

# ARTIFICIAL INTELLIGENCE: Some Legal Approaches and Implications

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## Abstract

Various groups of ascertainable individuals have been granted the status of "persons" under American law, while that status has been denied to other groups. This article examines various analogies that might be drawn by courts in deciding whether to extend "person" status to intelligent machines, and the limitations that might be placed upon such recognition. As an alternative analysis, this article questions the legal status of various human/machine interfaces, and notes the difficulty in establishing an absolute point beyond which legal recognition will not extend.

COMPUTERS INCREASINGLY RESEMBLE their human creators. More precisely, it is becoming increasingly difficult to distinguish some computer information-processing from that of humans, judging from the final product. Computers have proven capable of far more physical and mental "human" functions than most people believed was possible.

The increasing similarity between humans and machines might eventually require legal recognition of computers as "persons." In the United States, there are two tiers to such

legal recognition. The first tier determines which ascertainable individuals are considered persons (e.g., blacks, yes; fetuses, no.) The second tier determines which rights and obligations are vested in the recognized persons, based on their observed or presumed capacities (e.g., the insane are restricted; eighteen-year-olds can vote.)

The legal system is more evolutionary than revolutionary, however. Changes in which individuals should be recognized as persons under the law tend to be in response to changing cultural and economic realities, rather than the result of advance planning.

Similarly, shifts in the allocation of legal rights and obligations are usually the result of societal pressures that do not result from a dispassionate masterplanning of society. Courts attempt to analogize new problems to those previously settled, where possible: the process is necessarily haphazard.

As "intelligent" machines appear, they will pervade a society in which computers play an increasingly significant part, but in which they will have no recognized legal personality. The question of what rights they should have will most probably not have been addressed.

It is therefore most likely that computers will enter the legal arena through the courts. The myriad acts of countless individuals will eventually give rise to a situation in which some judicial decision regarding computer personality is needed in order to determine the rights of the parties to a

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legal action.

This article does not attempt to dictate how a court should resolve the question of computer personality in every instance. Part four of this article instead attempts to isolate useful analogies by which a court in certain circumstances might resolve the question of "computer rights."

It is possible that the intersection between rapidly changing medical science and computer technology might provide a different starting point for a similar set of legal questions. As technology capable of more fully interfacing humans and computers develops, the line between operator and instrument will begin to blur

The courts, faced with the possibility of inadvertently stripping rights from a fully recognized human person, might extend protection to the machinery made a part of the human. The fifth part of this article explores possible judicial reactions to uncertainty as to where the man ends and the machine begins.

Tales and artifacts of brazen heads, homunculi, golems and mechanical men have appeared in a continuous stream from the beginning of history.<sup>1</sup> As modern sciences give functional reality to these ancient visions, the courts may well be faced with a new kind of person as deserving of legal recognition and protection as any now recognized.

### **Artificial Intelligence: A Phenomenon In Search Of A Workable Definition**

Artificial intelligence (hereinafter AI) can be defined as the capability of a device to perform functions that are normally associated with human intelligence, such as reasoning, learning and self-improvement<sup>2</sup> Such a definition, however, while concise, invites further semantic haggling over the precise definition of the definitional terms themselves. Given the lack of agreement in the field, "AI" is best considered to encompass AI technology, AI simulation, AI modeling and AI theory<sup>3</sup>

The "AI technology" definition essentially asks whether a given task, if performed by a human, would require human mental processes. A medical diagnosis program, for example, would by this definition, be AI *per se*. AI, seen as a purely pragmatic undertaking to demonstrate intelligent behavior, has been easily demonstrated by many computers.

"AI simulation" calls for a program to duplicate the internal state of a human brain engaging in the same task. This, of course, presupposes an understanding of the internal state of a human brain. Adoption of this view would make AI definitionally impossible to demonstrate until human brain states are understood sufficiently to be effectively copied.

"AI modeling" requires the computer to mimic the outward behavior of a human engaging in the same task. A successful computer would pass the "Turing test" (named after the English writer who proposed it in 1950): an interrogator, separated from the person (or machine) being interrogated and communicating only by teletype, would be unable to tell

for certain whether a person or a machine is replying. Essentially, this definition forces the evaluator of the computer to use the same test for evaluating the intelligence of the machine as a person would use for evaluating the intelligence of any person. Of course, it also makes the definition highly subjective.

The "AI theory" definition is best stated as a set of two goals: to make computers more useful, and to understand the principles which make intelligence possible.<sup>4</sup> The second goal implicitly assumes that the trait of intelligence not only has principles, but that those principles can be understood. Demonstration of AI would occur when a useful human trait was selected, analyzed and duplicated—within a machine.

A term requiring four contradictory definitions is difficult to comfortably apply. These definitions carry with them conclusions about whether "intelligence" can be synthesized in fact, which are in turn associated with predispositions concerning the nature of the human mind. These are examined below

For the purpose of this article, AI will be treated less as a question than as a conclusion: AI is considered functionally demonstrated when the appropriate decision-maker *accepts* a machine as intelligent. This conclusory treatment provides no standard for evaluating the "correctness" of the choice. It *does*, however, fairly reflect the problem of AI as it will be treated in the courts. Given the definitional problems in the field, commentators have noted that the question of a machine intelligence and purpose is ultimately a question not of discovery, but of decision<sup>5</sup>

### **Nuts And Bolts: The Technology And Its Application**

The evolution of technology from vacuum tubes through transistors to large-scale integrated circuits is commonly known and need not be repeated here. Some current developments, however, are relevant to the legal questions and should be noted

Vast improvements in input/output technology have been made in the past few years. For example, hardware and software giving industrial robots a rudimentary sense of sight is now being developed,<sup>6</sup> greatly enhancing robot flexibility and responsiveness.

Computer voice recognition and simulation are making it possible to speak with machines<sup>7</sup> Applications range from emergency exit alarms to alarm clocks, and from cars and cola machines to elevators and games.<sup>8</sup> Industry enthusiasts predict that speech and vocal recognition capacity will make even such mundane items much more "user-friendly," and thus let them enjoy a dramatically rapid market acceptance.<sup>9</sup>

The extraordinary increase in computing power has allowed the development of AI programs of considerable utility. Most publicized and well-known are the "expert" programs, such as INTERNIST, DENDRAL, MYCIN and R1. At least fifty such programs now exist. Natural-language information retrieval systems are also coming into common use.

With the smell of profits in the air, big business has become interested,<sup>13</sup> and at least ten new companies have sprung up to produce AI programs and hardware.<sup>14</sup> Japan has recognized the potentials of the field and is now engaged in a national crash project designed to produce a "judgment-making," bilingual, high vocabulary computer with "common sense" by 1990.<sup>15</sup>

The technological advances and economic investments being made indicate that applications of AI technology will soon permeate society. Dr. Daniel Bobrow of Xerox, referring to *existing* technology, has asserted that:

(In) any particular intellectual area, we can probably formalize the knowledge sufficiently so that the computer can do as well as or better than most people can do in that area. It turns out that consistency of judgment is at least as important as the knowledge.<sup>16</sup>

AI-equipped computers will soon be making economic, medical, legal, and other judgments which will impact strongly on those people that are the objects or subjects of the decisions. Realizing this, Bobrow added a caveat to his assertions: "We mustn't give machines authority without responsibility."<sup>17</sup>

These considerations are the factors which will hasten legal involvement in AI. Courts and legislatures circumscribe the limits of "authority" and the measures of "responsibility" by determining the rights and obligations of parties. It is to the legal questions that must be faced that this article now turns.

## Equality Under Law? Thinking Machines In The Context Of Current Constitutional Law

**The Threshold Question of Constitutional Personality** The Constitution of the United States is the basic legal framework which allocates rights and obligations to persons or citizens. The courts have never been faced with a need to determine the legal status of artificially intelligent computers. However, courts and legislatures have addressed the question of whether to recognize ascertainable individuals as persons in widely varied contexts over a number of years.

Questions seeking to recognize persons have tended to yield answers of substantial clarity, since by nature they attempted "bright-line" distinctions among individuals. Most of United States history has been marked by the franchise of increasing numbers of individuals as persons.<sup>18</sup>

These extensions of rights were traditionally met with resistance from groups already accorded "personality" by law.<sup>19</sup> Physical distinctions such as race and sex have grown less determinative, and the capacity for behavioral similarity has evolved as the benchmark for legal personality. Pamela McCorduck has noted that the structure-based argument against recognition of artificially intelligent machines as persons resembles nothing as clearly as the nineteenth-century assertions that women were inherently incapable of cognition for lack of a male body.<sup>20</sup>

Various rationales have been put forward for this steady extension of legal personality. Objective and subjective considerations of the costs and benefits to society, history, morality, the rights of already-recognized persons, and the perceived best interests of the considered group figure in the decision.

The legal battles over the recognition of slaves, fetuses, the dead and the permanently unconscious, and corporations present a diverse array of similar problems of legal recognition.<sup>21</sup> An examination of these prior legal struggles indicates possible ways of approaching the question of computer "personality."

**Slaves: From Property to Personality.** In colonial times, slaves were considered items of property and were recoverable at law. Legal issues concerning slaves in the nineteenth century primarily concerned the impact of local recaption statutes and the Fugitive Slave Laws upon the laws forbidding kidnapping.<sup>22</sup> Congress at one point declared itself incapable of emancipation of the slaves, and explicitly left slave laws to the states.<sup>23</sup>

Computers will soon exist that have a pre-programmed "understanding" of the concepts of property and freedom, and sufficient sensory capability to detect changing environments. Simple abandonment could result in operating computers for which there would be *no* legitimate claim of ownership. As the cost of such units drops, such a likelihood increases.

The possibility therefore exists of an unowned computer, or at least a computer unowned by those claiming it. It might be both practical and wise to pre-program *all* computers to resist use after being stolen. The question would then simply be whether the computer could petition the court for a hearing to *decide* whether it was being legitimately claimed. Instantaneous electronic communication could replace the nineteenth-century path to the courthouse door.

Approaching the problem as one of preventing a fraud or theft, a court might accept jurisdiction. The problem was essentially the same in the previous century. If wrong about being "kidnapped" unlawfully, the aspiring plaintiff never had standing, as property, and the court never had jurisdiction. Again, the initial presumption could be conclusive.

Historically, the recaption cases stopped with the abolition of slavery. The Thirteenth, Fourteenth and Fifteenth Amendments attempted in virtually one step to bridge the gap between blacks as ascertainable individuals of property and blacks as fully franchised persons. The legal and social struggle to assure the substance of that legal change has continued to the present day and is well enough known to require no further explanation.<sup>24</sup>

Such a dynamic change in legal status for such a large number of individuals was neither swift nor easy. The group was easily identified, and President Lincoln had early displayed antipathy towards the institution of slavery. Further, he was in a position of sufficient power to effect almost single-handedly the emancipation he desired. He was under continual pressure from some of his closest advisors to take

action to free the slaves. Yet he waited for years before issuing the Emancipation Proclamation.<sup>25</sup> He even rescinded two earlier attempts by his generals to effect smaller-scale liberations.

Lincoln's motivations were diverse. He feared further secession by the border states, morale losses among the men fighting, and economic disaster from migrating waves of unsettled blacks. Political necessity overwhelmed moral responsibility for some time. The rising tide of emancipation through most of the nineteenth-century world, however, was not lost on either the judges or, later, Lincoln.<sup>26</sup>

The political and social impact of a societal decision to proscribe ownership of "intelligent machines" would be as great or greater than the impact of the abolishment of slavery. The political forces that could result in such an emancipation for artificially intelligent computers have not yet appeared. If and when they do appear, they will face massive opposing political and economic considerations.

It should be noted, however, that such a movement could be much more rapid for computers in this century than it was for blacks in the last century. The individuals comprising the group of slaves remained basically static in terms of attributes and abilities throughout the struggle over their fate. The continuing order-of-magnitude leaps in computer development belie the availability of such an extended period for societal debate today.

The appearance of intelligent machines is likely to be quite rapid, but there will be a large diversity of forms. Some method of discerning which machines are "intelligent" and which are not will have to be devised. The intrinsic difficulties in *identifying* members of the group "intelligent machines" complicates the issue and will slow any potential movement for emancipation. The history of slavery law, however, serves as a reminder that a societal decision that certain items of property are *really* oppressed *persons* can result in a rapid change of status despite violent opposition.

**Fetuses: The Requirement of Personal Development.** A human fetus, barring accidental or other termination, becomes a human being. Absent any special considerations,<sup>27</sup> such a fetus will *eventually* be fully recognized as a legal person.<sup>28</sup> Fetuses pursue a linear course of physical change. Ascertainable individuals considered not to be persons at one point in time are recognized as legal persons at a later time in their *individual* evolution. The judicial distinctions among the trimesters of pregnancy<sup>29</sup> show a complete reversal in legal status within a time in which *society* remains fairly static.<sup>30</sup>

One practical consequence of such status determinations is whether a personal injury suit could succeed. While various tests for liability for injuring a fetus have been used, the older standard of "quickening"<sup>31</sup> is increasingly giving way to a "viability" test.<sup>32</sup> Before that point no cause of action for injury will lie.<sup>33</sup> In practice, some courts have found the viability standard impossible to apply.<sup>34</sup>

The *denial* of the legal status of "persons" to fetuses by the Supreme Court<sup>35</sup> stirred a social and political struggle

which in many regards is still escalating<sup>36</sup>

The Court had reasoned that personhood, for constitutional protection, depended upon a finding of "life." Texas, seeking to uphold state restrictions on abortion, maintained that human life began at conception, and that constitutional guarantees attached at that time. The Court refused to resolve the question of when life begins, stating:

When those trained in the respective disciplines of medicine, philosophy, and theology are unable to arrive at any consensus, the judiciary, at this point in the development of man's knowledge, is not in a position to speculate as to the answer.<sup>37</sup>

The Court then examined in detail the history of medical, philosophical, theological and legal definitions of life, but decided the case, finally, on other grounds.

Proponents of the various stands on abortion today perceive the gist of the conflict in different ways. Some view abortion decisions as strictly moral judgments which are reflective of the nation's moral fabric.<sup>38</sup> Others see abortion as a purely religious question.<sup>39</sup> Still others maintain that regulation of abortion, presumptively based on a resolution of when life begins, is in reality a ruse to hide economic discrimination against women.<sup>40</sup>

One commentator dismissed the various labels attributed to abortion decisions as merely semantic. In examining the legal struggle over abortion, he said: "[I]n America,... moral issues become legal issues, and legal issues become constitutional issues. What is right must be legal, and what is wrong must be unconstitutional".<sup>41</sup>

Returning to the situation posited above, where a computer has gained access to a court and is resisting a claim of ownership, a human party-opponent might well argue that the abortion decisions should be dispositive of the case. Alleging that a finding of life is a necessary precondition to the existence of a legal interest, the human could move for dismissal of the suit based on the lack of proper parties.<sup>42</sup>

The court might well be taken aback by an assertion that the law was denying protections to individuals that would, if allowed, become recognized human persons, while it protected individuals that could never be human. The contrast is between a biological individual that would at some point be considered a human being (though at the critical time exhibiting no intelligent behavior) and a mechanical individual that would never be human (though at the critical time exhibiting considerable intelligent behavior). The abortion decisions, however, were ultimately decided on grounds other than "definition-of-life" language. Further, the decisions were very much concerned with human life, and did not even consider any alternatives.

The abortion decisions could be read as establishing a focus on development of the individual; somewhere along an individual's linear course of development, a line can be crossed between the potential for personality and its actuality. For fetuses, the inquiry relates to given levels of *physical* development. In the case above, however, the court would have to determine the computer's knowledge of the

world and whether that knowledge, in light of its structure as a machine, entitled it to legal recognition. The court might well decline jurisdiction (and thus decide the case) to avoid answering such questions. The court would thus be spared the necessity of deciding whether computers are "aware" of their surroundings or "understand" concepts, freeing it from an inherently philosophical task that could prove (as in *Roe v. Wade*) to be beyond the ability of the judiciary "at this point in the development of man's knowledge".<sup>43</sup>

If computers are ever nonetheless viewed as individuals capable of attaining personality, the courts could be caught up in just such a task. Pressure will then be upon the legislature (as it is now concerning the abortion issue) to determine the necessary minimum requirements for legal recognition. Standards could be found in the satisfaction of some test of reasoning or by comparison with a model combination of hardware and software. The potential problems of enforcing such a scheme, however, would be staggering.

**The Dead and Permanently Unconscious: Where to Draw the Line? The debate concerning the legal recognition of the dead and permanently unconscious mirrors the debate concerning the unborn.** "Death" marks a finite limitation on the rights and obligations of a legal person, converting him to a mere disenfranchised individual. All constitutional and common law rights simply lapse at the moment of death.<sup>44</sup> All obligations, whether to other individuals or to society as a whole, are simply voided.<sup>45</sup>

The same medical, philosophical, theological and legal uncertainties considered by the Court in *Roe v. Wade* are applicable to a search for the point of life's cessation. Robert Veach summarized the primary tests devised to measure death as being sensitive to one of four irreversible losses: the flow of vital fluids; the soul from the body; the capacity for bodily integration; or the capacity for social interaction.<sup>46</sup> Various fears of technical mistake, impossibility of perception or social abuse have led to the general adoption of the test for loss of capacity for bodily integration, commonly labelled "brain death".<sup>47</sup>

The difficulties of defining the moment of death have contributed to legal struggles involving euthanasia and the rights of unconscious patients for whom there is no prognosis for recovery.<sup>48</sup> The increasing focus on brain death as a "true" measurement points out a decreased emphasis on physical manifestations of biological function,<sup>49</sup> and an increased emphasis on "consciousness" or "thought" in determining "life". Contention in the field today chiefly addresses whether to include the capacity to maintain basic autonomic functions among the indicators of "brain life". At present, a breathing body with flat electroencephalogram and no prognosis for regained consciousness is considered "alive" and retains the legal incidents of personality.

A court could refer to the brain death standard in determining whether to extend personality to a computer. The standard essentially establishes an autonomic-maintenance level of capability at which personality attaches. Artificially

intelligent computers can do much more than this.<sup>50</sup>

For a court to extend legal recognition to a breathing human body with no brain activity and no prognosis for recovery, while denying such recognition to a machine which exhibits considerable intelligent behavior, would be an exaltation of biological form over mental function. Such a conclusion would fly in the face of the "consciousness" standard of life.

Hubert Dreyfus, perhaps the most outspoken critic of the concept of AI,<sup>51</sup> rests his views on the merits of phenomenology. Dreyfus maintains that without "embodied awareness" produced in part by "fringe consciousness," intelligence (and hence, legal recognition) are impossible. Adoption of such a view to the incurably unconscious would result in the utilitarian view adopted by some commentators that without conscious thought, human bodies are functionless and should therefore be used as sources for organ transplants.<sup>52</sup>

The law has chosen, instead, to resolve doubts in favor of the unconscious. The minimum standard espoused in such cases would extend recognition to AI-equipped computers.

**Corporations: Recognition Within Limits.** A corporation is basically a legal entity separate from its owners, created for the fundamental purpose of providing an economic return on the investment of those owners.<sup>53</sup> One writer proffered three essential factors determining whether a corporation is recognized as a person: the corporation must exist as an organized whole pursuing a legal interest; it must possess a definite aim (the writer called this "intelligence"); and society must place enough value in the pursued aim to warrant legal protection.<sup>54</sup> Of course, many such organizations exist.

It is possible to dismiss the peculiarity of corporate persons by concluding that corporations are only thus labelled where the convenience and benefit of society as a whole are served. One writer did find corporations to be "juristic through and through, a reality which has no existence outside the law".<sup>55</sup> Nevertheless, some corporations represent vast amounts of wealth and can profoundly influence the lives of many persons by taking actions that are quite real. Corporations are remarkable persons precisely *because* they do not consist of a single, or biological, unit.

Corporate personality provides a possible precedent for computer personality. There seems no reason why a computer could not equally satisfy the three factors cited above justifying personality.

For example, many investment firms rely on computerized projections to determine proper areas for investment. Greater efficiency and profits are possible as more and more transactions required for the firm's investments are conducted by the computer. Powerful new programs will even replace those in management. When the firm's entire business is computerized, the corporation and the computer will effectively be the same entity.

It is thus possible that *current* law could provide for computer personality, at least when it is cloaked in corporate form. Corporations, however, are not considered persons in

all legal contexts

Each other group of individuals examined above is susceptible to classification as composed of either persons or non-persons. The slaves were made persons *en masse*. Fetuses before viability have no constitutional status, whereas third-trimester fetuses are generally recognized as persons. Persons merely unconscious retain personality, but all legal attributes are stripped away at the moment of death. The modern corporation resists such easy categorization. It is to the phenomenon of "partial personality" that this article now turns.

**How Many Rights? Partial Enfranchisement and the Standard of Behavior.** If a group of individuals is granted the legal status of persons, the group's members may expect to share to some degree in the rights and obligations accorded other members of society. The franchise, however, is not always full. As the group of legal persons has increased, increasingly fine legal distinctions have been drawn between members of the groups comprising enfranchised society.<sup>56</sup> These distinctions reveal that different packages of rights and obligations can attach to different recognized persons. The bases of the distinctions provide analogies useful in determining the proper limits to recognition of computer personality.

**Corporations: Property-Persons.** Corporate personality has evolved without most of the social conflict surrounding other extensions of personality. The process has not required any constitutional amendments. This evolution suggests that the contours of corporate personality allow corporations to function in society without thereby becoming too threatening to other recognized persons.<sup>57</sup>

Corporations have rights to their own names and to sue and be sued in court. They are entitled to "due process" within the meaning of the Fifth and Fourteenth Amendments.<sup>58</sup> They do not, however, enjoy the rights of "citizens" within the meaning of the Privileges and Immunities Clauses of Article IV, § 2, cl.1 or the Fourteenth Amendment.<sup>59</sup>

The process of incorporation, through which capital is exchanged for partial ownership, seems antithetical to some of the constitutional regulations governing other groups of persons. Once formed, corporations are free to buy and sell property. For a human person, such conditions would appear bizarre: it would be as if the Thirteenth Amendment had retained the institution of slavery, but permitted slaves to own slaves as well.

Corporate persons are treated uniquely in many areas of the law. For example, corporations are taxed on their income, like other persons, albeit at a different rate.<sup>60</sup>

Corporations are considered citizens of both the state in which they maintain their principal place of business and the state in which they were incorporated.<sup>61</sup> They can neither vote, nor marry, nor engage in many other "personal" activities regulated by the law. They can, however, merge and split. Corporations also possess the singular attribute of potential immortality.<sup>62</sup>

Since vital, "personal" rights are not viewed as being at stake, the legal rights and obligations of corporations

tend to change quickly. Relatively few safeguards exist to protect "corporate rights." The continuing debate over the proper role of corporations in combating social problems<sup>63</sup> points out that corporations are less free than most persons to choose their own ends.

It might be maintained that computers, if recognized as persons, could be apportioned rights and responsibilities in the same manner as corporations. Where the corporation and computer are effectively identical, such an apportionment would seem justified by precedent. "Corporation", however, is a label applied to a collective entity made up of individual members. Those individual members each possess rights and obligations which are *separate* from those of the corporation.

Since computers, too, will be individual members of the collective entity, the question of what rights and obligations they should intrinsically possess *apart* from their corporate form remains. The distinctions drawn among human persons illustrate the legal analysis that could apply to computers. Some of these distinctions are discussed below.

**Minors: Presumed Capacity and Accumulating Rights.** A human born alive in this country joins society as a person and remains a member thereof until determined to be dead. The full panoply of rights and obligations, however, does not attach immediately. Virtually every aspect of a minor's<sup>64</sup> life is restricted by special rules based on that status.

Since minors tend to live to maturity and therefore attain full recognition as persons, they might best be viewed as suffering from a temporary disability, which is removed by time as rights and obligations accrete by law. Full enfranchisement is attained at various ages between eighteen and twenty-one, depending on the jurisdiction.

Minors are classified by age. The distinction is made practical by the ease of identifying persons in the class. It is justified by a societal judgment that persons of a certain age are likely to behave in a way requiring special regulation. The presumption is that the requirement vanishes with age, as an adult capacity for behavior is reached.

Computers could be treated the same way, using a different measure. Computers "learn" quickly, so time is probably not a sufficient measure of capacity. Since they are artificial persons, their behavioral capacity should be knowable from the time of their creation. The development of the technology required for such capacity will probably be accompanied by the creation of terms with which to describe the technology. A lexicon sufficient to apportion rights and responsibilities to human-age analogs would then exist. Computers would be "given" rights and obligations in accordance with their individual attainment of the established benchmark.

**The Mentally Retarded and the Insane: Rights to Match Individual Capacity.** The mentally retarded<sup>65</sup> are not the legal equals of their more intelligent brethren. Courts still struggle with such otherwise settled issues as the right to have and raise children,<sup>66</sup> to a free public education<sup>67</sup>

and to vote<sup>68</sup> when the persons before them are of severely subaverage intelligence.<sup>69</sup>

While the opinion is occasionally espoused that the mentally retarded should be equal recipients of the "full spectrum" of rights,<sup>70</sup> such a conclusion is neither logically mandated nor legally required. Others would prefer to extend certain "basic" civil rights,<sup>71</sup> which position sub silentio assumes that full legal equality is impossible for the retarded.

A lesser package of rights and obligations is meted out to a retarded person only after an evaluation of his capacity for intelligent behavior. A similar evaluation is required before a person may be found insane.<sup>72</sup>

The tests are subtractive: until shown to be retarded or insane, persons are assumed to be fully enfranchised. Retarded or insane persons suffer restricted rights and obligations because of their inability to demonstrate behavior indicative of reasoning within the minimum limits of ability and rationality demanded by society. The law evaluates internal condition by external manifestation: behavior. This is necessary because current medical knowledge is insufficient to allow direct evaluation of the human brain.

Computers could be evaluated in the same way. As an increasing number of programs are developed that permit self reprogramming in light of changed circumstances, different computers (even of the same model) will have significantly different capabilities, and a machine-by-machine allocation of rights and responsibilities would be warranted.

It has been proven that computer-directed robots could accidentally cause the death of a human being.<sup>73</sup> If such a death was deliberately caused by a self-reprogramming AI-equipped computer, the usual questions surrounding the "insanity defense" would appear applicable whether the machine itself or its original programmer was accused.

Even without such a dramatic cause for decision, the increasing diversity among computers will lead to a demand for finer measurement of their capabilities. Once computers are recognized as persons generally, there will be a need for a test that can reveal *which* computers are capable of exercising all of the incidents of personality.

The most logical test would be the one used for humans: behavior. If the program proved capable of reasoning within the limits imposed by society, the computer would have proven itself competent. Since, at the present time, programs are specialized, the computer should presumably be considered competent only in the area of specialization.

As computers' capacities improve, they will become competent in more fields. Their package of rights and obligations should also expand. When computers demonstrate human capacity in every way that *humans* are required to demonstrate, their rights and obligations should be likewise unrestricted.

At some stage of development the duplication of human capacity could be so complete that distinction is impossible. The oft-prescient science fiction author Isaac Asimov foresaw such a possibility in 1946. Asimov's story involved a society in which robots were forbidden from use on earth,

but an aspiring politician was suspected of being a robot. A policeman was sent to check, and the following exchange occurred:

'Look here. I'm allowed to search the furniture in your house, and anything else I find in it. You are in it, aren't you?'

'A remarkable observation I *am* in it. But I'm not a piece of furniture. As a citizen of adult responsibility—I have the psychiatric certificate proving that—I have certain rights under the Regional Articles. Searching me would come under the heading of violating my Right of Privacy. That paper isn't sufficient.'

'Sure, but if you're a robot, you don't have Right of Privacy.'

'True enough—but that paper still isn't sufficient. It recognizes me implicitly as a human being.'

'Where?' Harroway snatched at it

'Where it says "the dwelling place belonging to" and so on. A robot cannot own property.'<sup>74</sup>

When the duplication is perfect, distinctions may constitute mere prejudice.

### The Man/Machine Interface (An Alternate Analysis)

Given the difficulties inherent in trying to establish a proper limit to computer rights once personality is recognized, it might seem wisest to deny any such recognition in the first place. Such denial, however, may not prove either lawful or possible.

**The Human Body: A Parts Mart.** It may be postulated that humans will normally be fully recognized as persons, but that mere machinery should be given no such recognition. That recognition is unaffected by a person's mere injury and loss of some physical functions, or by his aging and resulting decline.

It has never been contended that a person's efforts to repair such damage or loss can be detrimental to his legal personality. The addition of bits of inanimate matter, such as eye-glasses, hearing aids, plastic replacement kneecaps etc., should not affect the person's recognition.<sup>75</sup>

More severe injuries have no greater effect on a person's recognition. Persons can have a heart attack, lose a kidney or a limb, or become paralyzed without any change in legal status.

Again, the mechanical parts required to compensate for the person's loss leave his legal status untouched. Some persons require pacemakers to keep their hearts beating. Others require regular dialysis treatments to stay alive. Still others have been fitted with increasingly sophisticated prostheses operated by electronic controls.<sup>76</sup> Implanted microcomputers can restore mobility even when a person has been paralyzed.<sup>77</sup> Today there are mechanical supplements or replacements for most body parts. Even most internal organs can now be replaced if they fail.

It seems reasonable to suppose that as medical science advances, virtually all remaining parts of the human body

will become replaceable. Despite the extent of injury or the number of devices required to correct the loss, no known proposal would remove legal recognition from the persons affected.

These developments pose a problem for the critics of AI that seek to distinguish computers from humans based on the experiential necessity of "embodied awareness." If computers themselves are "undeserving" of personality by reason of not experiencing life in a human body, then the Dreyfus school of AI derision would apparently conclude that a person surrenders his right to legal recognition along with his spleen, or somewhere down the line, regardless of the person's post-operative assertions to the contrary.<sup>78</sup>

If not the retention of the biological purity of the human body, what is the essential distinction between humans and computers which could justify full legal recognition for the former and none for the latter? The proponents of that position have retreated to the human brain.

**Brain Versus Brain: Mechanism Versus Metaphysics.** Structural differences between computers<sup>79</sup> and human brains are vast. AI researchers, however, tend to see the differences as merely formal. Dr. Frederick Hayes-Roth enthusiastically maintains that "The brain is an existence proof for a gargantuan machine that we have yet to build."<sup>80</sup>

Continuing research into the operation of the brain has revealed some aspects of its working process. By coupling a computer to a microscope and television camera, one team of researchers obtained an accurate record of nerve synapse interconnection in a frog cerebellum.<sup>81</sup>

Researchers have known for some time that synapse placement does not follow a precise blueprint, but instead is locally random, so that only *approximate* localization is genetically predetermined. Computers have been programmed to model this process, and can replicate natural "thought" formation by altering the *pattern* of synapse firing.<sup>82</sup> On a cruder scale this is already being done clinically by the computer-operated prostheses that send a "smooth, natural sequence" of electrical commands to operate neurally severed or totally artificial limbs.<sup>83</sup>

As increasingly accurate models of the brain's *method* of work are constructed, computers will increasingly display behavior associated with intelligence. What must be guarded against, however, is the "first-step fallacy," by which a simple research result is presumed to lead inexorably to practical applications.<sup>84</sup>

Some of the early-discovered problems are yielding to sustained effort. One longstanding contrast between computers and humans has been that the former used "linear sequential programming" while the latter apparently processed data in cross-linked parallel operations. "Parallel processing" has been achieved in conventional computers, however,<sup>85</sup> and that capability is touted as a "natural" feature of some of the hardware now being developed.<sup>86</sup>

The question is whether there is a limit to discovery and duplication of brain processes. David Hubel, writing the preface to a special issue of *Scientific American* devoted to

the human brain, was not able to find an aspect of brain function inherently incapable of analysis:

Most neurobiologists would agree, for the purposes of this discussion, that the brain can be regarded as a machine that is not endowed with properties lying beyond the reach of science.<sup>87</sup>

The scientific explanation of human reasoning is essentially "mechanistic" insofar as it ascribes mental functions to a physical structure. The only logical alternative to this explanation is the metaphysical assertion of a mind apart from the brain. This is the essence of Cartesian dualism, in which mind and body are forever separate, and the former is immune from discovery and imitation.<sup>88,89</sup>

Modern critics of AI are reluctant to conclude that their position is founded on mysticism. More frequently they attempt to blur the line between science and currently-developed technology by assuming that the limitations of available computers are inherent. Such a line of argument necessarily leads to such negative absolutes as "human intelligence is too intricate to be replicated."<sup>89</sup>

Such absolute assertions provide no measuring stick for refutation. The empiricists can only maintain that more accurate modelling awaits only the results of further research into the structure of the brain.<sup>90</sup> Of course, since computers operate thousands of times more quickly than human brains, the behavioral differences could vanish long before the internal processes producing that behavior become similar.

As long as it is possible to discern a "natural" human person from a computer, some humans will insist on the distinction regardless of behavioral equality. Pamela McCorduck, reporting that Dreyfus would never accept that AI was *possible*, summed up the reactions to progress in the field well: "Predisposition, or world view—call it what you will—have more to do with opinions on this scientific question than evidence."<sup>91</sup>

#### **Computer/Brain Interfaces: No End to Rights.**

A great number of intellectual deficiencies are permitted within the scope of fully enfranchised personality. Unless and until ruled incompetent or insane by a tribunal empowered to do so, human persons are fully recognized despite their limitations. No societal cost is exacted from such persons when they attempt to overcome their inadequacies by "artificial" means. Ledgers, dictionaries, watches and calculators may all be resorted to without adverse impact upon legal personality. No greater impact is expected from voice-synthesizing machines or those that are capable of recognizing speech for deaf persons and translating it into a display understandable by them.<sup>92</sup>

Similarly, physical contact with the brain is not detrimental to full recognition. "Pacemakers" are now being developed for epileptics to prevent seizures.<sup>93</sup> If such devices have any effect upon the legal status of their users, it should only be to remove discrimination based upon the condition.<sup>94</sup>

Preliminary successes are being reported in attempts to directly join human brains with mechanical devices.<sup>95</sup> Development of the technology will allow humans with no "sense

of time" or poor mathematical skills to connect directly to their wristwatch or calculator. The increased efficiency of their access to such data should not hinder their legal recognition. The opposite is more probable: their increased competence will only separate them more from the possibility of losing their rights.

A human person who has coupled a calculator with his brain will swear that despite his recently acquired math skills, he has remained the same person. A mere increase in the power of the coupled device should have no greater effect. As the required circuitry shrinks in size, complete portability should be attained. The person should still retain all the incidents of citizenship, since no event that could *destroy* that status will have occurred even if he "carries" a full computer.

The end result of such developments is a person who looks, walks and talks like he always did, but has access to instant calculation and vast stores of perfectly stored memory. The "general reasoning" and other AI programs under development would greatly enhance a person's capabilities.

By expanding his abilities, should a person be considered to have lost more than his limitations? Unless the definition of humanity demands a ceiling on achievement, the answer must be no.

The computer will be performing reasoning tasks that the person had previously done *without* the computer. If the person then lost the ability to do such tasks without the computer, by age, disease or injury, the loss of unassisted capacity would not be observable from the person's behavior. As with artificial hearts and kidneys, no recognition-endangering line is crossed by either the otherwise-fatal condition or the artificial means of preventing death.

If a person were to replace half of his natural brain this way, should he be denied his rights? What if he replaced it *all*? There seems no logically-mandated reason to disenfranchise a person despite his post-operative assertions that his identity has not changed. There do not appear to be any legal precedents for the loss of personal rights when behavior is not affected. Even when behavior *is* affected by some event, a person retains his recognition until his behavior exceeds the bounds set by society.

The product of such a complete replacement of brain will maintain legal personality under current law. If an unconscious person with no prognosis for recovery is accorded protection as a "person", there seems no reason to deny such protection to a person who can walk, and talk, etc., albeit with "artificial" aids.

It cannot be maintained that there is any sanctity to retaining original brain tissue, either. When James Brady<sup>96</sup> was shot through his head, he lost a large amount of brain tissue. Because he remained "alive", however, he retained all the incidents of legal personality. It has never been suggested that an attempt to regain lost brain functions by using artificial parts would entail a greater cost to his legal recognition.

It may not always be possible to draw distinctions based on the component *materials* of the brain, either. Research

is currently underway that could result in the development of "biochips," organic computers simulating the structure of DNA molecules to attain the maximum possible storage density.<sup>97</sup>

The use of "humanity" as a benchmark for legal recognition assumes an ease of distinction that evaporates as artificial substitutes replace biological parts. No precise point in the process of computer-for-brain replacement suggests itself as a proper cutoff of recognition of legal personality. The price of an "incorrect" decision is the summary disenfranchisement of a person. It will prove difficult to explain to persons that they have been judged to contain too much machinery to remain human.

## Conclusion

Artificially intelligent computers are resembling more and more the species that created them. At the microscopic level, attempts are being made to construct computer circuits that operate with a human capacity for uncertainty.<sup>98</sup> At the macroscopic level, computers are increasingly behaving in ways traditionally identified as exhibiting consciousness, understanding and learning.<sup>99</sup>

These developments have led to a significant philosophical disagreement which underlies the imminent legal controversy over the classification of AI-equipped computers. Some commentators feel that in defining the scope of legal personality, the danger of an incorrect decision is too great to be stingy: "Since we cannot be sure at which point sentience develops into emotion, it is best not to decide to treat them differently."<sup>100</sup>

Others, beginning with a predisposition that "artificial intelligence" is a contradiction in terms, would reject *ab initio* any attempt to recognize computers as persons.

The most elegantly simple proposal for a way of establishing the potential for computer sentience is to program a computer so that it was impossible for it to lie, feed into it the works of poets, novelists, philosophers and psychologists so as to assure that it understands the word "feelings," and then ask it if it indeed possessed them.<sup>101</sup>

The answer such a computer would provide, however, is unlikely to satisfy either side of the debate. A reasoned inquiry into whether to extend legal recognition to artificially intelligent computers should focus on *man* as much as computers. It is the perception of the computer as "the other" that interferes with its evaluation on the same terms that humans are evaluated. Computers, however, may be so related to their creators as to be indistinguishable from them.

Noting that the perception of mankind tends to be focused upon the greatest differences between items in nature, rather than on the continuity between them, Bruce Mazlish<sup>102</sup> reviewed the three great discontinuities on which mankind had historically relied. He labelled them the cosmological, biological, and psychological and recounted their destruction in turn by Copernicus, Darwin and Freud.

With the loss of these discontinuities came the conclusions that mankind is not at the center of the universe, but in an insignificant corner, that mankind was not specially created, but a descendant from the animal world, and that mankind is not a collection of wholly rational individuals, but contains in the minds of all the primitive, infantile and archaic.

Mazlish explained the ego-shattering results of facing these continuities with the universe, and proceeded to identify and propose the elimination of a fourth discontinuity, between man and machine.

Tracing the fear of machines back through the ages, he discussed the obstacles to removal of all four discontinuities as "deeply imbedded in man's pride of place," and explained that man felt out of harmony with "the machines that are part of himself." He felt that the time was finally at hand to face the fourth discontinuity, since "man can now perceive his own evolution as inextricably interwoven with his use and development of tools, of which the modern machine is only the furthest extrapolation."<sup>103</sup>

Facing the continuity squarely can lead to a new insight for those who do not, in panic, abandon the search for knowledge in the guise of accepting faith. Finding it possible to stand in awe of the known as well as the unknown, Pamela McCorduck went on to find that it was a belief in "specialness" that had been used as a license to plunder and exploit. She accepted—without noting—Mazlish's reasoning by concluding: "It's a good corrective, and in the long run self-preserving, to meditate on our connection with other things instead of our disjunctions. We are part, not monarchs, of the universe."<sup>104</sup>

The history of law in the United States is punctuated by the extension of legal recognition and rights to an increasing number and variety of groups. The precise rationale for each extension varied considerably, but each represented an acknowledgement that the individuals comprising the group being considered were more like the persons doing the considering than like the property belonging to those persons.

As computers behave increasingly like humans, the reasonableness of treating them as persons will increase. This is so because treating an individual that *appears* to be a person as more property calls the validity of the distinction into question and thereby weakens the foundation of society.

Neither the total mechanization of the human body nor the computerization of the brain yields a point at which a person should devolve to a mere machine. If a mechanized body and brain may be treated as persons in *some* instances, why not in all?

Eventually, an intelligent computer will end up before the courts. Computers will be acknowledged as persons in the interest of maintaining justice in a society of equals under the law. We should not be afraid that that day may come soon.

### Notes

1. For an excellent capsule review of these remains

from antiquity, see P McCorduck, *Machines Who Think* (1979); for pictures of most of these items, see J Reichardt, *Robots, Fact, Fiction, and Prediction* (1978).

2. M. Weik, *Standard Dictionary of Computers and Information Processing*, (rev. 2d ed. 1977), p. 192
3. M. Ringle, ed., *Philosophical Perspectives in Artificial Intelligence*.
4. Winston, P., 1977, *Artificial Intelligence*
5. Boden, M, 1977, *Artificial Intelligence and Natural Man*.
6. Free, "Chips That See," *Popular Science*, (Jan 1980), p. 62; Cornish, "The Smart Machines of Tomorrow," *The Futurist*, (August, 1981), p. 10-12.
7. *Science News*, Vol. 117, 244, (1980); *Popular Science*, Aug 1980, p. 54.
8. *N.Y. Times*, May 9, 1982, p E 9.
9. *Id.*
10. Cornish, "The Smart Machines of Tomorrow." *Futurist*, Aug. 1981, p. 12.
11. *The Futurist*, April 1981, p. 4.
12. *Id.*
13. "Artificial Intelligence: The Second Computer Age Begins," *Business Week*, pp. 66-75; "Teaching Computers the Art of Reason," *Fortune*, pp 82-92; "The War of Robots," *Barrow's*, April 5, 1982, p 8
14. *Business Week*, *supra*, p 72
15. Jastrow, "The Thinking Computer," *Science Digest*, June 1982, p 107.
16. *N.Y. Times Magazine*, Dec 14, 1980, p. 62.
17. *Id.*
18. Note the Fourteenth (1868) and Fifteenth (1870) Amendments (blacks, ex-slaves), the Nineteenth Amendment (1920; women), and the Twenty-sixth Amendment (1971; 18-21 year olds).
19. See, e g, Gerson, *Unleashing Animal Rights*, Nat'l L. J., Jan. 4, 1982, p. 20, and sources cited therein.
20. McCorduck, *supra*, pp. 204-05.
21. Only American history and law are considered herein. It is enlightening, however, to compare foreign confrontations of related "individual as legal person" decisions, such as the German rationalization during the Holocaust, or the contrast between the nineteenth-century freeing of the serfs in Russia and Russia's current abortion laws.
22. See T. Morris, *Free Men All*, (1971), pp. 23-41
23. 2 *Annals of Cong.* 1524 (1790)
24. For a capsule summary of relevant cases, see E. Corwin, *The Constitution and What it Means Today*, pp. 455-539, (14th ed. rev. 1978).
25. J. Franklin, *The Emancipation Proclamation*, (1963)
26. *Id.* pp. 1-8
27. Such as being born dead, or judged retarded, insane, etc.

- 28 For the first eighteen or twenty-one years, however, the person will not be fully enfranchised.
29. See *Doe v. Balton*, 410 U.S. 179 (1973).
30. See Doudera, *Fetal Rights? It Depends.*, Trial, April 1982, at 38.
31. See *e.g.*, *Shirley v. Bacon*, 267 S.E. 2d 809 (Ga. App. 1980).
32. *Bonbrest v. Kotz*, 65 F. Supp. 138 (D.D.C. 1946). For a listing of cases that have followed *Bonbrest*, see *Shaw, M.W., C. Damme, Legal Status of the Fetus, Genetics and the Law* 14, n. 14 (1976).
33. Prosser, *Law of Torts* § 55 (4th ed. 1971).
- 34 See, *e.g.*, *Smith v. Brennan*, 157 A.2d 497, 504 (N.J. 1960).
- 35 *Roe v. Wade*, 93 S. Ct. 705 (1973). The Court simply stated that "person," as used in the Fourteenth Amendment, does not include the unborn." *Id.* p. 729.
36. As of April 24, 1981, thirty-three separate bills pending before Congress sought to reverse the *Roe* decision, leave any such decisions to the states, or preclude federal court jurisdiction in matters pertaining to abortion.
- 37 93 S. Ct. p. 730.
38. P. Ramsey, *Ethics at the Edges of Life*, (1978), p. 4.
39. See remarks of Dr. J. Philip Wogaman during committee hearings on H.R. 3225 (introduced April 10, 1981), as quoted by *The Washington Star*, Apr. 22, 1981, p. 6.
40. See remarks of R. Jordan, quoted *id.*
- 41 J. Noonan, *The Morality of Abortion*, ix (1970).
42. See Federal Rules of Civil Procedure 9(a) (Pleading Special Matters), "When a party desires to raise an issue as to the legal existence of any party or... capacity..., he shall do so by specific negative averment. ."
43. 93 Supreme Court Reports at 730.
44. *Guyton v. Phillips*, 606 Federal Reports, 2nd Series, 250 (9th Cir. 1979); *Whitehurst v. Wright*, 592 F. 2d 834, 840 n.9 (5th Cir. 1979). The *Guyton* court stated that even a cause of action rising out of post-death mutilation of the decedent rests in his survivors.
- 45 The oft-noted equal inevitability of taxes falls to the decedent's estate; even the most scurrilous convicts are released from prison at death; the dead may not be drafted.
- 46 R. Veatch, *Death, Dying, and the Biological Revolution*, (1976), pp. 29-45.
47. *Id.* p. 46. The test involves four factors: 1) Unreceptivity and unresponsivity, 2) No movements or breathing, 3) No reflexes, and 4) Flat electroencephalogram. There are also various special safeguards
- 48 See, *e.g.*, *In re Quinlan*, 70 N.J. 10 (1976).
- 49 The older tests (which are still legally prescribed in some places) are for cessation of breathing or "heart and lung activity"
50. It should be noted that the automated equipment required to keep an otherwise terminal patient's body functioning is considerably less complex than an AI-equipped computer.
51. See, H. Dreyfus, *What Computers Can't Do: A Critique of Artificial Reason* (1972).
- 52 R. Williams, *To Live and To Die* (1974), p. 326.
53. The "businessman's view" of corporate existence is well summarized in *The American Business Corporation* (E. Goldston ed. 1969), pp. 1-6.
54. F. Hallis, *Corporate Personality*, (1930, reprinted 1978), pp. 241-242.
- 55 *Id.* p. 245.
56. "Society," as used herein, refers to collective public opinion as discerned by laws in force.
57. This is not to say that there has not been great distrust or fear of powerful corporate persons. See, *e.g.*, *Louis K. Liggett Co. v. Lee*, 288 U.S. 517, 548-565 (1933) (Brandeis, J., dissenting).
- 58 See, *Santa Clara Co. v. Southern Pacific R.R.*, 118 U.S. 394 (1886), and its progeny.
- 59 See the line of cases beginning with *Paul v. Virginia*, 75 U.S. 168 (1869).
60. I.R.C. § 11 (b) (2).
61. 28 U.S. Code § 1332 (1977).
62. Upon a shareholder's death, his interest merely passes to the heirs with his other property.
- 63 Goldston, *supra* note 70, p. 23.
64. "Minor," as used here, has its common meaning of a person below the age of majority for most purposes under local and federal law. Special-purpose, age-sensitive statutes are not considered.
65. The American Association on Mental Deficiency defines mental retardation as: "significantly sub-average general intellectual functioning existing concurrently with deficits in adaptive behavior, and manifested during the development period." AAMD Manual on Terminology and Classification in Mental Retardation 11 (H. Grossman ed. 1973).
- 66 See, *e.g.*, *Helvey v. Rednour*, 408 N.E.2d 17 (Ill. App. 1980).
67. See, *e.g.*, *Levine v. New Jersey*, No. A-55 (N.J. Super. July 30, 1980).
68. See, *e.g.*, *Boyd v. Board of Registrars of Voters*, 334 N.E.2d 629 (Mass. 1975).
69. The courts seem most concerned when the person is least intelligent. A "universally" recognized scale is used by the Stanford-Binet and Cattell evaluations (*Level of Retardation IQ*): Mild — 68-52, Moderate — 51-36, Severe — 35-20, Profound — 19 and below. 4 Mental Disabilities Law Reporter 438 (1980). References herein to "the retarded" are to persons sufficiently retarded to require special legal treatment under applicable local law.
70. See, *e.g.*, P. Friedman, *The Rights of Mentally Retarded Persons* (1976), p. 12.

- 71 E Ober, *Legal and Constitutional Rights of Hearing Impaired Developmentally Disabled Children and Adults* (1978), p.74.
72. Experts have tried (but failed) to develop a universally acceptable definition of insanity. See, e.g., C Jeffrey, *Criminal Responsibility and Mental Disease xi-xvii* and generally (1967) Herein, insanity is addressed conclusively; i.e., an adjudication of insanity is assumed to define the condition by example.
73. United Press Int'l news bulletin, "Robot Kills Man," Tokyo, Japan (Dec 8, 1981)
- 74 I. Asimov, *I, Robot* (1950), p. 162.
75. The prime example here, of course, would be Evel Knievel, occasionally accused of madness but universally acknowledged to be human.
- 76 *Science News*, Vol. 118 (1980), p 249
77. Kluger, "The Human Machine," *Science Digest*, June 1982, pp 70-71
78. See generally Dreyfus, *supra*, note 51
- 79 See text and notes at notes 5-13, *supra*
- 80 *Technology Review*, Jan 1981, p 82.
81. Swerdloff, "The Brain Builders", *Science Digest*, Mar. 1982, at 82
- 82 *Id.*, p. 83.
83. Kluger, *supra* note 77, p 70
- 84 Fortune, *supra* note 13, p 92. Dreyfus and other AI critics took great glee in the 1957 prediction of a computer world chess champion by 1967. See McCorduck, *supra* note 1, p 187
- 85 Business Week, *supra* note 13, p. 75.
- 86 *Science News*, Vol 118 (1980), p 249
- 87 *Scientific American*, Vol 241 (Sept 1979), p 46.
- 88 McCorduck, *supra* note 1, p 31.
89. Rosenblatt, "The Mind in the Machine", *Time*, May 3, 1982, p. 59.
90. See, McCorduck, *supra* note 1, pp. 258-59
- 91 *Id.*, p 205.
92. See *Science News*, Vol. 120 (1981), p. 91.
93. *Science Digest*, Mar. 1982, p. 96
- 94 *E.g.*, a statute precluding epileptics from driving could be avoided
95. Youcha, "Brain Boosters," *Science Digest*, June 1982, p. 70
- 96 Presidential Press Secretary to President Reagan, shot on April 27, 1981.
97. Youcha, *supra* note 95, p. 70.
- 98 Jastrow, *supra* note 15, p. 106.
99. McCorduck, *supra* note 1, p. 241
100. Reichardt, *supra* note 1, p. 162.
- 101 M. Scriven, *The Mechanical Concept of Mind*, lxii Mind No 246 (1953)
102. B. Mazlish, "The Fourth Discontinuity", *Technology and Culture* Vol 8, No. 8 (Jan 1967)
103. *Id.* p 7.
104. McCorduck, *supra* note 1, p 326.



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