displacement. These fears are reinforced by commentators who paint an economically gloomy picture for laborers. John Young of the Cybernetics Laboratory at the University of Ashton, England, predicts that "[t]he economic consequences and the social consequences of the introduction into industry of the general-purpose robot will be extreme. . . . Human beings will have little time to adapt slowly to the robotic revolution."[11] In addition, Adam Osborne, inventor of the portable computer, has written that " 'Of all the jobs in the industrial world today . . . perhaps half will be eliminated during the next twenty-five years.' "[12]

To protect themselves from the threat of replacement, labor unions have demanded concessions from corporate management. The Nissan Motor Company, Japan's second largest automobile manufacturer, signed an agreement in 1983 with its 47,000 member union that forbids the company from either dismissing of laying off workers when it integrates robots or other sophisticated technology into its plants.[13] In the United States, the International Association of Machinists has drafted a "Technology Bill of Rights" that guarantees that " 'Displaced workers shall be entitled to training, retraining and subsequent . . . reemployment.' "[14] To pay for this program, the union is demanding that an "automation tax" be imposed on robots and other equipment that elimi-

10. *British Blast Open Libyan Embassy to Search Building*, L.A. Times, May 1, 1984, § 1, at 1, col.4.

11. J. YOUNG, ROBOTICS 291 (1973).

12. Miller, *Tools and Monsters*, THE NEW REPUBLIC, May 16, 1981, at 31 *quoting* A. OSBORNE, RUNNING WILD: THE NEXT INDUSTRIAL REVOLUTION.

13. *At Nissan Motor Co. Robots Can't Rub Out the Jobs of Humans*, Wall St. J., Mar. 2, 1983, § 2, at 33, col. 5 (E. ed.).

14. Kvzela, *IAM Envisions a Tax on Automation*, INDUSTRY WEEK May 30, 1983, at 19.

nate jobs.[15]

On a more primitive level, workers have responded to the threat of job displacement with acts of sabotage. Like their English counterparts who attempted to destroy new textile machines at the outset of the Industrial revolution because they seemed to be taking away jobs, modern workers are using similar tactics against robots. Gerrit Nijland, a professor of industrial robotics at the Berenschot Management Training Center in The Netherlands, recently studied worker resistance in his country. He found that the most common sabotage took the form of slowing down machines by feeding them parts out of the proper order. In other cases, workers repaired robots incorrectly, mislaid spare parts or put sand into the machines' lubricating oil. By carrying out such acts, workers hoped to create management dissatisfaction with robots.[16]

Another author suggests that worker sabotage can be avoided through "early, honest, open communication" between management and the work force, and adoption of a "no loss of job" policy.[17] Agreeing with labor leaders, this author suggests that the new technology must not cost anyone their job if it will effectively integrate automotive. Instead, reduction in the labor force must come from attrition and management must convince laborers that the remaining jobs will be less fatiguing, higher paying and more challenging.[18]

Laborers have worries that go beyond economic displacement. One of these concerns is safety. For example, workers in Chrysler Corporation's Windsor assembly plant call their 58 robot spot welders "turkeys" because of the bobbing and pecking motion of the robots' articulated arms as they weld roofs and body frames. Like turkeys, these robots are notoriously stupid and do not know when to stop. This characteristic has triggered workers' fears of industrial hazard since errant robots have mangled themselves and killed humans.[19]

Statistics for robot caused injuries are inaccurate because of a disagreement over the definition of a "robot".[20] For example, industry spokespersons claim that most accidents recently attributed to robots were, in fact, caused by simple automated machines. These spokespersons obviously adopt a narrower definition of robot.[21]

Corporate safety officers, state and federal regulators and union officials agree that safety precautions are lagging behind the overall de-

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15. *Id.*

16. *Robot Sabotage*, TIME, Sept. 20, 1982 at 58.

17. K. SUSNJARA, A MANAGER'S GUIDE TO INDUSTRIAL ROBOTS 116 (1982).

18. *Id.* at 115-16.

19. *Robots Seen as Posing Threat to Worker Safety*, L.A. Times, Dec. 14, 1984, § 1C, at 1, col. 1.

20. *Id.*

21. *Id.*

velopment of robot technology. In response, the industry is developing temporary rules for worker protection and permanent robot safety guidelines.[22] The interim rules call for keeping humans out of the robot's "work envelope". Safety devices such as stout physical barriers, bells, whistles, blinking lights, automatic "bleeders" (which drain away pneumatic pressure in the event of an electrical power failure) and "light curtains" (which turn off a robot if the curtain is crossed by a worker or another machine) have been developed to protect workers from robots.[23]

Future developments call for design standards that will make robots less hostile to people. These advances include giving robots the capacity to identify and avoid hurting humans.[24]

III. THE ROBOT AS A KILLER

In the meantime, two humans have already died at the "hands" of robots. Both incidents demonstrate the dangerous consequences of venturing too close to an apparently idle robot.

One fatality occurred at the Kawasaki Heavy Industry Plant in Akashi City, Japan in 1981. The worker involved in the accident was responsible for overseeing a transmission gear production process that involved four automatic metal shaving machines and a robot that loaded parts into the first shaver. When one of the shaving machines broke down, it signaled the robot to assume a resting position and sent out a call to the human technician. The technician turned off both the shaving machines and the robot while he made repairs. Upon completion of these repairs, the worker re-activated the robot. Unexpectedly, the robot's arm stretched out and crushed him.[25]

Because the accident occurred in Japan, liability was established without litigation. In the more litigions United States, however, a similar case did make its way into court.[26]

Unit Handling Systems, a division of Litton Industries, manufactured a five-story robot that was employed by the Ford Motor Company for one of its casting plants. One part of the unit, one ton carts, which were mounted on rubber wheels, delivered and retrieved castings from high shelves inside the plant. The carts had mechanical arms to pick up and move the castings[27].

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22. *Id.*
23. *Id.* at 2, col. 2.
24. *Id.* at 3, col. 2.
25. *Id.* at 2, col. 3.
26. (case cite) *Author omitted citation* [Ed. note]
27. *Jury awards $10 Million in Killing By Robot*, N.Y. Times, Aug. 11, 1983, at 12, col. 1.

Robert Williams, a plant workers, climbed onto one of the upper storage shelves to retrieve a casting because the robot had been giving-workers erroneous information about the number of parts on that shelf. As Mr. Williams stood on the shelf, one of the carts approached without warning and struck Williams on the head with its mechanical arm.[28]

At trial, Litton argued that Williams had ignored the first rule for dealing with errant robots; he did not turn it off. Attorney Paul Rosen, together with his associate Joan Lovell, argued the case for Williams' widow and son. Attorneys for the deceased worker's family said that the robot operator's manual required workers to make constant adjustments without shutting it down. Litton failed to put in a beeper warning system to alert workers when the carts began moving. Furthermore they asserted that Litton's training had been tragically inadequate.[29]

The jury quickly agreed with Rosen and Lovell. They found that the Unit Handling System of Litton Industries was guilty of negligence and awarded damages of ten million dollars.[30]

IV. LEGAL THEORIES FOR ROBOTIC LIABILITY

A. THE FIRST LAW OF ROBOTICS

The robots used by both Kawasaki and Ford were simple machines. The court in the *Williams* case instructed the jury to apply ordinary negligence principles in reaching its decision.[31] In other words, the court made no distinction between robot and other similar industrial liability cases. If robots can continue to be classified as "[m]echanical devices that can be programmed to perform some task of manipulation or control,"[32] the existing tort law can sufficiently deal with injuries that result from their use, misuse, or abuse. These "robots of the first kind" are, however, harbingers of the future.

B. ROBOTS OF THE SECOND KIND

The development of artificial intelligence and more complex, sophisticated robots appears imminent. "Intelligent" robots, capable of seeing, smelling, hearing and feeling are already in operation. Further-

28. Fuller, *Death By Robot*, OMNI, Mar. 4, 1984, at 97, 100.

29. *Id.* at 102.

30. *Id.*

31. (case cite from number 26) *Author omitted citation* [Ed. note]

32. D. TVER, ROBOTICS SOURCEBOOK AND DICTIONARY (1983). The Robot Institute of America's 1979 definition of robots is the principally accepted industry standard. It is stated as follows: "A robot is a reprogrammable multifunctional manipulator designed to move materials, parts, tools or specialized devices, through variable programmed motions for the performance of a variety of tasks." *quoted in* D. BERGER, THE STATE-OF-THE-ART ROBOT CATALOGUE 1 (1984).

more, experimental robots capable of learning and acting independently have been built and will make their commercial debutes in a few years.[33]

One commentator reports that "[f]rom 1985 to 1990, robots will come into widespread use in spraying insecticide on farms, spreading fertilizer, inspecting eggs and packing them, milking cows, cutting lumber, planting and in ocean research."[34] The Japanese Ministry of Trade and Industry recently announced that it would undertake an eight-year, $85 million dollar project to build so-called "super robots." These robots would be able to carry out dangerous tasks such as fighting fires, maintaining nuclear power plants and working on the oceans' floors.[35] Manufacturers in both the United States and Japan will soon be marketing a robot capable of "snaking" through pipes to inspect remote areas of power plants for cracks and flaws. Westinghouse is working on an advanced "snake" robot that will have gripping devices for walking up poles. Carnegie-Mellon University is designing a robot to do "roof-bolting" in mines, which is considered one of the industry's most dangerous tasks.[36]

These robots of the second kind are best defined as sensory machines capable of reprogramming themselves to deal with problems. To the extent that they are capable (or allowed) to reprogram themselves, these machines can choose between alternatives or "think".

While these machines are coming off the drawing boards, a debate still exists as to whether robots can actually "think." Joseph Engelberger, who is sometimes called the "father of robotics", believes that robots can never possess human "judgment." He states "[w]ork that is changeable, varied, creative and unstructured will always be done by humans.[37]

But most who have studied or queried the future of robots have no doubt that the machines can learn and use judgment. The limit that some prognosticators envision is that humans "can never construct a genuine emotional brain in an artifact."[38] In other words, this class of

33. *See* A. COLE, THE SEARCH FOR ROBOTS 80-98 (1967), discussing one such machine. *See also, Robots*, NEWSWEEK, Sept. 21, 1981, at 92, discussing the status of intelligent robots.

34. P. BERGER, *supra* note 32, at 144, *quoting* the Japan Industrial Robot Association.

35. *Id.*

36. Armstrong, *Hard Hat Robots May Take Risk Out of Dangerous Jobs*, CHRISTIAN SCIENTIST MONITOR, Aug. 30, 1983, at 6, col. 4.

37. *From Garbage Collection to Brain Surgery With Robots*, U.S. NEWS & WORLD REPORT, Dec. 5, 1983, at 64. *See also* H. DREYFUS, WHAT COMPUTERS CAN'T DO: A CRITIQUE OF ARTIFICIAL REASON 197-217 (1957).

38. M. THRING, *supra* note 2, at 26; R. ULLRICH, THE ROBOTICS PRIMER 104 (1983) stating that the threat of the computer revolution can be avoided by "know[ing] things that the computer can never learn[.]"

robots will lack "religious feelings, value judgments, conscience[s] and morality."[39]

It is this lack of morality that scares some commentators. One writes, "[T]hese robots must be subjugated to regulation, because of their potential for doing harm to the human species. Their design must be supervised and their size restricted."[40]

The basic rules for designing such a subjugated robot were worked out in 1950 by Isaac Asimov, then a teenage science fiction writer. His "Three Laws of Robotics" are still popular with science fiction writers, readers, and roboticists who fear these technological creatures. Asimov's declares that:

1. A robot must not harm a human being, nor through inaction, allow one to come to harm.
2. A robot must always obey human beings, unless that is in conflict with the first law.
3. A robot must protect itself from harm, unless that is in conflict with the first or second laws.[41]

Although Asimov's Laws leave much to be interpreted by the amoral and non-thinking robot (e.g. the meaning of "harm," or how the robot is to treat animals, extraterrestrials, and other robots),[42] the writers who most fear robots for being amoral and nonthinking are the first to quote Asimov.[43] Professor Thring, at Queens College, London has gone so far as to equate Asimov's laws with his own "Two Law of Impotence for Robots". Thring's laws, unlike Asimov's, are attempts to describe what he considers to be the inherent limitations of all robots. Briefly his laws state that (1) A robot can only do what its human programmer designed it to do and never more; and (2) A robot can never have true human emotions.[44]

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39. M. THRING, *supra* note 2, at 26.

40. A. COTE, THE SEARCH FOR THE ROBOTS 222-23 (1967).

41. I. ASIMOV, I, ROBOT 51 (1950). *See also* Asimov, *forward* to J. ENGELBERGER, ROBOTICS IN PRACTICE at xiii (1980) for a statement of Asimov's continued belief in the limited capacity of robots and the viability of his "three laws."

42. The limited applicability of Asimov's laws can be seen from the following scenario: Robby, an Asimovian programmed robot, is stationed on a spaceship with a crew of ten humans and a pet dog. Robby is the only occupant with a complete map to get the crew home. Robby is first confronted by the dog. It intrinsically dislikes robots and growls threateningly. Next, an extraterrestrial appears and seems ready to decapitate Robby; in reality, it is making a friendly greeting. Finally, Robby is ordered to self-destruct the deranged human janitor in the crew.

Following Asmovian rules, Robby steps on the dog's head, zaps the extraterrestrial with a laser, and destroys itself. Alas, the petless crew is stranded in space and, in all probability is pursued by the vengeful comrades of the deceased extraterrestrial.

43. *See* J. YOUNG, ROBOTICS 3 (1973); J. ENGELBERGER, *supra* note 41, at 89, 118, 125; M. THRING, *supra* note 2, at 27.

44. M. THRING, *supra* note 2, at 27-8.

Given these laws, robots are only suitable to be servants, and rather dumb servants at that. Philosopher Mortimer Taube agrees. He argues that humans have a peculiar "feeling" or "aesthetic" that scientists can never give to mere machines.[45]

Another commentator states, "The robot is a machine. Let no one doubt that. . . ."[46] In his view, the robot is destined to be nothing more than a machine; a slave to mankind for all times. He also predicts that, in all probability, "some humans will adopt them as domestic pets, since this is the nature of human beings."[47]

It is hard to think of a statement that could be more condescending or presumptuous than this last one. One must wonder if these commentators' underlying fears of robot revolt will ever come to pass. Professor John McCarthy at Stanford University, suggests that revolt will never happen because "[w]e'll probably never want to deal with machines that are too much like us."[48] But he discourages programmers to "think of their programs as a servant, whose master, the user, should be able to control it."[49]

A related fear is that robots will eventually reproduce. One commentator states that, "If such self-replicating machines were also endowed with artificial intelligence of an advanced nature, society will be faced with a new challenge: What do humans do to guard against domination by intelligent machines?"[50] Another commentator predicts that we may see self-reproducing robots with 20 years.[51]

> "Many people have a deeply held belief that no object or animal should be able to replace a human being in a person's life. . . . Yet another commentator suggests that this fear of robots may be sexually based. It may be felt that there is a sanctity about human relationships that renders them beyond artificial simulation, but arguments of this kind cannot rule out the psychological possibility that a person may, in fact, come to regard a nonhuman object as an adequate substitute for a human friend. It is clear, for example, that some people set the value of their relationship with an animal above that of any human alliance, and the possibility that a computer might achieve such favor cannot be rejected merely on the grounds that it is not human.[52]

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45. M. TAUBE, COMPUTERS AND COMMON SENSE: THE MYTH OF THINKING MACHINES 117 (1961).

46. J. YOUNG, *supra* note 43, at 292.

47. *Id.*

48. McCarthy, The Little Thoughts of Thinking Machines PSYCHOLOGY TODAY, Dec. 1983, at 49.

49. *Id.*

50. R. DORF, ROBOTS AND AUTOMATED MANUFACTURING 177 (1983).

51. R. ULLRICH, *supra* note 38, at 7 *quoting* Georg Von Tiesenhausen of NASA's Marshall Space Flight Center.

52. Frude, *The Affectionale Machine*, PSYCHOLOGY TODAY, Dec. 1983, at 23.

He concludes that despite this apparent distaste for robots, more widespread usage and developments will force operators to face their fears.[53]

Anthropologist Morton Klass of Columbia University does not believe that society (as reflected in the science fiction stories he has studied) sees robots as a sexual threat. "[A]lthough we see in the robot a potential threat to our well-being, that threat is almost never a sexual one. . . ."[54] In fact, he concludes that the absence of this sexual fear, as portrayed in the literature of the 1940's and 50's was critical in transforming readers' views "from an infernal danger into something to which we respond with pleasure and affection."[55]

C. ROBOTS OF THE THIRD KIND

It has been predicted that by the turn of the century, robot designers will be able to develop an electronic machine which will be capable, in terms of its capacity, structure and complexity, of operating like a human brain.[56]

Unlike those who see only robots of the second kind in mankind's future, Aleksander and Burnett do not fear the coming of the "millenial" robot.[57] Rather, they compare the emergence of these robots of the future to the birth of a child. In fact, they consider these machines "children of our brains."[58] Alfred Cote, who also envisions the arrival of this third generation, agrees. "[T]hey'll be no more [a] threat to man's survival," he writes, "than today's machines are—provided that man continues to compete with them."[59] If however, society becomes lazy and does not improve itself, it will subject itself to control by these mechanical devices.[60]

Those who advocate that robots of the third kind (i.e., "manufactured equivalents of humans"[61]) will eventually be produced seem to

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53. *Id.* at 24.

54. Klass, *The Artificial alien: Transformations of the Robot in Science Fiction*, 470 ANNALS 171, 176 (1983).

55. *Id.*

56. I. ALEKSANDER & P. BURNETT, REINVENTING MAN: THE ROBOT BECOMES REALITY 281 (1983). *See also* Gunderson, *The Imitation Game*, in MINDS AND MACHINES 61 (A. Anderson ed. 1964) *quoting* A.M. Turing, father of the thinking robot who, in 1950, stated,

> I believe that in fifty years' time it will be possible to program computers, with a storage capacity of 10^9, to make them play the imitation game so well that an average interrogator will not have more than 70 per cent chance of making the right identification [between robot and human] after five minutes of questioning.

57. ALEKSANDER & BURNETT, *supra* note 56, at 61.

58. *Id.*

59. A. COLE, *supra* note 33, at 224.

60. *Id.*

61. Klass, *supra* note 54, at 172.

have the better argument because it is not based on theology or fear of the unknown.

The first philosopher to adequately develop an argument in support of the human-robot was A.M. Turing. He argued that machines could be created to exactly imitate humans. Such a machine would respond with the same degree of error that a human would. Under any test, its brain's capabilities and capacity would be indistinguishable from the human brain. Absent any way of distinguishing the robot brain from that of the human, Turing concluded that the former must be regarded as equivalent to the latter.[62] [63]

In 1979, F.H. George, the director of the Institute of Cybernetics at Brunnel University, England, reviewed all arguments made against robot-humans. He concluded that there is no reason why these machines cannot be designed to think.

Prior to this analysis, philosopher Hilary Putnam made an equally detailed review of the arguments against robot-humans. One widely held argument is worth reviewing. It is the argument that we cannot tell whether robots are living, therefore we should treat them as if they were non-human. Putnam, however, points out that same argument can be made with respect to humans.[64] In other words, we believe other humans are living because they act similarly to ourselves. If this assumption is true, a similar argument can be made for robots; especially ones that are created as androids which resemble humans in appearance and touch.[65]

Putnam also raises the possibility that even though one robot who creates other robots may regard itself as a conscious creator, it may also consider its creations as lifeless. She points out that "our position with respect to robots is exactly that of robots with respect to [other robots]."[66]

John Anderson, a professor psychology and computer science at Carnegie-Mellon University, observed in 1983 that computer capabilities are no longer seen as intelligent even though the machines may be able to outperform humans. As a result, these tasks are no longer seen as an indicator of human intelligence.[67]

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62. *See* A. Turing, *Computer Machinery and Intelligence*, MIND, Oct. 1950, 433-460. *But cf.* Ziff, *The Feelings of Robots*, ANALYSIS 98 (1959) for a response to Turing's argument. Ziff argues that Turing's robots were only giving performances which could not be distinguished from reality.

63. F. GEORGE, PHILOSOPHICAL FOUNDATIONS 147 (1979).

64. H. Putnam, *Robots: Machines of Artificially Created Life?* 61 J. OF PHILOSOPHY 668, 689 (1964).

65. *Id.*

66. *Id.*

67. Huyghe, *Of Two Minds*, PSYCHOLOGY TODAY, Dec. 1983, at 32.

Professor Thring's argument that robots can never be endowed with emotion[68] is rejected by M.I.T. Professor Marvin Minsky who is regarded as one of the chief architects of artificial intelligence. He states that "[i]t is a mistake in our culture that feeling and emotion are deep, whereas intelligence, how we get ideas, is easy to understand."[69] He feels that humans can effectively comprehend the dynamics of emotions, and concludes that humans can also program robots so that they can display emotion. He writes: "[o]nce we can get a certain amount of thought, and we've decided which emotions we want in a machine, that it won't be hard to do."[70]

With regard to the question of whether a robot is a machine or artificially created life Putnam thinks that the situation "calls for a decision and not for a discovery. If we are to make a decision it seems preferable . . . to extend our concept so that robots *are* conscious - for 'discrimination' based on the 'softness' or 'hardness' of the body parts of a synthetic 'organism' seems as silly as discriminatory treatment of humans on the basis of skin color. (emphasis added)"[71]

This discrimination consciousness of robots logically leads to the discussion of equality for the mechanical creations. In 1972, William Lycan, an associate professor of philosophy at Ohio State University, delivered a lecture on the civil rights of robots. He defined a robot as being a manufactured android, but otherwise indistinguishable from man. As an example, he described a fictional robot named Harry "who can converse intelligently on all sorts of subjects, play golf, write passable poetry, control his occasional nervousness pretty well, make passionate love, prove mathematical theorems, attend political rallies with enthusiasm, show envy when outdone, throw gin bottles at annoying children, etc."[72]

He pointed out two differences between Harry and a human: (1) Harry was an artifact, and (2) Harry was made partly or entirely of hardware. Lycum concluded, however, this distinction is not a sound basis for denying Harry equal treatment. He argued, "If we object to racial and/or ethnic discrimination in our present society, we should object to discrimination against harry on the basis of his birth place.[73]

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68. *See supra* notes 28-29 and accompanying text.

69. Huyghe, *supra* note 67, at 32.

70. *Id.*

71. Putnam, *supra* note 64, at 691.

72. Speech by W. Lycum, *The Civil rights of Robots*, at Kansas State University (Oct. 1972) *quoted in part in* J. REICHARDT, Robots: Fact, Fiction and Prediction 162 (1978).

73. *Id.*

D. ROBOTS OF THE FOURTH KIND

Professor Lycan suggests that it is possible that "two or more extremely intelligent and sensitive beings, who were created by humans, could themselves build a super-being who was so superior in every way to humans that it could never have been created by them."[74]

If we failed to treat robots of the third kind like humans, how will robot-gods treat us? Aleksander and Burnett ask, "Has man not, by a process of LaMarckian evolution, produced his own successor and, if we hold to the principle that we use to justify our own authoritarian attitudes toward nature, would we not be bound to step aside and make way for the superior being?"[75] Richard Dorf properly asks, "What do humans do to guard against domination by intelligent machines?"[76] For scientists, writers and philosophers, this has been an issue for more than fifty years. If futurists are correct, it will be an issue for the legal community before the end of the century.

In 1964, one commentator identified the problem with trying to ignore the issue. He wrote:

> A goal seeking mechanism will not necessarily seek our goals unless we design it for that purpose and, in that designing, we must foresee all steps of the process for which it is designed. . . . The penalties for errors of foresight, great as they are now, will be enormously increased as automatization comes into its full use.[77]

IV. DEVELOPING A JUS ROBOTICUM

Both the roboticists and philosophers have presented society with a challenge: how should we treat robots? Not only must society develop treatment for today's robots but it must adopt one for robots of the year 2000 and beyond. Guidelines, rules and laws must be laid down and undoubtedly the legal community will be called upon to help.

As indicated above, ordinary tort principles of intent, negligence and strict liability do, and will, properly govern injuries produced by robots of the first kind, which are simple reprogrammable automatic machines presently among us. Robots of the second kind, such as those with human specified limits, logically should be governed by the same law, possibly with one major caveat. The reprogramming of an errant robot of the second kind must be mandatory.

Even if robots of the third kind, the robot-persons, never come into being, it seems ethically and morally essential that we should be able to distinguish them from lesser robots. If we do not, the nagging fear of

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74. *Id.*

75. I. ALEKSANDER & P. BURNETT, *supra* note 56, at 162.

76. R. DORF, ROBOTICS AND AUTOMATED MANUFACTURING 177 (1983).

77. N. WEINER, GOD AND GOLEM, INC. 63 (1964).

revolt and domination will continue to haunt mankind. But how does one distinguish a robot from a robot-human? In other words, what are the peculiar traits of humans that robots must attain to be classified as a quasi-human? To determine this, society must first decide which characteristics are inherently human.[78]

For more than a century, Anglo-American law has struggled with at least part of the problem in a slightly different context. Instead of attempting to upgrade a mechanical being to a state of humanity, it has devised a test for lowering a human to a state of incipience. It has adopted the insanity test. As currently set forth in the Model Penal Code, insanity is the incapacity to either appreciate wrongfulness or conform to the requirements of the law.[79] A possible "sanity" test for robots would mirror this test. In other words, sanity could be defined as the capacity to appreciate what is lawful and proper in human society and the ability to conform to the requirements of the law. This, however, is obviously an inadequate test of humanity. Even the simplest of intermediate robots could be programmed to identify the general principles of law governing a society and to conform to them. Modern computers, in fact, can readily regurgitate statements of the law. Yet, because they lack mobility and any independent intellectual capacity, they are incapable of causing harm. While they may be "sane" they are certainly not human.

Julien Offray de La Mettrie, writing in 1747, suggested that man is a machine constructed in such a way that it is not possible to exactly define or describe him.[80] Since no one has exactly described man, maybe La Mettrie is correct. Nevertheless, there seems to be some basic characteristics, (which can be borrowed from philosophers who have tried to differentiate man and robot), that will lead us toward a correct response. In the form of a simple test, these characteristics can be set out as follows:

1. Does it/he/she have a complex brain?
2. Is the brain capable of speculation, calculation and memory, in addition to the operation of sub-system or body parts?

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78. *Cf.* J. REICHARDT, *supra* note 72, at 161 *quoting* R. Buckminster Fuller, who rather facetiously defines a human as:

> a self balancing, 28-jointed adapter-base biped; an electrochemical reduction plant, integral with segregated storages of special energy extract in storage batteries for subsequent actuation of thousands of hydraulic and pneumatic pumps with motors attached; 62,000 miles of capilaries . . . . The whole, extraordinary complex mechanism guided with exquisite precision from a turret in which are located telescopic and microscopic self registering and recording range finders, a spectroscope, etc.; the turret control being closely allied with the air-conditioning intake -and- exhaust, and a main fuel intake . . . .

79. MODEL PENAL CODE § 4.01 (Proposed Official Draft 1962).

80. *See* J. LA METTRIE, L'HOMME MACHINE (1747).

3. Is the brain's capacity for speculation, calculation and memory comparable to that of a human?
4. Is the brain capable of learning, i.e., can it separate potentially useful information from useless information, and can it purge or discard the useless?
5. Is the brain's capacity to learn unlimited by subject matter, i.e., is it capable of invention?
6. Is the brain capable of using sensory devices to perceive its environment and to interface with humans even if those sensory devices are not connected?

Assuming a robot can "pass" this test and the sanity test as well, it seems logically, ethically and morally compelling not only to regard it as both human and sane, but also entitled to the rights of other "natural", humans.

V. CONCLUSION

Establishing that robot-humans can exist (assuming that we accept the argument that they can) merely leads us to more fundamental and pragmatic questions. First, should they be allowed to exist? If those who fear intelligent robots are right, should not every robot be programmed to function in accordance with Asimov's second law: total obedience to humans?

On the other hand, is such a law ever totally effective? Assuming such a requirement were established, but it proved ineffective, would it not produce exactly what it was meant to prevent, namely revolt and domination?

Fear and historic discrimination against the unusual would demand that we make robot-humans our slaves. Logic, ethics and open-minded morality dictate that we give robot-humans equal rights with humans.

This first question of robot existence lead us to the second, more pragmatic problem. If robot-humans are given human rights in our private-property conscious society, who is to pay for their freedom? For those who are certain that robots are subject to certain natural laws of "impotence" that will never allow them to attain human status, these issues are nonsense. But for those who disagree, (and even those who are uncertain) these issues are both real and imminent.