The Artificial Other

Discussion Questions and Reading Assignments

I. Is There Intelligent Life in the Universe? Us, Them, and Them Who Might Become Us

- **Human and Artificial Consciousness**

Why are human beings fascinated by AI? □ How can you tell whether something is alive or not? □ What makes a human behave in a certain way? □ How do we know every member of our class is human? □ What metaphors do we use to describe our minds and brains? □ Are computers conscious? □ Is consciousness necessary for thought? □ Is the consciousness requirement for artificial intelligence solipsistic? □ Airplanes do not fly the same way as birds, yet no one disputes that they are indeed flying. Does machine thinking have to "look like" human thinking in order for it to be classified as thinking? □ Would we be able to recognize machine thinking if it didn't look like human thinking? □ If a machine exhibits a convincing constellation of behaviors consistent with consciousness and intelligence, is it in fact indistinguishable from consciousness? □ Do humans, unlike computers, have intrinsic intentionality? □ Is human uniqueness an illusive kind of species prejudice? □ Does the existence of artificial intelligence demonstrate the uniqueness of humankind, or weaken this claim?


McCorduck, *Machines Who Think,* ch. 8


McCarthy, "What is Artificial Intelligence?" 31-36; Luger, "Artificial Intelligence: Structures and Strategies for Complex Problem Solving," 37-53; Searle, "Is the Brain a Digital Computer?" 193-201

- **Animal Intelligence**

What do we know about the relationship between human and animals that might be gainfully applied to the relations between human and machine? □ Are animals intelligent but not conscious? □ Do dogs and cats feel guilt when confronted with a hole in the yard or a shredded curtain? □ Does this make them self-conscious? □ Are dolphins, giant squid, whales, and sharks on the same continuum with human intelligence? □ Are plants conscious? □ Do they have memories? □ How does a rock resist becoming something else? □ Do rocks have internal monologues reminding them that they are rocks?


Moravec, *Robot: Mere Machine to Transcendent Mind,* ch. 7

- **Alien Intelligence**

What do we know about the differences between Western and Eastern thinking that might be applied to our understanding of artificial intelligence? □ Does the Japanese mind work the same way an American mind works? □ Can the Asian mind be considered, in any way, alien or strange when compared against so-called Western minds? □ Do minds the world over experience the same Jungian archetypes (Earth Mother, fallen angel, etc.)? □ What advantages might accrue from the opportunity to examine an alien intelligence from beyond the solar system? □ What might the discovery of alien life tell us about ourselves that we do not already know? □ What is the likely outcome of a human encounter with an alien intelligence?

 Kurzweil, *The Age of Spiritual Machines,* ch. 3

- **Intelligence Tests**

Can we detect the consciousness and intelligence of other humans by objective measurement? □ Assume that standardized tests promote the idea that every question has only one right answer, and that the measure of a person is a number. Does this have anything to do with artificial intelligence? □ Are there different kinds of intelligence? □ What's the difference between an emotional quotient, an IQ score, and a spatial reasoning score? □ Are Jeopardy winners smart in the same way spelling bee winners are smart? □ Why are so many of these intelligence tests time-dependent? □ What is the fallacy of concreteness, and how might it apply to an understanding of intelligence?

 Turing, "Computing Machinery and Intelligence," 94-104; Hutchens, "How to Pass the Turing Test by Cheating," 105-113

- **Machine Intelligence**

Can computers think? □ Can computers understand the arithmetic operations they perform? □ Can computers reason scientifically? □ Would machines need to exhibit the capacities for remembering and forgetting in order to evince true intelligence? □ Does intelligence require not only the acquisition and weighing of sensory experience in gaining knowledge, but also "unlearning" or extinguishment of things already learned? □ Can we prove a computer is not conscious? □ Do people anthropomorphize their computers in the same way they do their cars?

 Hearst and Hirsh, "AI's Greatest Trends and Controversies," 77-86; McCarthy, "Little Thoughts of Thinking Machines," 187-190; Dennett, "Consciousness in Human and Robot Eyes," 202-208

II. Automatons, Information Theory, and Cybernetics

- **Early Automatons and Thinking Machines**

Is artificial intelligence a Western idea? □ Who was Hero of Alexandria? □ What is the mechanical philosophy? □ What was Lady Lovelace's objection to the idea of thinking machines? □ Are computers mainly infallible stores of information, statistical and symbolic machines (facilitators of product), helpmates in the production of knowledge (facilitators of process), or watchdogs, surveillers, dummy testers and monitors (gatekeepers)?


McCorduck, *Machines Who Think,* ch. 1


Mazlish, "The Man-Machine and Artificial Intelligence," 3-15; Ormsby-Lennon, "The Dream of Mechanical Life," 16-19; Standage, "Artificial Intelligence: Monster in a Box," 20-23; Wood, "Living Dolls," 24-26; Schaffer, "Wise Guys and Living Dolls," 27-28

- **Information Theory and Uncertainty**

What is information? □ What is information theory? □ What is the legacy of physics research where information theory is concerned? □ What is meant by the "information processing" approach? □ How is deconstructionism a product of the information processing approach? □ How does it relate to theories of probability and uncertainty? □ Could a machine ever understand ambivalence or uncertainty? □ What is Gödel's theorem? □ Does Gödel's theorem show that machines can't think? □ Do mathematical theorems like Gödel's show that computers are intrinsically limited? □ Can human beings solve Gödelian unsolvable problems? □ Will we know a machine is thinking when it is able to solve hard problems humans cannot solve, or when it solves problems that humans have found difficult to solve? □ What is fuzzy logic? □ Can deterministic systems produce random results? □ Can random systems produce deterministic results? □ What is infoglut? □ Can too much information be a bad thing?


McCorduck, *Machines Who Think,* ch. 2 & ch. 6


Hayles, *How We Became Posthuman,* ch. 3


Lucas, "Minds, Machines, and Gödel," 87-93

- **Cybernetics**

What is cybernetics? □ How is it a "metascience"? □ What does it have to do with gunnery and range finding? □ What is homeostasis? □ Do humans operate homeostatically? □ Can machines express holism? □ What is a McCulloch-Pitts neuron? □ Is vitalism a legitimate challenge to the modularity expressed in AI? □ Are

living things fundamentally organic or mechanical? □ Are analog and digital technologies mutually exclusive (neuronal cybernetics)? □ Is it possible to be a holist and a mechanist (Descartes)?

 McCorduck, *Machines Who Think,* ch. 4

 Hayles, *How We Became Posthuman,* ch. 4

 Selfridge, "The Gardens of Learning," 154-163

III. Turing, Logic Machines, and the Crisis of Common Sense

- **The Turing Machine and Imitation Game**

What is a universal Turing machine? □ How did Turing's "imitation game" work? □ Can the Turing test determine whether computers can think? □ Is failing the test decisive? □ Is passing the test decisive? □ If a simulated intelligence passes the Turing test, is it considered intelligent? □ Have any machines passed the test? □ Can all human beings pass the Turing Test? □ Is the test a legitimate intelligence test? □ What's wrong with the Turing test? □ Is the Turing Test mere trickery? □ Should it now be retired? □ Would the Turing test work on alien intelligences, or is it too human-centric? □ When a computer is tested for intelligence, it is by a human being. When human beings are tested, who is it that is administering the test? □ What is computational autism?

 McCorduck, *Machines Who Think,* ch. 3

- **Logic Machines**

What were George Boole's Laws of Thought? □ How does Herb Simon and Allen Newell's Logic Theorist work? □ How does the General Problem Solver (GPS) work? □ What is recursion? □ Is cognitive dissonance scientific? □ Can computers draw analogies? □ What is the Chinese Room argument? □ Is the Chinese Room argument circular? □ Can the Chinese Room, considered as a total system, think? □ Do Chinese Rooms instantiate programs? What is pattern recognition?

 Minsky, "Steps Toward Artificial Intelligence," 54-76

- **Common Sense and Expert Systems**

How can a human solve a problem by brute force? □ Is there any other way? □ What is commonsensical thought? □ What does it mean to favor a commonsensical solution? □ Is common sense timeless? □ Is it possible to firmly believe in two

contradictory things at the same time? □ Is true cognitive dissonance possible? □ Where is intelligence located—in logical thought, or in banks of expert knowledge? □ Do human beings complete many tasks by deploying the same general methods or protocols? □ Or is every situation different? □ Is it true that just about anything can be defined by answering no more than twenty questions? □ How does an expert system work? □ Can symbolic representations account for human thinking? □ What is a heuristic? □ Do human brains use heuristics as physical symbol systems do? □ Do physical symbol systems play chess the same way humans do? □ What is list processing? □ What is a pruning strategy? □ What does a knowledge engineer do? □ What's the knowledge representation problem? □ What's the knowledge acquisition bottleneck? □ What problems are there with natural language processing? □ What other problems do expert systems have? □ What is chunking? □ What is the Neats vs. Scruffies holy war? □ Do computers already exceed human intelligence in many specialized areas? □ Will AI research always be hampered by the inability to find suitably interdisciplinary people? □ Does reading involve more than simple knowledge acquisition (KA)? □ Is there any such thing as an absolute where knowledge is concerned? □ If information is socially conditioned and constructed, will Wikipedia entries ever be complete?

 McCorduck, *Machines Who Think,* ch. 11 & 12

 Laird and Rosenbloom, "In Pursuit of Mind: The Research of Allen Newell," 121-130; Simon, "Herbert Simon Remembers Allen Newell," 131-143; Simon, "Allen Newell," 144-153; Feigenbaum, "The Age of Intelligent Machines," 164-167; Dreyfus and Dreyfus, "From Socrates to Expert Systems," 171-176

- **Artificial Intelligence: Contemporary History and Trends**

How important was the Dartmouth Conference to artificial intelligence? How was Sputnik important to the history of AI? □ Why did AI funding shrink at the end of the Vietnam War? □ What was the AI Winter? □ What technologies represented the first commercial uses of AI? □ What are the various disciplines within contemporary artificial intelligence (AI)? □ What is the difference between "strong AI" and "weak AI"? □ What is the difference between "classical" AI and "statistical" AI? □ Is artificial intelligence a metascience today? □ Is artificial intelligence a legitimate sub-domain of computer science? □ Why is artificial intelligence so controversial in computer science, but robotics generally speaking is not? □ What role has cost containment played in the last several decades of AI research? □ What is the "Greek oracle" approach to AI? □ Which do you think was more dangerous for the creation of new technologies: the culture of fear surrounding the Cold War, or the consumerist age of global capitalism?

 McCorduck, *Machines Who Think,* ch. 5 & Afterword

 Kurzweil, *The Age of Spiritual Machines,* ch. 4 & 5


"Proposal for the Dartmouth Summer Research Project on Artificial Intelligence," 114-119; Newquist, "The Brain Makers," 168

IV. Religion and Dignity: The Machine and Human Spirit

- **Human Anxiety**

Are there religious motivations behind robotics, genetic engineering, and nanotechnology research? □ Are we interfering with evolution or God's work if we pursue artificial intelligence, or are we subverting evolution or God's wishes if we do not? □ Does building a human out of spare parts denigrate humankind or elevate humankind? □ As machines become more like people, do people become more like God? □ Who may claim priority in creating robot intelligences and human clones—human or God? □ Are there certain human rules, religious strictures or socionatural laws, that can't—or shouldn't—ever be violated? □ Is the idea of artificial intelligence obscene, immoral or anti-human? □ Are some of the advantages of computers—efficiency, and reduction of waste, elimination of injustice and suffering—incompatible with being human? □ What should a pilot privilege in a crash landing? □ His instruments or his senses? □ What about in a decision that could make or break all of humanity? □ Has technology already identified the God spot in our brains?


McCorduck, *Machines Who Think,* ch. 9

- **The Computer as Spiritual Companion**

Should a machine contemplate questions of God and religion? □ Are there certain actions or ways of thinking that should be contemplated only by human beings? □ Is God a master computer programmer? □ Do humans show signs of intelligent design? □ Does God prohibit computers from thinking? □ Would God ever consider conferring a soul on a machine? □ Why would God exercise the option of refusing to commune with intelligent machines? □ If a machine were to commune with God, would it still be a machine? □ Is spiritual materialism an oxymoron? □ If machine spirituality did exist, what would prevent it from having instant gratification as its hallmark?

- **Robotics and Automation**

How is robotics research similar to, and different from, artificial intelligence research? □ What are the major problems in robotics? □ Most people view as inevitable automation and the development of new technologies like robots. But many workers who lose their jobs consider this business practice unfair. Do you think the development of new technologies, and their implementation, is inevitable? □ What, if anything, should we as a society do for those people who lose their jobs? □ If automation eliminates the jobs of the unskilled, as Kurzweil asserts, why is there so much illegal immigration of unskilled workers into the United States? □ Can automation also threaten highly skilled workers with unemployment? □ Why is there

a persistent labor problem (unemployment and underemployment) in modern capitalist economies? □ Is this the only time in history to have exhibited such a problem? □ Why should we spend millions of dollars to build androids with human abilities, when millions of inexpensive original-model humans are available? □ Could artificial intelligence or other computer devices spark a neo-Luddite movement? □ Is high technology inherently bad or good? □ What does it mean to make a Faustian bargain with high tech? □ Because technology exhibits the disturbing quality of unintended consequences, should humanity avoid the development and implementation of certain technologies? □ Which ones? □ Why are the Japanese world leaders in robotics? □ What is the ningyo tradition and how does it shape Japanese perception of robots?

 Moravec, *Robot: Mere Machine to Transcendent Mind,* ch. 2 & 3

 McCorduck, *Machines Who Think,* ch. 10

 Moravec, "Robotics," 227-232

- **Balancing Our Humanity with Technology**

Are there any kind of robots that shouldn't be created, or that you wouldn't want to see created? □ Should the development of such smart robots be stopped after reaching a certain level of performance? □ Does cloning threaten human dignity? □ Do you have an absolute right to a unique genome? □ Is personal identity reducible to genetic identity? □ Could a human clone be considered an artificial intelligence? □ Is it morally acceptable to clone humans as repositories of organ transplants? □ Should robotics and artificial intelligence join atomic weapons and human cloning as areas of illegitimate science? □ Many of the world's religions extol the virtues of hard physical labor. If robots take up the drudgery of humankind, will humans lose their nobility? □ Is it a good thing that autonomous robots never get tired? □ Will automation ever give us more leisure time? □ Is that a "good thing"? □ Are there any dangers in robot or computer toys, or are they mostly innocuous? □ Space exploration is risky, expensive, and lonely. Should space exploration proceed mainly with cheap and expendable telerobotic technology? □ Should we abandon human space flight altogether? □ Does it violate human decency to remove the eyes of a cat, keep them artificially alive, and use them as the visual receptors of a computer? □ Which is more difficult to justify: (a) war to be fought between nations entirely by machines, or (b) war fought between nations by cockroach-controlled battlebots? □ Is it ethical to use cockroaches to steer automobiles? □ Are robotic technologies "appropriate technologies"?

 McCorduck, *Machines Who Think,* ch. 13

 Berkeley, "Small Robots—Report," 256-260

V. Disembodiment Never Looked So Attractive: Immortality and Machine Diversity

- **Disembodiment**

Are the mind and the body separate entities? □ Is embodiment a real thing? □ Does thinking require a body? □ What happens to the human mind when it is deprived of all or part of its body—as in amputation or sensory deprivation tanks? □ Are most human experiences mental or physical? □ Can embodiment be considered improvisational? □ Is all infotainment—media and entertainment—a form of disembodiment? What about using a telescope or microscope? □ Are your memories disembodied? □ If stereotypes can be described as "pre-recordings" are they too disembodying? □ If you could live 100 extra years in a replacement body made of silicon, would you do it? □ What if you could live an extra 500 years? □ What might the social effects be of digital immortality? □ Is a downloaded person the same person? □ If we destroy a person's body once we have downloaded his mind to a machine have we murdered him? □ Are Star Trek characters committing suicide each time they teleport? □ Is it morally permissible to kill another human being if they've been successfully replicated at a distance? □ Would a cyberspace inhabited by a downloaded humanity necessarily have to be a welfare state? □ How would people be punished for crimes? □ What would happen to people who fell through the cracks of a virtual market economy? □ What happens to cybernated brains that don't pay their utility bills? □ If we decide to download our collective consciousness into computers, what is the chance that we will remain humans? □ How would we protect and maintain those computers once we had all migrated?

 Moravec, *Robot: Mere Machine to Transcendent Mind,* ch. 6

 Moravec, "Pigs in Cyberspace," 439-441

 Hayles, *How We Became Posthuman,* ch. 8

- **Hang in There for Digital Athanatos**

Can robots think? □ Can a combination robot/brain simulator think? □ Is having the option of immortality blasphemous? □ Is immortality a good idea – wouldn't you get bored or something? □ Are people who are resigned to die as dangerous as those to might become immortal? □ What stake do mortals have in the future? □ How likely is it that we will live long enough to live forever? □ Is it fair to say that our conception of death decides our answers to all the questions life puts to us? □ That is, does death give ultimate meaning to our lives? □ What is the LifeLog project? □ Will it ever be possible to record experiences, or will any mechanical form record only events? □ Would a recorded memory of your life still be interpreted subjectively? □ If you could record everything you ever said, heard, or saw would anyone else care to see the recording? □ What kinds of experiences might you permanently delete? □ What sorts of laws would have to be enacted to govern their use? □ What are the privacy implications of a personal memex? □ Are preserving and transmitting your ideas on paper or audiotape forms of immortality? □ Which formats will endure longer? □ Is part of your consciousness actually transmitted in this way? □ Because so much of

her daily life is already meticulously recorded, is it fair to say that Paris Hilton already more immortal than you? □ Would you like to have a monitor built into your tombstone that shows scenes from your life in on endless loop?

 Moravec, *Robot: Mere Machine to Transcendent Mind,* ch. 4 & 5

 Minsky, "Will Robots Inherit the Earth?" 267-271; Vannevar Bush, "As We May Think," 426-433; Bell and Gray, "Digital Immortality," 433-434; Gemmell, et al., "MyLifeBits," 435-438; Pohl and Moravec, "Souls in Silicon," 442-445

- **Nature and Machine Diversity**

Are the resources of the planet limited or boundless? □ Could a robot species wreak global environmental havoc? □ Could a robot species cause our own extinction? □ What about social problem of immortality is connected with population growth? □ Or is technology the only way to make the luxury of a greener environment affordable? □ Are dreams of digital immortality, virtual reality simulators, and even simple television viewing, subconscious and urgent responses to environmental degradation? □ Do we now feel threatened by machines because we've driven our natural predators (lions, sharks, bears, etc.) to the brink of extinction? □ Will machine diversity one day exceed biological diversity? □ Could a post-biological universe actually be more diverse than the biological one we now know? □ Can wild spaces, digital wildernesses, exist in cyberspace? □ Can they be conserved or preserved? □ Is there a relationship between artificial intelligence and the commodification of things? □ Are humans just "products" in an era of cloning?

 Dennett, "We Earth Neurons," 191-192

- **Artificial Life, Computational Complexity, and Emergence**

What is Artificial Life? □ How are Artificial Life (AL) and Artificial Intelligence (AI) related? □ What are genetic algorithms? □ Can automata think? □ Can a computer simulation of a living system ever be considered literally alive? □ Or is this a simple category mistake confusing simulation with realization of a simulation? □ What do we mean by order? □ What is complexity? □ What is computational complexity theory? □ What is emergence? □ What is an evolutionary or genetic algorithm? □ Is "self-organizing" just another way of saying "endowed by God"? □ Who is the maker of a robot capable of remaking itself? □ Is novelty the result of chaos interacting with stable or static systems, as in John Conway's Game of Life? □ What is Herb Simon's "ant on a beach" analogy. Are we humans merely ants on a beach? □ How does a child learn to be ticklish? □ Do you learn more and better by success or failure? □ Are A-Life and genetic algorithms just interesting ideas, or do they have real-world applications? □ What is NP-completeness? □ What is the traveling salesperson problem? □ Imagine the Internet became emergent. How would we know it was alive, or why would it tell us? □ A thermostat may hold three beliefs: (1) it's too cold, (2) it's too hot, or (3) the temperature is just right. Does this make the thermostat sentient? □ Can an intelligence create an intelligence more intelligent than itself?

 Kurzweil, *The Age of Spiritual Machines,* ch. 2

 Hayles, *How We Became Posthuman,* ch. 6 & 9

 Gardner, "Mathematical Games," 335-337; Bedau, "Artificial Life," 338-349

- **Darwin Among the Machines**

Is society really more complex today than it has ever been before? □ Are we humans making ourselves obsolete in the process of creating complex urban societies? □ Is civilization really too complex for all but the specialist? □ Is the Renaissance virtuoso, like da Vinci, an obsolescent concept? □ Are our minds too limited to comprehend and adjust to the product of our own thought and action? □ Can machines really help reduce human emotional anguish? □ Faculty at UCA still teach ancient Greek philosophy. Does that prove we have reached a plateau in our intellectual development as a species? □ Is technological progress inevitable and accelerating? □ Can computing power continue to grow exponentially? □ Is technology just another kind of evolutionary strategy, like Darwinian selection or Lamarckianism? □ Is evolution a kind of programming? □ Does junk DNA prove evolution is a sloppy programmer? □ If natural selection, operating over the millennia, managed to shape an intelligent humanity, why should it be so hard to artificially select for a new robotic humanity? □ Right now our progeny are the product of chance. Should our children be designed? □ Are "learning" and "adaptation" just two other ways of saying "change" and "flexibility"? □ What would happen if we reengineered ourselves into several different species? □ How likely is this? □ What attributes would you add, extend, or delete if you could alter yourself? □ If you could implant into infants the simple, basic skills acquired in the first few years of childhood—potty training, don't touch a hot stove, reading—to speed up the process of human maturation, would you do it? □ What would happen if we reengineered humanity for the purposes of economics rather than evolution? □ Brain boost drugs may soon become as common as coffee. Would this revolution finally put people at fair advantage to one another by leveling the biointellectual playing field?

 Kurzweil, *The Age of Spiritual Machines,* ch. 1

 Moravec, *Robot: Mere Machine to Transcendent Mind,* ch. 1

VI. Posthumanity and the "Death of Man"

- **The Computational Universe**

Have we, or will it ever be possible, to discover programs running in nature? □ Is the world truly analog or digital? □ What are the limitations of analog and digital technologies? □ Is the world as it is the same as our beliefs about the world? □ Where does the Zeitgeist come from? □ Is the world we experience made of atoms, formulas, and natural laws, or something else? □ Can the world be said to be made

of stories? □ Is the world made up of "problems"? □ If so, do they all demand solutions? □ Is there anything wrong with a science that asks, "What is the problem?" and then seeks out a solution? □ What is Kurzweil's Law of Accelerating Returns, and how is it related to Moravec's idea of "escape velocity"? □ Why is the article "What the Frog's Eye Tells the Frog's Brain" considered one of the most important research papers of the twentieth century? □ What is the difference between the observer-relative and observer-independent psychological senses? □ Is mathematics observer-relative ("all mathematics is metaphor") or –independent? □ Is math a language or a science? □ Can computers recognize Gestalts? □ Are all of science and technology culturally determined? □ Is math a science or social construct?

 Wolfe, "Mind, Self, Society, and Computer," 214-224; Lettvin, et al., "What the Frog's Eye Tells the Frog's Brain," 246-55

- **The Self in the Computational Universe**

Is the brain a computer? □ Is it analog, digital, or parallel? □ Is the relation between hardware and software similar to that between human brains and minds? □ What's the difference between a human brain and mind? □ Is the <u>brain</u> really a digital computer? □ Is the <u>mind</u> the software implementation running on top of that computer hardware? □ What is Moore's Law? □ According to Moore's Law, when will computer processing speed exceed human mental processing limits? □ Does software development follow Moore's Law? □ Is intelligence visible on Positron emission tomography (PET) scans? □ Can intelligence be 'seen,' and if not, is <u>that</u> intelligence? □ Do we really use only a fraction of our brains? □ We do not generally think a basic calculator is a thinking thing. Thus, is it fair to say that when we are doing basic addition/subtraction/ division/multiplication we are no longer thinking things? □ Can a computer really compute random numbers? □ Can you? □ What is the "identity from pattern" argument? □ Does all life, all intelligence, have to have material instantiation? □ Or is form, flux, and process enough? □ What are the pitfalls of the identity from pattern argument? □ Why is not knowing what is in the self more comforting to some than knowing it is clockwork or algorithms? □ Is the human mind simply a container into which you pour knowledge? □ Or is all knowledge already inscribed on its folded surfaces, only waiting for an opportunity to be recalled—as in Plato's <u>Meno</u>? □ Are we doing a better job turning machines into human beings or human beings into machines? □ Is our educational system in danger of turning students into human logic machines instead of intuitive problem solvers? □ Can intuition be taught? □ What is genius? □ Is genius on balance a benefit to humanity, or a danger? □ Why are some people good multitaskers ("parallel processors") while others are not? □ Does photographic or mnemonic memory really exist? □ If so, do these people exhibit aspects of intelligent machinery? □ Is mystery an essential part of what it means to be human?

 Hauser, "Why Isn't My Pocket Calculator a Thinking Thing," 177-180; Moravec, "When Will Computer Hardware Match the Human Brain," 237-245

- **Cyborgs and Transhumanism**

What is the point of transhumanism? □ What is a cyborg? □ How are you already a cyborg? □ Is a blind man's cane part of a man? □ Imagine I begin replacing your organs one by one. At what point do you become no longer "you"? □ Are humans really humans in the absence of technology? □ Are we natural-born cyborgs? □ What is a posthuman? □ What is the goal of posthumanity? □ Can posthumans have a shared metanarrative? □ Are there many exclusive kinds of intelligence? □ Was Foucault right—have we already experienced the "death of man"? □ Is it ethical to use biological components in machines? □ Is it ethical to grow manufactured bio-components in human wombs? □ Are cloning, behavior modification therapy, psychotropic drugs, cognitive reprogramming, and genetic engineering the consequences of viewing ourselves as machines? □ Can we consider the brainwashed members of cults just programmed robots? □ Will artificial intelligence always fail in a race against human cloning because the former is economically infeasible, while the latter is not? □ Why bother with all the mechanical tinkering when it's already so easy to make exact copies of humans?

 Hayles, *How We Became Posthuman,* ch. 1, 2 & 5

 Ullman, "Programming the Post-Human," 350-357

 Kurzweil, *The Age of Spiritual Machines,* Epilogue

- **Bioinformatics**

Is biology a life science or an industry as practiced today? □ Does Occam's razor apply to explanations of the "laws of life"? □ What machine metaphors define life? □ Does the discovery of DNA confirm the power of God's Word? □ How is artificial intelligence used in medicine? □ Does informatics make semi-exact medical "mumbo jumbo" scientific? □ What is differential diagnosis? □ How does the Bayesian approach work in medical computing? □ What expert systems have been developed for use in medical care? □ What is a decision-support system? □ What is a critiquing system? □ What are the ethics of computer prognosis? □ Do computers prevent medical errors? □ What is evidence-based medicine? □ What is automated multiphasic health testing? □ Are robots appropriate for geriatric care ("automated eldercare")? □ Is medical computing inherently depersonalizing, or could it be configured as an agent of patient empowerment? □ Would computers make better psychiatrists and physicians because they are disinterested and objective? □ What is computerogenic disease? □ Can disembodiment be reconciled with less invasive body penetrating technologies such as EEGs, EKGs, and scanners? □ Is scanning a form of "remote viewing"?

 Lenoir, "Shaping Biomedicine as an Information Science, 287-303; Kay, "Cybernetics, Information, Life: The Emergence of Scriptural Representations of Heredity," 303-332

VII. A Self-Imposed Cyberia? Virtual Reality, Cyber/sex, and Gaming

- **Virtual Reality**

Why are we so interested in creating a mirror world of bits that perfectly matches our world of atoms? □ Does virtual reality bear any relation to physical reality? □ What is reality? □ What's so unreal about virtual reality? □ Will people still want to visit Aruba or go shopping at the mall long after they no longer need to? □ Hypothetically speaking, how can someone like Truman on the Truman Show ever be considered real? □ After all, he occupied an unreal world, didn't he? □ Is cyberspace a lonely place? □ How would we know if the very moment we are now experiencing might actually be a cyberspace simulation? □ How can we be sure we are not simply the occupants of a forgotten holodeck made by human (or human-like!) ancestors generations ago? □ Why would anyone ever want to leave a holodeck? □ How might future society treat holodeck or VR addiction (so-called "electronic LSD")? □ Are wars real? □ Was the Cold War a real war, or simply a war presented and extended via computer simulations ("neocortical warfare")? □ Were the Gulf and Iraq wars 'real' wars? □ What about Vietnam? □ Is there a difference between simulating intelligence and duplicating it? □ Do we have access to unmediated reality? □ How subjective are human perceptions? □ Is the reality you see the same reality we all see? □ Is our recognition and understanding of such things as pain, time, and color ultimately subjective? □ Is the use of a calculator to solve math problems a form of virtual reality? □ Is using a phone to alert police to the presence of a bicycle thief on campus a form of VR?

 Kurzweil, *The Age of Spiritual Machines,* ch. 7

 Turkle, "Looking Toward Cyberspace: Beyond Grounded Sociology," 397-400; Clark, "On the Future Prospects of Virtual Reality (VR) Addiction," 414-418

- **Cyber/sex**

Is cybersex real sex? □ Can cybersex ever be considered better than real sex? □ Could you contract a virus during virtual sex? □ Does virtual sex threaten the world's oldest profession? □ What will cybersex do to monogamy and marriage? □ Can a "rape" in cyberspace ever be said to be equivalent to a physical rape? □ Are femininity and masculinity forms of automation? □ Is technology inherently pro-war and anti-woman? □ Is disembodied cyberspace more appealing to men because they are solitary, rational, and independent? □ Which sex is considered more in touch with nature? □ Which sex is known for knowing its body and plumbing better? □ How are machines like women? □ How does teledildonics intersect with morality?

 Magnus, "Reality, Sex, and Cyberspace," 401-405; Balderston and Mitchell, "Virtual Vaginas and Pentium Penises," 406-413

- **Fun and Games?**

Is computer chess a good measure of human intelligence? □ Did Deep Blue play chess the way Gary Kasparov did? □ Was Deep Blue not thinking because it was searching rather than using pattern recognition? □ Is Deep Blue a blow to human dignity—or a testament to the ingenuity of programmers and engineers? □ What does it mean to say that a game is "solved"? □ Is tic-tac-toe solved? □ Checkers? □ Chess? □ Minesweeper? □ How do video games inculcate feelings of omnipotence in the game player? □ Is this deliberate? □ Have you every strongly identified with a character in a video game? □ Have you ever felt empathy for one? □ Does Lara Croft allow young men to get in touch with the complex emotional ("feminine") side? □ Do male Tomb Raider players become transgendered?

 McCorduck, *Machines Who Think,* ch. 7

 McCarthy, "Making Computer Chess Scientific," 120; Kennedy, "Lara Croft: Feminist Icon or Cyberbimbo?" 366-371

VIII. Robot (and Human) Rights

- **Robot Rights**

Do we owe robots benevolence? □ Do robots deserve human rights? □ At what point has a machine gone from mere property, to an entity worthy of moral protection? □ Can computers have free will? □ Should computers have emotions? □ What about the capacity for anger? □ Will we have to teach robots that they are at the center of the universe so that they can protect themselves from us? □ Does becoming emotionally involved in your work improve your work or weaken it? □ Can a robot be heartlessly exploited? □ How should we treat our robots from day to day? □ Is it moral to turn them off? □ Would you consider it ethical to reset an intelligent robot's brain if such a thing were possible? □ Is it wrong to smash a robot appendage with a hammer? □ Is it wrong to smash a robot if it has been endowed with a system that actively tries to avoid being smashed? □ If in the future machines have the ability to reason, be self-aware and have feelings, then what makes a human being a human being, and a robot a robot? □ Should battle droids, like the Predator drone, be awarded Purple Hearts or Congressional Medals of Freedom? □ Will we one day have statues on the Mall in the District of Columbia depicting our robot heroes?

 Holst, "Should Robots Be Slaves?" 261-266

- **Robot Judgment**

Can a robot be ethical? □ Would machines have to have inner lives, personal histories, and inner monologues in order to fully comprehend the consequences of their actions? □ Is altruism dependent on an understanding of personal history, which machines do not have? □ Would computers make good arbiters of justice? □

Can computation replace judgment? □ What do human judges know that we cannot tell a computer? □ What about politicians? □ Can robots be charged with homicide? □ Would a robot need to feel guilt or blood lust or any other emotion in order to be charged with a crime? □ When HAL kills, who is to blame?

 Dennett, "Did HAL Commit Murder?" 209-213

- **Human Rights in the Machine Age**

Do humans deserve human rights? □ What would become of humanity if machines made all the most important decisions? □ Could ubiquitous household robots make human slavery more palatable? □ If possible, should criminals serving several consecutive life sentences have their minds downloaded into machines so they can serve out their time? □ What if we could do same-day surgery computer implants to fool a criminal into thinking they had served out their time? □ Could they be released immediately? □ Is punishment for the body or the mind—or both? □ If machines exhibited superior intelligence, would humanity survive the encounter? □ How do Isaac Asimov's Laws of Robotics apply to robot and human rights?

IX. Nanotechnology, Quantum Computing, and Distributed Cognition

- **Nanotechnology, Quantum Computing, and Biocomputing**

What is nanotechnology? □ Is DNA an existence proof of nanotechnology? □ Do self-replicating machines already exist in the form of software code, email spam, viruses, and stem cells? □ Are viruses essentially indistinguishable from self-replicating machines? □ What are the benefits of flexible accumulation? □ What could nanobots do, constructively speaking? □ How does quantum computing work? □ Why is quantum computing a threat to cryptography? □ Does human consciousness exhibit quantum properties? □ Is there a relation between quantum mechanical effects and existential philosophy? □ How might molecular computing work? □ Is using organic elements in a self-replicating intelligence cheating? □ What is the "gray goo" problem? □ Are nanobots likely to be really dangerous, or just a nuisance?

 Kurzweil, *The Age of Spiritual Machines,* ch. 6

 Joy, "Why the Future Doesn't Need Us," 272-283

- **Distributed Cognition**

How autonomous is intelligence? □ Is it the product of the individual? □ Or of society? □ Or of the environment? □ Is it true that culture is just as important in creating humans as human beings are in creating culture? □ Is culture a form of artificial intelligence? □ Does humanity exhibit collective intelligence, or perhaps a humanoid Overmind? □ Are you simply a cog in the vast social automaton known as culture? □

Is there only one of you, or are there many of you? □ Do the brain's two hemispheres indicate that we are each composed of two people living in symbiosis? □ Is your mind one thing or many things? □ Can you consider your mind to be its own society? □ Is the unitary self an illusion, or the most basic reality? □ Do you deploy different selves in different situations and in grappling with different problems? □ Do you still always have a "core self"? □ Can we verify that other people are truly autonomous and self-conscious? □ How do we know other people exist? □ What are other people here for? □ Do other people exist only to serve your own purposes? □ Regarding distributed intelligence—are parts of you *in* other people? □ Are objects in this room part of a smart environment that cannot be separated from your own intellect? □ Is God a distributed intelligence because she interpenetrates everything? □ If you were to describe the Internet as a person, what adjectives would you use to describe it?

 Hayles, *How We Became Posthuman,* ch. 11

X. Computers in Art: Generative Art and Creative Digital Assistants

- **"Giant Brains" in Fiction and Popular Culture**

What themes appear regularly in fictional accounts of machine intelligence? □ Why do we dream of a dystopian future? □ Why have robots with intelligence played so many roles in the movies? □ Has their role changed over time? □ Why do so many science fiction stories focus on sex between robots and humans? □ How are computers portrayed in children's literature ["The Nightingale" precedent of Hans Christian Andersen]? □ Could Sherlock Holmes, Frankenstein, and the Golem be considered artificial intelligences? □ Why are we so amused by Disney animatronics? □ Why is the Pirates of the Caribbean ride so popular? □ Why are people interested in digital personalities like Daft Punk, Max Headroom, and S1m0ne? □ How old were you when you discovered the future didn't need you? □ How old were you when you discovered the future sucked?

 Paasonen, "Best Wives Are Artifacts?" 361-365; Sunden, "What if Frankenstein('s Monster) was a Girl?" 372-377; Franklin, "Computers in Fiction," 378-380; Post and Rose, "AI in Space: Past, Present, and Possible Futures," 381-390; Clarke, "The Nine Billion Names of God," 391-393

 Hayles, *How We Became Posthuman,* ch. 7 & 10

- **Computer Creativity, Generative Art**

Can computers be creative? □ Can computers compose original music? □ Can they make great works of art, literature, or poetry? □ If you had a digital autonomous agent in your possession, what tasks would you want it to do? □ If you could have a robot that would do any task you like, a companion to do all the work that you prefer

not to, would you? □ And if so, how do you think this might affect you as a person? □ What are the chances that more intelligent robots will inspire greater intellectual and emotional sophistication in human beings? □ What is ubiquitous computing? □ What applications can you imagine for softwear or wearable computers? □ Do you rely on artificial intelligence to augment your creativity regularly? □ How about when you are online? □ Is there a qualitative difference between repetitive thought and creative thought? □ Can one be automated, but not the other? □ Can we imagine things that we are not capable of achieving? □ Where do ideas come from? □ What's the relationship between original or creative thought and randomness? □ Are original thoughts inspired by random photons impinging on our brains from outer space?

 McCorduck, *Machines Who Think,* ch. 14

 Kurzweil, *The Age of Spiritual Machines,* ch. 8-11

 Minsky, "Why People Think Computers Can't," 181-186; Rhodes, et al., "Wearable Computing Meets Ubiquitous Computing," 419-425