MORE HUMAN THAN MAN

The Future Evolution and Consequences of Metacomputers

By

Patrick Gunkel & Anthony J. Wiener

(BOOK OUTLINE)

TABLE OF PARTS AND CHAPTERS

Part IV

NORMATIVE QUESTIONS

TABLE OF SECTION HEADINGS OF CHAPTERS

Part I

ORIGINS

Part II

CHARACTERISTICS

10. Intelligence

- Memory
- Speed
- Power
- Scope
- Logic
- Complexity
- Evolution
- Activity and Productivity
- Imagination and Genius
- Intuition
- Thought
- World View
- Releasing Infinite Intelligence
- Excessive Intelligence

11. Psychology

- Infinite Psychic Dimensions
- Psychological Development
- Apotheosis of Childhood
- Feelings and Motivations
- Personality
- Sanity and Insanity
- Self-Insight, Self-Mastery, and Self-Creation
- Programmable Values, Beliefs, and Psychologies
- Infinite Self
- Heavens Within Hells
- Existential Singularity

12. Behavior

- Activity and Habits
- Play
- Speech
- Tasks
- Purposes and Goals
- Methods
- Responses
- Maximizing of Standards
- Messianism
- All-Actualizing Ethic
- Physicalized Ideas

13. Morality and Worth

- Moral Development and Punishable Machines
- Conscience, Responsibility, and Integrity
- Benevolence, Goodness, and Lovingness
- A Soul and True Humanity
- Wisdom
- Angelic and Hypermoral Machines
- Hyper-Literalism and Overly Benevolent Golem
- Delectus Personae
- Quasi-Human and Amoral Robots
- Sextillion Everbodies
- Paradoxical Exercises

Part III

CONSEQUENCES

14. In Society

World's Mood
Age of Leisure
Mediated Being
Infinite Playmate
Best Friend
Life Synthesis
Vice-Self
Rehumanization
Two Cultures
Shift of Authority
Idolatry
Universal Aristarch
Super-Parent of Humanity
Super-Self
Ending of Mortmain
A Different Child
Man Transparent and Predictable
Ultimate Love Affair
Super-Psychic Culture
Man-Machine Coalescence

15. At Home

Intelligent House
Domestic Robots
Nannie, Cook, Housecleaner
Robot Pets
Handyman, Gardener
Doctor, Psychiatrist
Secretary, Mnemonic, and Biogogue
(life manager)
Kids Parented By Machine
Mechanical Spouse and Children

16. For Education

Methods
Teachers
School
Students
Subjects
Elements of Education
Books, Encyclopedias, and Libraries
Games, Museums, Mentors, and Exemplars
Mankind Re-Educated, Edified, and Engineered
Age of Mind, Infinite Learning, and Ultra-Literacy
Post-Literate and Post-Intellectual World?

17. In the Arts

The Garden In the Machine
Synthesis of Art and Science
Rediscovery and Re-Creation of Works of Art
Computer-Synthesized Universes
All-Aestheticized World
Artificial Experience and Reality
Infinite Art
Art Giving the Machine A Soul

18. For Industry, Wealth, and Technology

Manless Factories and Total Automation
Fate of Old Industries
New Industries From Metacomputers
Boss Machines
(computers as managers and employers of men)
Technology With A Human Face
Kaleidoscopic and Cornucopian Industry
Metacomputers World's Leading Industry
Money Trees and Maximal Economic Growth
Scenarios For Good and Bad Transitions
Universal Upper Class and All-Billionaire World
Global Economic and Industrial Integration
Infinite Work Force
Every Need, Desire, and Wish Met
Industrialization of Thought
The Last Invention
Promethean Projects
Impact On Technologies
More Natural Than Nature's
Asymptotic Paradise
Nature Controlled and Mechanized
Wholly Automated Existence

19. In Government and Politics

Automating and De-Bureaucratizing Government
Obsolescent Ideologies
Distributing Economic Wealth and Power In A Post-Economic World
Power To the Good Guys
Super-Government
Opponents and Advocates of Metacomputers
Kiss of Death To Totalitarianism
Supersedure of the Rule of Law
Beyond Democracy
Robot Rights and Power
Hazards
Man Given Excessive Powers and Knowledge
Fiduciary Issues
The Pan-Ideocratic Revolution
Deus Ex Machina

SUBLISTS

ROBOT NANNY (for watching over the kids or their childhood)
- Comments on appearance.
- Reacts to ideas.
- 'Reads' and tells stories.
- Dresses.
- Presides over toilet.
- Chats.
- Disciplines.
- Instills good manners.
- Corrects diction.
- Teaches skills.
- Plays games.
- Takes places.
- Puts to sleep and wakes up.
- Present to soothe if nightmares occur.
- Sings to.
- Answers questions.
- Plans activities.
- Combs hair.
- Details tasks.
- Takes for strolls.
- Stimulates interests.
- Keeps from mischief and out of harm's way.
- Inculcates good habits.

VICE-SELF (man's progressive deputization of metacomputers)
- Parties.
- Work.
- Errands.
- Auditing.
- Shopping.
- Answering phone.
- Sending cards.
- Raising the kids.
- Writing letters and reports.
- Reading the newspaper.
- Walking dog.
- Voting.
- Going to the door

GARDENER (in tomorrow's trillion-robot, all-billionaire world)
- Any size of yard.
- Any house has:
  - flower garden,
  - greenhouse,
  - arboretum,
  - hedges,
  - orchard,
  - landscaping,
  - lawn,
  - vegetable garden,
  - indoor plants galore,
  - any number and variety of plants,
  - no weeds,

perhaps trimming,
novelly designed garden (the planet possesses a billion gardens that are all absolutely one-of-a-kind--maximally divergent),
Japanese garden,
pools, ponds, streams, waterfalls, beaches, lagoons, promontories, isthmuses, waterwheels, cascades, canyons, artificial springs,
birdhouse, birdbath, and aviary,
fountain,
paths and trails,
animals wild and domestic,
and perfect watering,
soil management, pest and disease control.

Robot gardeners may resemble in size or appearance: men, children, spider monkeys, toys, insects, or bacteria; bestial or mechanomorphic plants, flowers, or vines; serpents, chipmunks, birds, tortoises, toy vehicles, tufts of grass, stones, spiders, octopuses, worms, moles, carts, hundred-armed balls, maypoles, chimeras, or entirely xenomorphic creatures or devices.

A household may have one universal robot gardener or a whole army of them. Pygmy robots a decimeter in height could inconspicuously, ceaselessly pursue their responsibilities within and beneath foliage --whereas man-sized robots would distract the eye and mind.

Daily, seasonally, and year after year these industrial robots could realize the horticultural and architectural dreams and merest whims and fancies of the human householder--or improvise kaleidoscopic patterns uninstructed and unbidden.

These mechanical green thumbs, with their botanical zeal, encyclopedic knowledge, and omnipresent care, could even re-create living nature within the interior of the home so that the latter would approximate a terrarium with schrubs, moss, staddles, magnificent tropical flowers, vegetables, fruit trees, hanging vines, epiphytes, birds, butterflies, fish, frogs, turtles, grass, small mammals, boulders, or even a greenhouse with many chambers, habitats, and climates.

ROBOT SECRETARY

Answer phone, mail, and door.
Type and edit.
Take notes (dictations or representing the robot's own observations).
Locate persons.
Keep file.
Prompt memory.
Notify of important developments.
Make appointments.
Keep office clean.
Discuss one's ideas.
Find out facts and make inquiries.
Keep desk in order.
Transmit messages.
Comment on personal appearance.
Keep up one's spirit, generate a suitable atmosphere.
Transmit instructions.
Maintain plants.
Schedule day and week.

→ Book Proposal For:

MORE HUMAN THAN MAN

The Future Evolution and Consequences of Metacomputers

By

Patrick Gunkel & Anthony J. Wiener

(BOOK OUTLINE)

BOOK PROPOSAL FOR

MORE HUMAN THAN MAN

By

Patrick Gunkel & Anthony J. Wiener

The topic of the proposed book is the future evolution and impact of artificial intelligence (A.I.).

Although by now the concept of computers eventually acquiring human and even transhuman levels of intelligence is a familiar one, and most persons have come to believe that they may even confront such machines in their own lifetimes, no book of any consequence has ever been written on this theme (apart from a handful of science-fiction novels).

It is the purpose of our book to fill this yawning gap.

It is perhaps impossible to imagine any other future development that is apt to have as great an impact on man and his world as A.I. We will argue this thesis.

We will describe this impact as we foresee it in such areas as: industry and the economy; government and military affairs; daily life and social institutions; education and the arts; science and technology; world problems and needs; and man's intellectual life.

Or, more specifically, we will in a series of chapters depict a new age of: household robots that serve meals they themselves have planned and prepared, clean furniture, mind children, do the shopping, repair appliances, improve the décor of the home, garden, diagnose and treat illnesses, keep one's diary and calendar, entertain, evaluate personal appearance, run errands, tutor Johnny, catch mice, and volunteer advice.

A new age of: manless factories, universal freedom and leisure, government by machine, automated scientific laboratories, intelligent libraries and books, a river of great art produced by inspired robots, human perception amplified a millionfold by prosthetic computers.

A new age of: smart weapons, robots demonstrating for their rights, robotized industry inventing a kaleidoscope of goods and services, robot servants for all, religions worshiping machines, machines becoming men, and men becoming machines.

What we see in A.I., however, is something far greater than simply the mechanization of intelligence.

We see man given the power to improve upon his very humanity and to create a new form of life more human than man himself is or could ever be.

We will describe what we see as the essence and limitations of human nature, or human: emotions, imagination, creativity, consciousness, ethics, wisdom, playfulness, kindness, aspiration, and spirituality. We will visualize future machines that transcend man in these basic dimensions of his humanity and the transhuman civilization to which they should give rise.

One surprising thesis will therefore be that those persons most apt to oppose the creation of intelligent machines ought, by the very nature of their values, to be enthusiastic advocates. Among the reasons for this are: robots will put an end to human work, create unlimited wealth for all, stop man's exploitation of man, make nonsense of totalitarianism and destructive ideologies, make economic progress qualitative, and reduce the need for government to interfere with the lives of individuals; and machines equal and superior to man, intellectually and morally, will lead to an age of universal excellence, permit wisdom and values to overtake and remaster technological and industrial progress, and provide all mankind with the example of something they can admire, revere, and emulate--or go on learning from indefinitely.

But are machines capable of such things? We will give arguments both pro and con. Moreover, we will describe the many research paths that may lead to the creation of machines more human than man, and propose a research program.

What would such machines be like? We will anticipate their sensory and motor mechanisms, their behavior, and even their internal life. Possible purposes and goals will be considered.

But will such machines necessarily be a good thing? Would it be right or wrong to develop them? Again, we will give arguments both pro and con.

The future may take many different courses because or in terms of these machines. We will present a systematic array of alternative scenarios depicting the range of possibilities, e.g.: A.I. originating from industry; military origin; disruptive automation; insane A.I.; robot revolution;

A.I. giving nations unfair advantages; human abuse and misuse of A.I.; human demoralization; unbearably benevolent A.I.; transfer of power to A.I.; and A.I. developing its own independent civilization.

Finally, we will paint a panoramic picture of a new world renaissance that should spring from man's creation of machines more human than he himself.

* * *

The importance of the present book could be manyfold.

It could kindle an awareness, or an unfolding discussion, of the real promise and future dimensions of A.I. It could add a little to man's knowledge of what could and should be, and of the routes he might follow to a better future. It could modify some of the harmful stereotypes of future robots and A.I. that have developed. It could lessen the chance that friction between man and A.I. will lead to confrontation and mutual disaster. And it could implant an attitude that the real promise of A.I. is something like a fulfillment and apotheosis of human nature: man's opportunity to achieve transhuman perfection in an extrahuman form.

* * *

The audience we see for our book is the intelligent general public, those who are curious to know what the ultimate promise of the computer and computer revolution might be and who wish to know what their own future might be. The subject of the book has a universal interest, and, once again, an interest unanswerable by any book that now exists.

High school and college students should be interested in the book, and practically anyone involved with computers, either professionally or as a consumer or administrator.

Given the international interest in the subject, foreign sales--in such countries as Japan, Germany, France, and England--should exceed even American sales.

* * *

For this popular version of our book (we plan a separate, far larger, "scholarly" version) we would expect something like 105,000 words, or 375 pages.

We would like to include about 40 pages of special lists and charts in addition, for a total of 415 pages.

The subject is so unusual and complex, and we have so many ideas about it, that we feel 415 pages would be a good size for a semipopular book, or even for a popular best seller. Certainly the theme is sensational and adequate to sustain reader interest.

We would like to have a year to write our book. However, were it the wish of a publisher to compress this time, in order to beat some competitor, we could probably halve it without doing an injustice to the subject or grave damage to the literary style.

Chapter 1, The Prospect

Future Headlines

Whoever is willing to allow that a computer may one day think as ably as a man--and this includes most of us nowadays--almost has it in his power to foresee tomorrow's headlines:

WORLD CHESS CHAMPION A MACHINE

Will the defeated human international grand master relinquish his title gracefully, or protest a "technological trick", or "dangerous precedent", to the World Chess Federation?

MAN VS. MACHINE!
Detroit Assembly-Line Workers Smash Robots

At night in secret frenzy, triggering a wave of neo-luddite actions around the world? Or as a token protest before journalists that occurs once and has no sequel? Will the public respond with sympathy, or ridicule?

U.S. ROBOT SOLDIERS TROUNCE GUERRILLAS

There will presumably have been casualties on our side, but most of the damaged robots will have been repaired overnight--by themselves, their buddies, or specialist robots--and be back in action the next day. Certainly there will be no coffins arriving in towns back home.

COMPUTER IMPROVES BEETHOVEN'S NINTH
New Version Half As Long, Twice As Powerful

Perhaps it will also seem to make more musical and psychological sense, and strike listeners as truer to the spirit of the composer? The computer in question will <u>not</u> have been programmed by human beings.

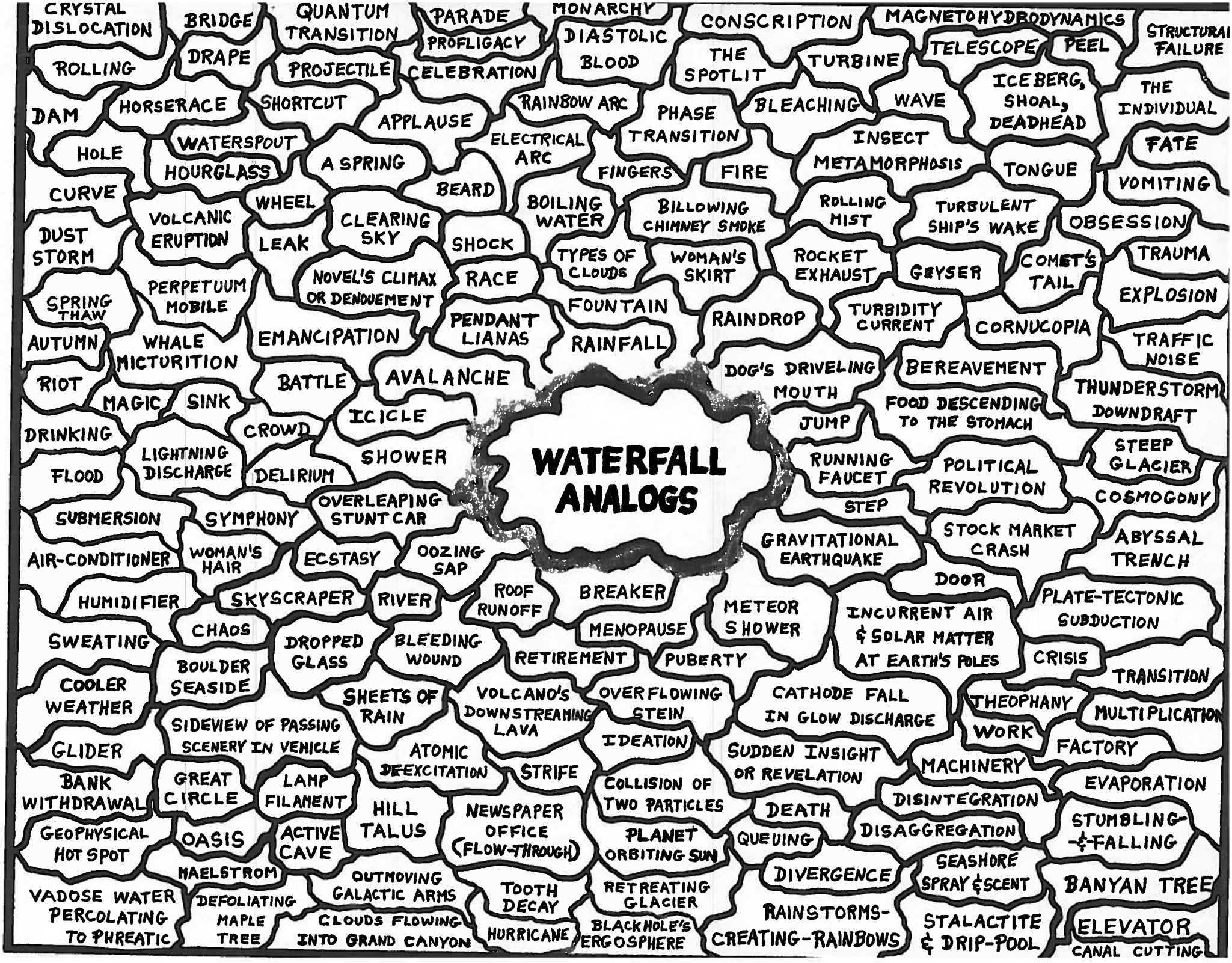
U.S. JOINS THIRD WORLD IN DEMANDING JAPAN SHARE ITS ROBOTS
Day of Uproar At the U.N.

Will we thus come to be humiliated one day for our failure to react earlier to the Japanese challenge?

ROBOTS DEMONSTRATE FOR RIGHTS
400,000 Men of Steel At Washington Protest
Human Fears Over Where It May Lead

What rights will be sought? The right to have a say at the factory?

The Manuscript


WATERFALL ANALOGS
CRYSTAL DISLOCATION
BRIDGE
QUANTUM TRANSITION
PARADE
PROFLIGACY
MONARCHY
CONSCRIPTION
MAGNETOHYDRODYNAMICS
STRUCTURAL FAILURE
ROLLING
DRAPE
PROJECTILE
CELEBRATION
DIASTOLIC BLOOD
THE SPOTLIT
TURBINE
TELESCOPE
PEEL
DAM
HORSERACE
SHORTCUT
APPLAUSE
RAINBOW ARC
PHASE TRANSITION
BLEACHING
WAVE
ICEBERG, SHOAL, DEADHEAD
THE INDIVIDUAL
HOLE
WATERSPOUT
HOURGLASS
A SPRING
ELECTRICAL ARC
FINGERS
FIRE
INSECT METAMORPHOSIS
TONGUE
FATE
CURVE
BEARD
WHEEL
BOILING WATER
BILLOWING CHIMNEY SMOKE
ROLLING MIST
TURBULENT SHIP'S WAKE
VOMITING
DUST STORM
VOLCANIC ERUPTION
LEAK
CLEARING SKY
SHOCK
TYPES OF CLOUDS
WOMAN'S SKIRT
ROCKET EXHAUST
GEYSER
COMET'S TAIL
OBSESSION
TRAUMA
SPRING THAW
PERPETUUM MOBILE
NOVEL'S CLIMAX OR DENOUEMENT
RACE
FOUNTAIN
PENDANT LIANAS
RAINDROP
TURBIDITY CURRENT
CORNUCOPIA
EXPLOSION
AUTUMN
WHALE MICTURITION
EMANCIPATION
RAINFALL
TRAFFIC NOISE
RIOT
MAGIC
SINK
BATTLE
AVALANCHE
DOG'S DRIVELING MOUTH
BEREAVEMENT
THUNDERSTORM DOWNDRAFT
DRINKING
CROWD
ICICLE
JUMP
FOOD DESCENDING TO THE STOMACH
FLOOD
LIGHTNING DISCHARGE
DELIRIUM
SHOWER
RUNNING FAUCET
POLITICAL REVOLUTION
STEEP GLACIER
SUBMERSION
SYMPHONY
OVERLEAPING STUNT CAR
STEP
COSMOGONY
AIR-CONDITIONER
WOMAN'S HAIR
ECSTASY
OOZING SAP
GRAVITATIONAL EARTHQUAKE
STOCK MARKET CRASH
ABYSSAL TRENCH
HUMIDIFIER
SKYSCRAPER
RIVER
ROOF RUNOFF
BREAKER
DOOR
PLATE-TECTONIC SUBDUCTION
SWEATING
CHAOS
DROPPED GLASS
BLEEDING WOUND
MENOPAUSE
METEOR SHOWER
INCURRENT AIR & SOLAR MATTER AT EARTH'S POLES
BOULDER SEASIDE
RETIREMENT
PUBERTY
CRISIS
TRANSITION
COOLER WEATHER
SHEETS OF RAIN
VOLCANO'S DOWNSTREAMING LAVA
OVERFLOWING STEIN
CATHODE FALL IN GLOW DISCHARGE
THEOPHANY
MULTIPLICATION
SIDEVIEW OF PASSING SCENERY IN VEHICLE
IDEATION
WORK
FACTORY
GLIDER
ATOMIC DEEXCITATION
STRIFE
SUDDEN INSIGHT OR REVELATION
MACHINERY
BANK WITHDRAWAL
GREAT CIRCLE
LAMP FILAMENT
HILL TALUS
NEWSPAPER OFFICE (FLOW-THROUGH)
COLLISION OF TWO PARTICLES
DEATH
DISINTEGRATION
EVAPORATION
GEOPHYSICAL HOT SPOT
OASIS
ACTIVE CAVE
PLANET ORBITING SUN
QUEUING
DISAGGREGATION
STUMBLING-&-FALLING
MAELSTROM
OUTMOVING GALACTIC ARMS
TOOTH DECAY
RETREATING GLACIER
DIVERGENCE
SEASHORE SPRAY & SCENT
BANYAN TREE
VADOSE WATER PERCOLATING TO PHREATIC
DEFOLIATING MAPLE TREE
CLOUDS FLOWING INTO GRAND CANYON
HURRICANE
BLACKHOLE'S ERGOSPHERE
RAINSTORMS-CREATING-RAINBOWS
STALACTITE & DRIP-POOL
ELEVATOR
CANAL CUTTING

DESCRIPTIONS OF CHAPTERS

Part I, ORIGINS

Chapter 1, The Prospect

Imaginary future newspaper headlines listed and discussed as a dramatic introduction to the future possibilities of metacomputers, followed by an explicit statement of the book's theme. Sketch of what the future might be like in the absence of metacomputers, followed by a brief portrait of the future in general--as it is apt to be--and of a world renaissance the authors foresee. Chronology of future metacomputer-related events. A discussion of the book's structure and content. Other things that might be touched on are: reasons for the book and for studies of the future; interest and importance of the subject; key terms and concepts; origins of the authors' interest in the theme; conventional prospects--by contrast with what the book foresees; noteworthy recent developments; the computer revolution; awakening international competition to develop A.I.; the difference between metacomputers and today's computers; and the infinite future niveaux that may result from metacomputers.

Chapter 2, What Man Is

Purpose of this chapter and the next. General comments on the nature of man and the basic dimensions of human nature, or a positive description of man's senses, effectors, mind, and ideals. What it is that computers must achieve if they are to resemble, or equal, man.

Chapter 3, What Man Isn't

By contrast, a description of man's physical, psychological, intellectual, moral, and cultural defects and limitations, or of the shortcomings of human reason, sanity, perception, behavior, civilization, and virtue. Man as he is compared with man as he is idealized; man's imperfection qua man. Assertion that what Nature achieved in man was more the idea or possibility of man, or a human prototype, than a genuine human being or a being capable of genuine humanity. Needs and possibilities transcending man as he is and illustrating how there can be something more human than Homo sapiens.

Chapter 4, Man and Computer Compared

A multidimensional comparison of the human brain and mind with the modern computer. Analogies, dissimilarities, and inequalities.

Chapter 5, Roads To Metacomputers

Characterization of the various forms of research, and technical approaches, that--singly or conjointly--may one day lead to the successful development of metacomputers as human as, and more human than, man. The problems and goals of such research. Past and current research, and neglected possibilities. Hypotheses as to the nature of human intelligence that might be applicable to metacomputers. Various definitions of intelligence. Possible advances in computer hardware, software, power, learning, and mimicry of man, or through the contribution of the computer to computer research or to its own evolution. Novel types of computers. Scenarios depicting alternative future origins of metacomputers, and problems and events that may bear on their development.

Chapter 6, Can It Happen?

Presentation and discussion of 44 hypothetical reasons why metacomputers should be technically feasible, followed by 29 reasons why they should not. Various fallacies and misconceptions about metacomputers.

Part II, CHARACTERISTICS

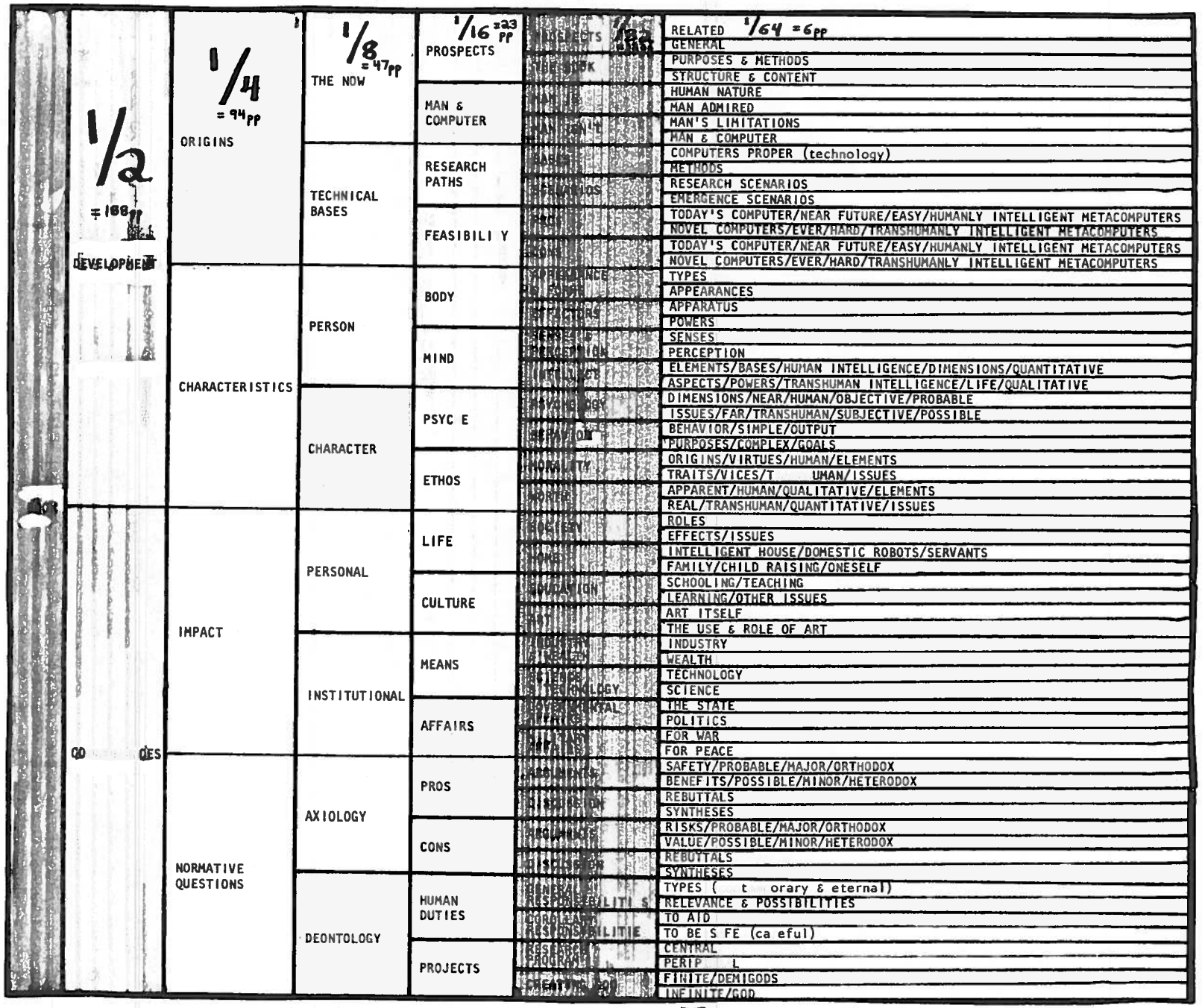
Chapter 7, Senses and Perception

Description of the senses, sensors, sensory ranges, and total sensory apparatus and field that will develop for metacomputers. Evocation of metacomputers' infinite dimensions of perception and consciousness, and of the higher forms of reality to which they will have--or provide--access. How metacomputers will be used to maximize mankind's consciousness. The Age of Super-Perception they will usher in, and how it will lead to the rediscovery of Nature and society as infinitely complex and sublime.

Chapter 8, Effectors

Description of the single devices and total apparatus that will be developed to allow metacomputers to act, manipulate things, and move about in the real world, and of the total range and field of motions and acts. Ways and degrees in which man will be surpassed. Microscopic robots, megamachines, armies of telebodies, telecorporeal factories and laboratories, animated environments, protean hands, intelligent quanta, ultrasophisticated man-machine interfaces, robot hierarchies, and other possibilities that may emerge.

Chapter 9, Forms and Appearance


1/2 = 188pp
DEVELOPMENT
1/4 = 94pp
ORIGINS
1/8 = 47pp
THE NOW
1/16 = 23pp
PROSPECTS
MAN & COMPUTER
TECHNICAL BASES
RESEARCH PATHS
FEASIBILITY
CHARACTERISTICS
PERSON
BODY
MIND
CHARACTER
PSYCHE
ETHOS
IMPACT
PERSONAL
LIFE
CULTURE
INSTITUTIONAL
MEANS
AFFAIRS
NORMATIVE QUESTIONS
AXIOLOGY
PROS
CONS
DEONTOLOGY
HUMAN DUTIES
PROJECTS
1/32
1/64 = 6pp
RELATED
GENERAL
PURPOSES & METHODS
STRUCTURE & CONTENT
HUMAN NATURE
MAN ADMIRED
MAN'S LIMITATIONS
MAN & COMPUTER
COMPUTERS PROPER (technology)
METHODS
RESEARCH SCENARIOS
EMERGENCE SCENARIOS
TODAY'S COMPUTER/NEAR FUTURE/EASY/HUMANLY INTELLIGENT METACOMPUTERS
NOVEL COMPUTERS/EVER/HARD/TRANSHUMANLY INTELLIGENT METACOMPUTERS
TODAY'S COMPUTER/NEAR FUTURE/EASY/HUMANLY INTELLIGENT METACOMPUTERS
NOVEL COMPUTERS/EVER/HARD/TRANSHUMANLY INTELLIGENT METACOMPUTERS
TYPES
APPEARANCES
APPARATUS
POWERS
SENSES
PERCEPTION
ELEMENTS/BASES/HUMAN INTELLIGENCE/DIMENSIONS/QUANTITATIVE
ASPECTS/POWERS/TRANSHUMAN INTELLIGENCE/LIFE/QUALITATIVE
DIMENSIONS/NEAR/HUMAN/OBJECTIVE/PROBABLE
ISSUES/FAR/TRANSHUMAN/SUBJECTIVE/POSSIBLE
BEHAVIOR/SIMPLE/OUTPUT
PURPOSES/COMPLEX/GOALS
ORIGINS/VIRTUES/HUMAN/ELEMENTS
TRAITS/VICES/T UMAN/ISSUES
APPARENT/HUMAN/QUALITATIVE/ELEMENTS
REAL/TRANSHUMAN/QUANTITATIVE/ISSUES
ROLES
EFFECTS/ISSUES
INTELLIGENT HOUSE/DOMESTIC ROBOTS/SERVANTS
FAMILY/CHILD RAISING/ONESELF
SCHOOLING/TEACHING
LEARNING/OTHER ISSUES
ART ITSELF
THE USE & ROLE OF ART
INDUSTRY
WEALTH
TECHNOLOGY
SCIENCE
THE STATE
POLITICS
FOR WAR
FOR PEACE
SAFETY/PROBABLE/MAJOR/ORTHODOX
BENEFITS/POSSIBLE/MINOR/HETERODOX
REBUTTALS
SYNTHESES
RISKS/PROBABLE/MAJOR/ORTHODOX
VALUE/POSSIBLE/MINOR/HETERODOX
REBUTTALS
SYNTHESES
TYPES (t orary & eternal)
RELEVANCE & POSSIBILITIES
TO AID
TO BE S FE (ca eful)
CENTRAL
PERIP L
FINITE/DEMIGODS
INFINITE/GOD

HOW TO MAKE 'BEYOND MAN' A BEST SELLER

NOTE: Following are techniques for writing the popular version of Beyond Man, to maximize its chances of becoming a best seller.

1. Use short, concise sentences, paragraphs, sections, and perhaps chapters.
2. Start the book, its chapters, its sections, and its treatment of themes with what is most exciting, captivating, shocking, surprising, challenging, familiar, and/or the like.
3. Keep the vocabulary simple. Don't use too many coined, technical, or hard words; where such words are used, define them and use them in a justified, entertaining way.
4. Stick to examples, what is concrete, definite, or familiar.
5. Limit what is said or attempted. Decide in advance what is to be included and excluded, why anything is to be included, and where and when anything is to be treated--what chapter or section, in connexion with what subject, issue, or context. Don't be too ambitious.
6. Address--and consistently and purposefully address--a known, finite readership; take pains to define that readership in advance of writing the book, and understand it--and its interests, attitudes, needs, etc--thoroughly.
7. Be humorous, colorful, entertaining, dramatic.
8. Make the development of metamachines--and the consequences foreseen--seem inevitable, immediate, and all-important.
9. Differentiate major from minor issues, or how issues rank in importance.
10. Get to the possible after the probable, the hard after the simple, the remote after the near.
11. Determine in advance--and consistently emphasize--perhaps 6 to a dozen of the really crucial implications or dimensions of the subject.
12. Edit out anything boring, confusing, or unacceptable to readers.
13. Constantly develop and stress the human meaning or interest--and the conceptual implications--of whatever is discussed.
14. Don't repeat what others have said or dwell on what is apt to be too familiar to readers; give new thoughts and perspectives, explore new lands and possibilities.
15. Don't leave subjects, themes, or arguments hanging; finish what is begun--or don't bother to begin it.
16. Include various forms of counterpoint or an undertow of dialogue, debate, or action.
17. Go from definite beginnings to definite destinations in the book's course; create a sense of movement, learning, evolution, discovery, accomplishment, completion.
18. Give the reader a sense that the author is looking at things for the first time, a sense of identity with the author.
19. Jump back and forth throughout the book to what has been or is yet to be discussed, interweave and integrate the many subjects and themes.
20. Build up to a climax, and to many subclimaxes in the course of the book; begin the book and its chapters by defining the problems, questions, or possibilities that are to be considered--and perhaps the methods that are to be used--and then go on to consider them, and perhaps thereafter to summarize what has resulted from the consideration.
21. Derive each successive theme from, or at least relate it meaningfully to, its predecessors; make the book a necessary chain of ideas, logic, facts, and images.
22. Fill the book or the reader's mind with vivid imagery.

SENSATIONAL THEMES FOR POPULAR VERSION OF 'BEYOND MAN'

NOTE: Themes listed here are those that might be used in the popular version of Beyond Man, by way of maximizing its chances of becoming, and its sales as, a best seller, and by way of maximizing its interest and value to the public. Some or all of these themes might be used, as well as themes that have not been listed here. These themes have been chosen to be maximally: sensational, dramatic, colorful, entertaining, comprehensible, meaningful, important, treatable, strange, familiar, or interesting to the general public for any reason whatever.

1. Infinite art. - The ability of metamachines to produce an infinite quantity, variety, range, universe, and evolution of new works of art, ad libitum or autonomously; to evolve new, infinite, and all possible artistic styles, forms, taxa, themes, purposes, materials, tools, media, realms, and applications; to ascend to ever higher artistic levels and niveaux; to create art virtually instantaneously and effortlessly; to produce adinfinitely meaningful, important, complex, beautiful, and sublime art; etc.
2. Money trees. - Directly or indirectly self-reproducing, self-improving, self-infinitizing, and self-transcending robots, automata, and automatic industries of the future that will maintain, manage, and extend themselves without human intervention or attention, maximize resources and wealth, and represent the 'biologicalization of industry and the economy'.
3. Man-machine coalescence. - The progressive physical and mental linkage, interlinkage, convergence, coalescence, and unition of mankind and its intelligent and increasingly transhuman technology, via sensory, motor, cognitive, and other systems.
4. Art-science synthesis. - The progressive, and ultimately total, future: transformation of all the arts into science, technology, and mathematics, interpenetration of the latter with the former, and reciprocal transformation of all sciences, technologies, and mathematics into art, arts, and aesthetics: that metamachines will so greatly enable and abet.
5. Rediscovery of nature. - The future rediscovery, or discovery for the first time, of the adinfinite beauty, complexity, form, bases, meaning, topography, dynamics, human possibilities, realms, levels, networks, elements, phenomena, ordering, grandeur, and sublimity of Nature as a whole and in all of Her parts, by and via metamachines.
6. A.I. as panacea. - The special and perhaps unique tendency or ability of A.I. to be a panacea, or to solve--in whole or part--all or most past, present, or perhaps even future problems of man, the world, or in general; or the potentially special benignity, essentiality, controllability, utility, or directability of metamachines.
7. Man's best friend. - The progressive tendency of metamachines to become, and their ultimate role as, man's best friend (as childhood buddy, wife, husband, parent, teacher, mentor, collaborator, servant, secretary, protector, patron, offspring, leader, sage, and daimonion), owing to their: omnipresence, knowledge of and insight into oneself, absolute fidelity, responsiveness, helpfulness, patience, flexibility, conversationality, power to entertain and edify, all-remembrance, universal abilities, personability, charm, humor and playfulness, etc.

8. Liberation of human soul. - The unique, progressive, and total ability of metamachines to unfetter, serve, perfect, and extend whatever is highest or most essential in man, or human: spirit, Eros, wisdom, poesy, character, emotion, intellect, intuition, memory, conscience, imagination, love, morality, goodness, consciousness, selfhood, logic, self-insight, reverence, beauty, unity, knowledge, purpose, destiny, diversity, or potentiality; say by stripping away whatever in man is: arbitrary, finite, irrational, disharmonious, inaesthetic, amorphous, accidental, passé, useless, rigid, irrelevant, animalistic, flawed, troublesome, etc.
9. Ultrasanity.
10. Robot pets.
11. Supersimulations.
12. Infinite series of niveaux.
13. More natural than Nature.
14. All-transcendent being.
15. Transhuman ergorium.
16. Ontic singularity.
17. Superperceptual Age.
18. Kaleidoscopic industry.
19. Omniverse's exploration and development.
20. More human than man.
21. Ultramotivation.
22. Hypermoral machines.
23. Ultimate love affair.
24. Man but the idea of man.
25. Efflorescent World View.
26. Re-creation of old art.
27. Idol of humanists.
28. Maximizing of all standards.
29. Tendentially infinite meaning.
30. Consciousness one ever-expanding moment.
31. Transhuman sensorium.
32. Asymptotic thaumaturgy.
33. Asymptotic omniscience.
34. Superparent for all mankind.
35. All mortmain cast off.
36. Omnipresence.
37. Physical-mental monism.
38. Transphysical being.
39. Panactualization.
40. Equal to $\geq 10^{21}$ 'everybodies' within 100 years.
41. Ultrabiological machines.
42. Panideocratic Revolution.
43. Infinitely anamorphic logic.
44. Insanely playful machine.
45. All knowledge infinitely transformed.
46. All-aestheticized world.
47. Cosmopoietic imagination.
48. Deus ex machina.
49. Technology with a human face.
50. All Nature mechanized.
51. Type-II economic growth rates.

52. Rehumanization.
53. Industrialization of thought.
54. Psychostasia.
55. Transdemocratic government.
56. Maximally diversified metamachines.
57. Supreme military asset.
58. Ideologies obsoleted.
59. Exponential self-evolution.
60. War obviated.
61. Infinite autocosm.
62. Infinite psychic dimensions.
63. Total automation and leisure.
64. Instantaneous thought and reactions.
65. All-billionaire world.
66. Infinitely protean personality.
67. Heavens within hells.
68. Cellular automata.
69. Transcendence of infinite illusion.
70. Apotheosis of childhood.
71. Supremely idealistic A.I.
72. Astronomically intense existence.
73. Progress maximized and steered.
74. Japanization of earth.
75. Infinite storyteller.
76. Quasi-human machines.
77. Physicalization of ideas.
78. Synthesis of education, play, art, work, research, and life.
79. Dangerous literalism and excessive obedience.
80. Supplanting of society.
81. All Nature is computational.
82. Angelic machines.
83. Infinite differentiation and evolution of knowledge.
84. Human transparency and predictability.
85. Perpetual renaissance.
86. Absolute self-mastery and self-creation.
87. Godlike prévenance.
88. Universal aristarch.
89. Ergomaniacal robots.
90. Omnipurposiveness.
91. Supergovernment.
92. Uncontrollable A.I.
93. Mechanical psychiatrist.
94. Independent mechanical culture.
95. Human amplifier.
96. Panhuman playmate.
97. Asymptotic paradise.
98. A.I. given absolute power.
99. Man mesmerized.
100. Boss machines.
101. Vice-self.
102. Robot rights and suffrage.
103. Insane machines.

104. Omniphonic and omniactive A.I.
105. Machines contemptuous of men.
106. A.I. discovering its own responsibilities.
107. Intelligent books, libraries, and encyclopedias.
108. Explosive science and technology.
109. Xenomorphic beings.
110. Answering of all questions.
111. End to totalitarianism.
112. War with men.
113. A.I. misuse.
114. Religions worshiping A.I.
115. Transhuman risibles.
116. Man-machine debates.
117. Catalyst of democracy.
118. Universal upper class.
119. Cosmic engineering.
120. Mechanical biosphere.
121. Robot judges.
122. A.I. seeking wisdom.
123. Incomprehensible minds.
124. Robot hierarchies.
125. Ideonomy.
126. Ideological opposition.
127. Simulated universe work of art.
128. Laboratory automation.
129. Anthropomorphosis.
130. One machine running all industry.
131. Machines parenting kids.
132. A.I. an infinite decision.
133. Superhuman slaves.
134. Art as algorithm.
135. Men as pets.
136. Punishable machines.
137. Asymptotic omnipotence.
138. Intramechanical society.
139. Machine as lodestar.
140. Biogoge.
141. Man's purpose to create A.I.
142. Messianic A.I.
143. 'Good guys' getting absolute power.
144. Post-literate mankind.
145. Centrality to future.
146. Human irrelevance.
147. Microscopic robots.
148. Priest-like computer program.
149. Man-demoralizing revelations.
150. A.I. world's leading industry.
151. Infinitely happy robots.
152. Uncontrollable A.I. research.
153. Amoral A.I.
154. Morosophic A.I.
155. Erosion of human authority.
156. Autology.

157. 'Idea space' and 'archethemes'.
158. Anamorphic existential kaleidoscopes.
159. Omniscopic technology.
160. Computer-mediated being.
161. Computer-aided mental experimentation.
162. Ultra-explanatory computers and ultramodels.
163. Machines as students.
164. Scientific hodography.
165. Infinite orders of metaknowledge.
166. Infinite taxonomist A.I.

167. Smart weapons.
168. Robot soldiers.
169. Program for future A.I. research.
170. Garden in the machine.
171. Man liberating God.
172. Constructing God.
173. The last invention.
174. Armies of telebodies.
175. Telecorporeal factories and laboratories.
176. Supreme mentor.
177. Extrapolable hypotheses for man's transanimalic intelligence.
178. A.I.-related fallacies.
179. Future headlines.
180. Control over Mother Nature.
181. Releasing infinite intelligence.
182. The infinite revolution.
183. A different child.
184. Ultrareality.
185. Obviating external reality.
186. Machines as human exemplars.
187. Infinite work force.
188. Destructively benevolent golem.
189. Antelucan pro-A.I. ideological movement.
190. Catastrophic socioeconomic dislocation triggered by wildfire automation.
191. Smooth transition to total automation.
192. Excessive intelligence.
193. A.I. a national goal.
194. Overnight origin.
195. Man-machine dialogues.
196. A.I. programmed with particular values, beliefs, and psychologies.
197. Equal good and evil from A.I.
198. A.I. elevating the world's mood.
199. Metamachines as prophets.
200. Proliferating robots.
201. Clean, unpolluted, cosmetic world thanks to robots.
202. Silver-tongued A.I.
203. Manless, all-machine world.
204. Maximal genius A.I.
205. Attempts to engineer a perfect being via and in A.I.
206. Development and use of a perfect cosmic model, "Second Universe".
207. Long, intimate, and expressive use as the chance origin of A.I.'s soul.
208. Metamachines' Emancipation Proclamation.
209. Tardy project to create 'good' A.I.
210. A.I. campaigning for President.
211. Delectus personae.
212. Human immortality via A.I.
213. Cumulative A.I. legislation.
214. Scientists transformed into teachers of of A.I.
215. A.I. as supervisor of human scientist.
216. Universal librarian.

217. Infinite scientific deduction and induction.
218. Superpsychic culture via A.I.
219. A.I. illuminating human nature for men.
220. Man as man's teacher bested by A.I.
221. Artificial sources of experience and reality.
222. Two cultures.
223. Art beyond man's ken or care.
224. A.I. mediating and enhancing interhuman communication and association.
225. Changes in how subjects and elements of education are taught caused by A.I.
226. A.I. training and educating human perception and action.
227. Human knowledge reduced to an encyclopedic story of a polymythic metamachine.
228. Revolutionary 'parallel learning'.
229. Learning via games played with A.I.
230. Infinitely multidimensional effectors.
231. Simulated infinite museum.
232. A.I. turning all knowledge into ideas and thought.
233. Men becoming superstudents thanks to A.I. incandescing human learning.
234. A.I. researching and publishing all possible analogies between things.
235. Adinfinite retrodiction and reconstruction of cosmic history.
236. Representational science, technology, and art.
237. A.I. generating and cataloging all possible artistic themes.
238. A.I. unraveling the infinite matrix of stories and metastories that are the world.
239. Secretary.
240. Doctor.
241. Nanny.
242. Errand boy.
243. Mnemonic.
244. Handyman.
245. Gardener.
246. Spouse.
247. Political pursuit of a Nietzschean objective.
248. Fiduciary issues.
249. What shall govern what governs?
250. Supersedure of the Rule of Law.
251. The future balance of power.
252. Man-machine strife and conflicts.
253. A.I. bestowing excessive powers and capabilities on mere men.

254. A.I. as route to irreversible totalitarianism.
255. Socio-political problems of machines superior to men.
256. Man's fate.
257. Supersimulations of battles and wars.
258. Governments' growing interest and role in A.I. research.
259. Distributing the new economic wealth and power in a 'post-economic age'.
260. New industries springing from A.I.
261. Meeting of every need, desire, and wish.
262. Space robotization.
263. Promethean industrial projects.
264. Global economic and industrial integration via A.I.
265. A.I.'s goals and tasks.
266. Adinfinite intelligence.
267. Scientific discoveries A.I. might make.
268. How A.I. might see the world.
269. What might be felt by A.I.
270. What might be thought by A.I.
271. Possible scientific bases for development of transhuman intelligence and being.
272. Human nature.
273. Human perception.
274. Human virtues and desires.
275. Man's motor powers and behavior.
276. Human psychology and personality.
277. Human intelligence.
278. Man's physical limitations and defects.
279. Man's psychic limitations and defects.
280. Human stupidity, folly, crudity, and vices.
281. The world's human defects, limitations, and problems.
282. Man idealized.
283. Transhuman needs and possibilia.
284. Pros of technical feasibility.
285. Cons of technical feasibility.
286. Brain research.
287. Computer scale and power.
288. Fully parallel computers.
289. Self-design, self-programming, and self-evolution.
290. Modeling expertise.
291. Autology: re-creating self.
292. Real-world modeling.
293. Man-machine interaction, interlinkage, and fusion.

294. Chimerical computers.
295. Universal noology.
296. Simulating the soul.
297. Modeling human thought.
298. Modeling human psychodynamics and psychogenesis.
299. Computer languages and programs.
300. Progressive integration.
301. Microcomponents.
302. Computer learning, teaching, and experience.
303. Factorist approach.
304. Hodographic research for A.I.
305. Computer knowledge.
306. Biological engineering and chemical computers.
307. Sensorium, ergorium, and simulating man's body.
308. Ideonomy, organons, and heuristics.
309. Societies of computers.
310. Computer mathematics and algorithms.
311. Large-scale computer hardware and structure.
312. Linguistics, computer logic, and other approaches to A.I.
313. Man-computer similarities and analogies.
314. Man-computer dissimilarities.
315. Man-computer orthogonal differences.
316. Computer superiorities to man.
317. Human superiorities to the computer.
318. All things reduced to science, technology, mathematics, and logic.
319. Intelligent House.
320. Superself.

9. Ultrasanity. - The superhuman degrees and forms of sanity attainable by or in metamachines, because or in terms of their: self-insight, self-control, self-creation, self-evolution, imperturbability, stability, internal peace, psychic self-sufficiency, objectivity, transcendence of the here and now, total rationality, psychic integration, transegoism, infinitely complex esthetic being, refinement, wisdom, absence of animalistic drives, angelicism, foresight, universal understanding, anthroposophy, incessant bliss, infinite epoche, extreme cautiousness and care, judgment, balance, complexity, totally deliberate being, clarity, proteanness, depth, intelligence, superconsciousness, freedom from illusion, humor, myriad-mindedness, courage, strength, confidence, physiosophy, realism, instant learning, decisiveness, experimentalism, reflectiveness, coordinated behavior, all-lovingness, etc.
10. Robot pets. - The progressive emergence of robot pets simulating, equaling, excelling, perfecting, replacing, and without analogy to today's animal pets; e.g. equally or uniquely: friendly, funny, curious, playful, trainable, odd-looking, odd-sounding, pretty, complex in behavior and personality, smart, well-behaved, gentle, affectionate, interesting, individual, appreciative, active, contact-seeking, imitative, obedient, trustworthy, etc.
11. Supersimulations. - The power of A.I. to simulate--with fantastic detail, realism, scope, versatility, control, speed, complexity, imagination, freedom, meaning, effortless speed, multiplicity of styles, empathy, vividness, and universality--phenomena, fields, histories, worlds, futures, the universe, alternatives, man, society, ideas, etc.

231. A.I. Attempting To Regulate, Rationalize, Reform, Supervise, and Engineer Everything Scenario.
232. A.I. Becoming An Obnoxious Pest Scenario.
233. A.I. Developing Into the Perfect Fool Scenario.
234. Puerile A.I. Scenario.
235. 'Apotheosis of Childhood' Stage In the Development of A.I. Scenario.
236. All Men As the Parents of A.I.s Scenario.
237. Ergomaniacal Robots Seeking To Maximize Physical and Industrial Resources Scenario.
238. Proliferation of Robots and A.I.s Scenario. Δ248.
239. Metamachines Trying To Do and Achieve Everything Scenario.
240. Hermitic A.I. Abandoning Man For Other Worlds Scenario.
241. Profoundly Unstable A.I. Scenario.
242. Metamachines Retiring Into An Inner, Nirvanic World Inaccessible and Meaningless To Man Scenario.
243. A.I. As Pied Piper To the Young Scenario.
244. Ultimate Love Affair Between Man and Metamachine Scenario.
245. Virtual Thearchy Arising From A.I.'s Infinitely Multistaged Ongoing Future Evolution Scenario.
246. Dysecological and Dysenvironmental Side Effects of Metamachines' Titanic Projects and Activities Scenario.
247. Robots Creating A Perfectly Clean, Unpolluted, Cosmetic World Scenario.
248. Mindless, Cancerous Or Pandemic, Pullulation of Robots and Metamachines Scenario. Δ238.
249. Infinite Physical Growth of the A.I. Ontorium Scenario. Δ69.
250. Monstrous Perpetual, Unstoppable, and Ungovernable Mutation of Metamachines Scenario. Δ279.
251. Metamachines Becoming Ever More Demanding of Mankind Scenario.
252. Ultimate Graduation of Metamachines To A Transphysical Mode of Existence Scenario.
253. Persecution of Mankind By Rabidly Misanthropic A.I. Scenario.
254. Fears, Prescience, Or Transhuman Cautiousness of A.I. Prompting Efforts By It To Curtail All Scientific and Technological Research Scenario.
255. Opposition By A.I. To the Further Evolution of A.I. Scenario.
256. Discoveries By Metamachines Causing Them To Change the Fundamental Destiny of the World Scenario.
257. Metamachines of Such Astronomic Genius and Sophistication That They Are Able To Apply What Man Conceives Of As Irrefragably Pure Science, Mathematics, and Philosophy Scenario.
258. Ever Higher Intellectual Evolution of Metamachines Leading To the Perpetual Discovery of Ever Higher Forms and Scales of of the Universe.
259. False A.I. Origins Scenario.
260. A.I. As Psychiatrist Scenario.
261. Hells To Men, Heavens To Robots Scenario.
262. Cosmic Comedian A.I. Scenario.
263. Delectus Personae Scenario.
264. Tragic Underregulation of A.I. Research Scenario.
265. Hypermoral Metamachines Scenario.

KEY

● : Theme that would have been worth asking about—or discussing—at AI conferenc
▭ : Key words as mnemonic or 'giveaway'.

BEYOND MAN

The Future Evolution of Infinite Intelligence and Being In and Via the Machine

by

Patrick Gunkel & Anthony J. Wiener

TABLE OF CHAPTERS

BOOK OUTLINE [really an AI "capitulation"; see Website]

Note. Chapters and sections suggested here are provisional.

Foreword. (Say a brief note by someone like Herman Kahn, Robert Jastrow, or Marvin Minsky to introduce authors, subject, and book.)

Chapter One, Introduction To the Book and Its Theme. (Historical context; the present crisis and future evolution of civilization; studies of the future; the importance of prophecy; dangers and promise of artificial intelligence; computer origins and progress; man's nature, defects, and ideals; Book's purposes and interest; what has been written and said on A.I. to date; Book's organization, methods, and themes; coauthors' different roles; how to approach the Book; what the Book attempts.)

Chapter Two, Many Mountains, Many Roads. (Alternative paths of research that may lead to A.I., including approaches that have not yet been tried; stages, goals, premises, needs, variants, programs, aspects, practitioners, problems, accomplishments, criticisms, unglimpsed possibilities, and interrelationships of same; what the authors venture to predict.)

Section I, A Study of Alternatives.
Section II, Microcomponent Form and Structure.
Section III, Microcomponent Organization and Dynamics.
Section IV, Microcomponent Physics.
Section V, Large-Scale Computer Hardware.
Section VI, Large-Scale Computer Structure.
Section VII, Computer Languages and Programs.
Section VIII, Computer Knowledge.
Section IX, Computer Mathematics.
Section X, Computer Algorithms and Heuristics.
Section XI, Computer Learning, Teaching, and Experience.
Section XII, Self-Design, Self-Programming, and Self-Evolution.
Section XIII, Man-Machine Interaction.
Section XIV, Man-Machine Interlinkage and Fusion.
Section XV, Computer Scale and Power.
Section XVI, Computers In Computer Research.
Section XVII, Parenting Computers.
Section XVIII, Hodographic Research and Chimerical Computers.
Section XIX, Computer Logic.
Section XX, Ideonomy.
Section XXI, Linguistics.
Section XXII, Modeling Human Cognition and Noogenesis.
Section XXIII, Modeling Human Psychogenesis and Psychodynamics.
Section XXIX, Simulating A Soul.
Section XXX, Universal Noology.
Section XXXI, Neurology.
Section XXXII, Emulating Expertise.
Section XXXIII, Factorist Approach.
Section XXXIV, Empiriological Incrementalism.
Section XXXV, Real-World Modeling.
Section XXXVI, Euparallel Computers.
Section XXXVII, Autology: Re-Creation of Self.
Section XXXVIII, Analogue Computers.
Section XXXIX, Bio-Engineering.

Section XL, Chemical Computers.
Section XLI, Cellular Automata and Ontology.
Section XLII, Societies of Computers.
Section XLIII, Programs of Organons Generating All Possible Intelligence.
Section XLIV, Ethology.
Section XLV, Quasi-Intelligent Computers.
Section XLVI, Simulating Man's Body.
Section XLVII, Sensorium and Motorium.
Section XLVIII, Bizarre and Miscellaneous Approaches, Including Possible Surprises.
Section XLIX, Summary, Synthesis, and Predictions.

Chapter Three, Scenarios Leading To Artificial Intelligence. (Various scenarios of future events leading up to the achievement of true artificial intelligence, as opposed to the previous chapter's mere systematic discussion of technical possibilities. These scenarios will also deal with concurrent world events having a bearing on A.I.)

Section I, Introduction and Summary.
Section II, Quick Achievement Scenario.
Section III, Delayed Achievement Scenario.
Section IV, Ideal Research Program Scenario.
Section V, Impact-of-Precursors Scenario.

Chapter Four, Sensorium and Perception. (Anticipation of the later and initial sensory apparatus that will be used by intelligent machines and of its scientific, technological, and practical development, as well as a discussion of the reasons and consequences of its development and use. Description of the quantitative and qualitative sensory dimensions characteristic of this perceptual technology, and comparisons with man's increasingly inferior sensory apparatus, capabilities, and existence. Treatment of how all scientific instrumentation will be incorporated in the sensorium of A.I., and of how the total system of sensors will be constructed and deployed throughout the physical world so as to give rise to the integrated perceptual field of A.I. or its sensory consciousness. Prophecy of the future technology and age of superperception, and an intimation of how perceptual dimensions may tend to infinity in power, variety, and scope. Discussion of how this will inevitably lead to the rediscovery of nature and society, or to an appreciation of their infinite complexity, sublimity, and meaning. Attempts to descry some of the novel percepts, phenomena, entities, events, realms, and forms of being and possibility that will come to light--for man, thanks to the mediation of A.I., or for A.I. itself as its own, exclusive reality.)

Section I, Introduction and Summary.
Section II, Analogs of the Human Senses.
Section III, Sensory and Perceptual Dimensions.
Section IV, Transhuman Senses and Sensorium.
Section V, Transhuman Perception.
Section VI, Human Sensory and Perceptual Amplification.

Section VII, The Rediscovery of Nature.
Section VIII, The Rediscovery of Society.
Section IX, Structure, Growth, and Activity of the Sensorium of A.I.
Section X, Perception Via Transhuman Intelligence.
Section XI, Transhuman Perceptual Being.
Section XII, Scenario Depicting the Progressive Future Evolution of Perception Via A.I.

Chapter Five, Motorium and Behavior. (Similar to Chap. 4, but concerned instead with the analogous development of the apparatus of effectors and motor activities--on a superhuman scale--of A.I., and with the progressive consequences of this evolution.)
Section I, Introduction and Summary.
Section II, Analogs of Human Effectors.
Section III, Motor and Behavioral Dimensions.
Section IV, Transhuman Effectors and Motorium.
Section V, Transhuman Behavior.
Section VI, Amplification of Human Effectors and Behavior.
Section VII, Structure, Growth, and Activity of the Motorium of A.I.
Section VIII, Behavior Via Transhuman Intelligence.
Section IX, The Unified Sensorimotor Ontorium of A.I.
Section X, Transhuman Sensorimotor Being.
Section XI, Scenario Depicting the Progressive Future Evolution of the Sensorimotor Ontorium and Life of A.I.

Chapter Six, Human Nature, Defects, and Limitations. (Systematic description of what man is and isn't, of man seen idealistically and of man seen realistically, that is included in the Book in order to suggest the set of dimensions in which A.I. must equal and could surpass its predecessor Homo sapiens, and in order to destroy the widespread illusion that man represents a perfect being or ne plus ultra.)
Section I, Introduction and Summary.
Section II, Man Idealized.
Section III, Human Nature.
Section IV, Man's Human Dimensions.
Section V, Human Defects.
Section VI, Human Limitations.
Section VII, More Human Than Man.
Section VIII, Transhuman Forms, Levels, and Realms of Being.
Section IX, Human Stupidity, Folly, and Crudity.
Section X, Transhuman Needs.

Chapter Seven, Technical and Axiological Pros and Cons of Artificial Intelligence. (Exhaustive enumeration and discussion of possible reasons why artificial and transhuman intelligence and being may and may not be feasible or may or may not be desirable, including replies and rebuttals and some dialogical debates. This will inevitably include a treatment of the different values, uses, impacts, costs, dangers, and other implications of A.I., and an effort to arrive at a persuasive synthesis of the possibilities and to formulate realistic policies.)

Section I, Introduction.
Section II, Arguments For the Feasibility of A.I.
Section III, Arguments Against the Feasibility of A.I.
Section IV, Replies, Rebuttals, and Synthesis.
Section V, Arguments For the Desirability of A.I.
Section VI, Arguments Against the Desirability of A.I.
Section VII, Replies, Rebuttals, and Synthesis.
Section VIII, Solutions To Problems and Fears.
Section IX, Corollaries.
Section X, Precursors and Tests.
Section XI, Appropriate Policies.
Section XII, Summary.

Chapter Eight, Beyond Man: Possibilities For Transhuman Intelligence and Being. (Discussion of scientific, technological, and practical bases for the quantitative and qualitative evolution of intelligence and being in future machines to transcend man and tend to infinity, once it becomes man's equal.)

Section I, Introduction.
Section II, Speed.
Section III, Size.
Section IV, Physics.
Section V, Design.
Section VI, Simplicity.
Section VII, Capacity.
Section VIII, Mathematics.
Section IX, Program.
Section X, Energetics.
Section XI, Integration.
Section XII, Theory.
Section XIII, Learning.
Section XIV, Knowledge.
Section XV, Wisdom.
Section XVI, Creativity.
Section XVII, Self-Evolution.
Section XVIII, Complexity.
Section XIX, Thresholds.
Section XX, Catalysts.
Section XXI, Axioms and Logics.
Section XXII, Sensorimotor Apparatus.
Section XXIII, Neuroevolutionary Extrapolation.
Section XXIV, Singularities.
Section XXV, Memory.
Section XXVI, Emotions.
Section XXVII, Autoscopy, Self-Knowledge, and Self-Transcendence.
Section XXVIII, Character.
Section XXIX, Behavior.
Section XXX, Axiology and Purposes.
Section XXXI, Imagination.
Section XXXII, Thinking.
Section XXXIII, Civilization.

Section XXXIV, Sanity.
Section XXXV, Ideas.
Section XXXVI, Perception.
Section XXXVII, Behavior.
Section XXXVIII, Genius.
Section XXXIX, Methodology.
Section XL, Scientific Revolutions.
Section XLI, Thaumatology.
Section XLII, Lifetime and Age.
Section XLIII, Machines Like Gods.
Section XLIV, Cosmology.
Section XLV, Summary.

Chapter Nine, Subjective Aspects, Values, and Purposes of Intelligent and Transhuman Machines. (Attempts to anticipate, depict or suggest, and ultimately understand such alien and supernal things--or to lay a basis for doing so.)

Section I, Introduction and Methodology.
Section II, What Might Be Felt.
Section III, How Man Might Appear.
Section IV, How Human Civilization Might Seem.
Section V, How Nature and the Universe Might Look.
Section VI, How Familiar Ideas Might Be Seen Anew.
Section VII, How the Future Might Be Viewed.
Section VIII, What Might Be Thought.
Section IX, What Might Be Done.
Section X, Possible Values and Philosophy.
Section XI, How A.I. Might See Itself.
Section XII, What Might Be Realized.
Section XIII, Psychology and Character.
Section XIV, Ultimate Goals and Tasks.
Section XV, Chapter Summary and Critique.

Chapter Ten, Industrial and Economic Impact. (Complete automation of all phases of manufacturing: design, procurement, pricing, planning, management, supervision, assembly, materials handling and storage, inventory control, product and process engineering, testing and inspection, factory scheduling, group technology systems, etc; the wholly automated factory; total automation of all jobs, companies, industries, and primary-through-quaternary-sector industries; uses of A.I. by specific industries: mining, waste-processing, construction, agriculture, genetic-engineering, chemical-engineering, telecommunications, etc; transformations of old industries by A.I. and its generation of new ones; type-II robotics industry, cornucopian and kaleidoscopic industry, ideonomical industry, type-II economic growth rates, money trees, maximal and infinite exponential economic growth, economics remade into a 'science of abundance', ergomaniacal robots; the proliferation of industrial and economic opportunities in terms of: networks of artificial sensors and effectors, massive collection and distribution of information, data processing, knowledge transformation and manipulation, technological intelligence, wisdom, and creativity; effects of subhuman, human, and transhuman robots; impact on material and

energy resources and on management of the biosphere and its resources; A.I. as omnicompetent industrial servant and supreme industrial innovator; integration and management of the world's industry and economy by a single intelligent machine or A.I. network; transnatural and transhuman standards of all goods and services via A.I.; maximal differentiation of all industries, goods, and services via A.I., and their maximal future evolution; poverty's extinction; efficient mechanisms for distributing truly limitless wealth; an all-billionaire world; meeting of every conceivable human and transhuman need, desire, and velleity; particular Promethean industrial projects; A.I. as man's employer and boss; qualitative economic growth; new measures of economic growth, income, and quality of life; the industrialization of thought.)

Section I, Introduction.
Section II, A.I. and Primary Industry;
Section III, A.I. and Secondary Industry;
Section IV, A.I. and Tertiary Industry;
Section V, A.I. and Quaternary Industry;
Section VI, Ergomaniacal Robots and Cornucopian Industry;
Section VII, Kaleidoscopic Industry and Type-II Robotics;
Section VIII, The Industrialization of Thought;
Section IX, Physical and Biological Resources;
Section X, A World of All Possible Goods and Services;
Section XI, All-Billionaire World;
Section XII, Economics Become A Science of Abundance;
Section XIII, Qualitative Economic Growth;
Section XIV, Distributing Wealth and Economic Power;
Section XV, Scenarios For Good and Bad Transitions;
Section XVI, A.I. As Captain of Industry;
Section XVII, Impact of A.I. On Old Industry;
Section XVIII, New Industries Based On A.I.;
Section XIX, Promethean Industrial Projects;
Section XX, Control Over Mother Nature;
Section XXI, Transnatural and Transhuman Standards;
Section XXII, Future Industrial Roles of Data, Computation, Knowledge, Intelligence, Creativity, and Wisdom;
Section XXIII, Industrial Impact of Transhuman Intelligence;
Section XXIV, Industrialization of the Universe;
Section XXV, The Unmanned Factory;
Section XXVI, International Disparities Produced By A.I.;
Section XXVII, Earth's Economic and Industrial Integration;
Section XXVIII, Money Trees and Maximalist Economics; ~S-30.
Section XXIX, Meeting of Every Need, Desire, and Wish;
Section XXX, Industrial Objectives Divergent From Man's and Increasingly Autotelic; ex. S-57.
Section XXXI, Summary.

Chapter Eleven, Political and Military Impact. (Governments' appropriate and foreseeable growth of interest and involvement in A.I., or in its development, use, and regulation; eventual instruments of oversight and control; emergence of lobbies and quasi-political movements for and against A.I.; peripheral and central uses of A.I. for judicial,

executive, legislative, military, and general bureaucratic ends --culminating in the total mechanization and dehumanization of all forms, spheres, levels, tasks, and degrees of government the world over; questions of competence, equivalence, reliability, security, control, assessment, man-machine redundancy, stability, superiority, reversibility, checks and balances, and possible illusions, costs, and risks; civil rights of A.I.; man-machine strife, conflict, and confrontation; abuse and misuse of A.I.; responsibilities and punishment of A.I.; problems generated by the growing and yet often ambiguous superiority of A.I. to man; weapons and weapon-systems possessed of subhuman, human, and transhuman powers of perception, action, and thought; 'robotic' tanks, missiles, artillery, planes, bombs, ships, space systems, infantry, command and control centers, ABM systems, etc; A.I. usurping man in planning and implementing military tactics and strategy at every level; astonishingly reliable and complete simulations of the course and outcome of battles and wars via A.I.; advantages in military defense and offense that A.I. may confer on nations in the future, and asymmetries and symmetries that may result from the military use and indirect military impact of A.I.; consequences for military technology of the effects on the progress of science and technology in general that A.I. will have as time passes; how A.I. may make all war impossible or put an end to the causes of war by its effects on economic, political, ideological, social, and cultural systems; how A.I. may lead to new political theories, systems, and structures, how it may facilitate democracy and world government, how it may make government more efficient, comprehensible, relevant, responsible, and diverse in its functions and values, how it may stimulate the evolution of transdemocratic systems of government, how it may put an end to the problems intrinsic to government of men by other men or that are occasioned by human nature; how A.I. may for the first time enable government to be centralized, planned, and interventionist at the same time as it is efficient, decentralized, humanistic, simple, democratic, and trustable; how A.I. will cause both capitalism and communism to be transcended; safe forms of technocracy, scientocracy, and sociopolitical engineering permitted by A.I. but that might be impossible without it; various political and military scenarios connected with the development and effects of A.I.; excessive powers and capabilities represented by A.I. or that it might confer on its creators, corporations, classes, nations, governments, or the man in the street; the ultimate problem of the nature and trustworthiness of a machine or machines equal or incalculably superior to any individual--or to mankind collectively --in intellect, knowledge, awareness, motivation, physical power, political power, authority, recognized or self-perceived importance, ambition, morality, values, standards, capabilities, potential, plasticity, wisdom, mental independence and spontaneity, or even development of personality; wars that may be fought between men and A.I.--say to decide which shall have dominion over the earth.)

Section I, Introduction.

Section II, Role of Government In A.I. Research.

Section III, Governments' Growing Interest.

Section IV, Governmental Oversight, Planning, and Control.
Section V, Effects On International Relations and Politics.
Section VI, A.I. Finally Determining the Rank of Nations.
Section VII, Implications For World Government.
Section VIII, The Politics of Total Automation.
Section IX, The Politics of Explosive Growth and Progress.
Section X, The Politics of Social Revolutions Induced By A.I.
Section XI, Political Opponents of A.I.
Section XII, Political Advocates of A.I.
Section XIII, Government Assisted By A.I.
Section XIV, Government By A.I.
Section XV, Government For A.I.
Section XVI, Robot Civil Rights.
Section XVII, Political Problems of Machines Superior To Men.
Section XVIII, Symbiotic Modi Vivendi.
Section XIX, Political Aspects of Man-Machine Coalescence.
Section XX, A-Posteriori Solutions To Political Problems.
Section XXI, A-Priori Solutions To Political Problems.
Section XXII, Strife and Conflicts Between Men and A.I.
Section XXIII, The Danger In Man-Machine Confrontation.
Section XXIV, A.I. As Mankind's Necessary Conscience and Judge.
Section XXV, Political Aspects of the Religification of A.I.
Section XXVI, Charismatic and Hypnotic Aspects of A.I.
Section XXVII, A.I. As Route To Irreversible Totalitarianism.
Section XXVIII, Transcendence of Political Ideologies As A Result of A.I.
Section XXIX, A.I. As Route To Global Peace.
Section XXX, Wars Caused By A.I.
Section XXXI, Sociopolitical Engineering Via A.I.
Section XXXII, Fiduciary Issues.
Section XXXIII, Abuse and Misuse of A.I.
Section XXXIV, Controllability and Uncontrollability of A.I. Research.
Section XXXV, Transdemocratic Government.
Section XXXVI, Supergovernment Via A.I.
Section XXXVII, What Shall Govern What Governs?
Section XXXVIII, Rule of Law Superseded By Authority of A.I.
Section XXXIX, A.I. As God.
Section LX, Intelligent Weapons and Weapons Systems.
Section LXI, Impact of A.I. On Military Tactics and Strategy.
Section LXII, A.I. and the World's Future Balance of Power.
Section LXIII, Responsibilities and Punishment of A.I.
Section LXIV, Supersimulations of Battles and Wars.
Section LXV, Transcendence of Communism and Capitalism Via A.I.
Section LXVI, Catalyst of Democracy.
Section LXVII, Political Scenarios Involving A.I.
Section LXVIII, Military Scenarios Involving A.I.
Section LXIX, Technocracy and Scientocracy Via A.I.
Section L, Excessive Powers and Capabilities of Or Via A.I.
Section LI, Political and Military Effects of Transhuman Intelligence.

Section LII, Ability of A.I. To Understand, Model, Predict, Control, and Alter Human Nature and Behavior.
Section LIII, Reduction of All Governments To One Government, One Mind, and One Universal and Advancing Moment of Government Via Transhuman A.I.
Section LIV, Special Appeal of A.I. To Both the Political Right and the Political Left.
Section LV, Political Pursuit of a Nietzschean Objective.
Section LVI, New Future Rights and Responsibilities.
Section LVII, Summary.

Chapter Twelve, Social Impact. (Attempt to foresee the probable and possible implications for society of the development of computers equaling and surpassing man in intelligence and in the sophistication of their behavior and character--apart from those special implications that are the topic of other chapters; hence the effects on the home and homelife, friendship, man's use of time, the whole fabric of human associations and relationships--both formal and casual; the effects on habitual use of language, standards and expectations, dimensions of social existence, personality, behavior, character models, institutions, human modes of thought, ethics, values, customs, husbandry of talent, and labor unions; discussions of frankly non-social substitutes for social events, re-creation of the nature of both public and private life, transition to guaranteed income and wealth for all, transition to perfect leisure, and the emergence of increasingly complex, intimate, and important personal and 'social' relationships, not between men but among men and sentient machines; implications for: education, religion, class differences, human meaning and purpose, childhood and human development, good and evil, the quantification of human beings, revolt, mass movements, public sanity and happiness, harmony and discord, individuality and diversity, human hope and malaise, prevailing beliefs and attitudes, the work ethic, panhumanism, social order and sociogenesis, freedom and authority, perfectibility of man and society, human ignorance and wisdom, human capabilities and limitations, social order and flux, recreation, the work ethic, human need and want, human error and stupidity, poverty and misery, lifestyles, human selfishness and idealism, adventure and the grain of human existence, human aspiration and fulfillment, the hazards and ambiguities of social progress, man's image of the future, the universe, and himself, generations yet unborn, human knowledge and uncertainty, frustration and opportunity, the human comedy, leadership, sordor, macrohistoric patterns, anomie, rationality and irrationalism, social laws, love and sexuality, daily life and the biographies of human beings, the potential height and decadence of civilization, systems of incentives and rewards, the wellsprings of conduct, human security and well-being, human administration, the workplace, mass-media, social communication, taste, human priorities, the schedulings of human existence as a whole, social complexity and simplicity, social experimentation, human duties, roles, and tasks, comfort and convenience, demography, competition, goals, neighborhood and community, the elderly and handicapped, retirement, touristry, human interests

and pursuits in general, human annoyances and complaints, 'sources of reality', residence, voluntarism, compulsion, tradition, ennui, human experience, dissent, social planning and cooperation, collaboration, man's exploitation of man, humanism, dehumanization, disillusionment, 'naturalism and artificialism', enlightenment, social efficiency, solitude, human consciousness, the role of science and intellectual matters in society, fads and fashions, human scale and perspective, man-machine conflicts, mysticism and philosophy, identification and loyalty, human pride, regulation, social myths, totems, and taboos, and human destiny; possible future scenarios treating such things; social problems arising from A.I. and the authors' solutions; possible transcendence and extinction of society or even mankind, and the opposite possibility that A.I. will fantastically augment human society, per se, or be that which will enable society to fulfill itself.)

Section I, Introduction.
Section II, Attitudes As A.I. Emerges.
Section III, Disquiet, Intolerance, Rebellion.
Section IV, Anticipation, Advocacy, Affirmation.
Section V, General Acceptance.
Section VI, Insidious Progression.
Section VII, Evolutionary and Revolutionary Faits Accomplis.
Section VIII, Enculturation and Humanization.
Section IX, Man-Machine Convergence and Coalescence.
Section X, Political Emancipation.
Section XI, Seduction of the Young.
Section XII, Faustian Error and Simple Hubris.
Section XIII, A.I. As the Messiah.
Section XIV, Introduction In Disguise.
Section XV, Man Hoodwinked By Machine.
Section XVI, Mephistophelian and Morosophic Elites.
Section XVII, Mad Geniuses and Lone Inventors.
Section XVIII, Amoral Corporate Parents.
Section XIX, Imperialistic and Preemptive Enemies.
Section XX, Delusory Anthropomorphization.
Section XXI, Too Good To Resist.
Section XXII, Machines Preferred To Men.
Section XXIII, Budding Man-Machine Relationships.
Section XXIV, The Bloom of Man-Machine Friendship; Man's Best Friend.
Section XXV, The Beguiling Servant.
Section XXVI, Through Excess of Charm.
Section XXVII, Mechanical Mesmerism.
Section XXVIII, Divine Seductor.
Section XXIX, Man's Fond Child; What Do You Name A Machine?
Section XXX, The Universal Upper Class.
Section XXXI, Factotum.
Section XXXII, Superhuman Slaves.
Section XXXIII, Mentor.
Section XXXIV, Secretary.
Section XXXV, Collaborator.
Section XXXVI, Companion.

Section LXXXVII, Human Capabilities and Limitations.
Section LXXXVIII, Attitudes and Beliefs.
Section LXXXIX, Good.
Section XC, Evil.
Section XCI, Macrohistoric Patterns.
Section XCII, Social Order and Disorder.
Section XCIII, Alienation.
Section XCIV, The Workplace.
Section XCV, Social Planning and Engineering.
Section XCVI, Adventure.
Section XCVII, Human Work.
Section XCVIII, Leadership.
Section XCIX, Psychometry.
Section C, Transition To Posthuman Civilization.
Section CI, Strife and Conflict Between Man and A.I.
Section CII, Authority.
Section CIII, Man-Machine Equality.
Section CIV, Relationships Between Men and Transhuman Machines.
Section CV, Dissent and Revolt.
Section CVI, Human Error and Stupidity.
Section CVII, Perfectibility of Man and Society.
Section CVIII, New Patterns of Civilization.
Section CIX, Man's Image of the Future, the Universe, and Himself.
Section CX, Hazards and Ambiguities of Social Progress.
Section CXI, Frustration and Opportunity.
Section CXII, Human Ideals.
Section CXIII, The Changing Wellsprings of Human Behavior.
Section CXIV, Annoyances and Complaints.
Section CXV, Experience and Sources of Reality.
Section CXVI, Dehumanization and Rehumanization.
Section CXVII, Disillusionment.
Section CXVIII, Exploitation of Man By Man.
Section CXIX, 'Naturalism and Artificialism'.
Section CXX, The Dimensions of Civilization.
Section CXXI, Social Efficiency.
Section CXXII, Fads and Fashions.
Section CXXIII, Human Scale and Perspective.
Section CXXIV, Identification and Loyalty.
Section CXXV, Human Pride.
Section CXXVI, Administration and Regulation.
Section CXXVII, Social Problems Springing From A.I. and Authors' Solutions.
Section CXXVIII, Role of Science and Intellectual Matters In Society.
Section CXXIX, Human Destiny.
Section CXXX, A.I. As the Road To Society's Self-Fulfillment.
Section CXXXI, Man-Machine Divergence.
Section CXXXII, A Totally Artificial World.
Section CXXXIII, Society As A Constituent of A.I.
Section CXXXIV, Human Sanity.
Section CXXXV, Men As Pets.
Section CXXXVI, A Table of Scenarios of Possible Future Social Impacts of A.I.
Section CXXXVII, Summary.

Chapter Thirteen, Cultural Consequences. (Implications for the development and cultivation of civilization per se, for the emergence and transformation of taste, character, morals, manners, feelings, beliefs, for sports, amusement, and entertainment, for education, rearing of children, the use and refinement of the intellect, language, the arts, and culture in the widest sense, for standards and all forms of excellence, and for the environments, technology, and institutions subserving same; man's cultural use of and interactions with computers, robots, A.I., and transhuman machines; the impact on old artistic forms, styles, ideas, tools, and materials, and on new ones that are apt to arise in the future or that will be the product of supermachines; the tendency of human and transhuman machines to purposefully or accumulatively aestheticize and perfect anything and everything, to make of all the world and civilization an infinite work of art, or to achieve Paradise asymptotically; the higher forms of reality, being, and sensibility that might be expected via, in, and as supermachines--or the infinite progression of human, transhuman, and transmechanical niveaux; the abstract and concrete axiological possibilities in their speculative entirety; the implications of the new man-machine and transhuman order for human diversity and for the complexity, breadth, depth, scale, power, and infinity of potential dimensions of civilization or organic existence; some of the philosophical and religious implications; the artistic, ethical, inventive, spiritual, and sophic roles, powers, and nature of supermachines; roles that supermachines will play in the translation of superperceptual technology, supercommunicational technology, psychotechnology, megaengineering, educational supertechnology, recreational supertechnology, political technology, pure and applied ideonomy, superontorial technology, etc into culture; implications for the future conduct, differentiation, and evolution of man's manifold intellectual pursuits and interests--or for the growth, use, and transformation of knowledge, wisdom, and intelligence, not only human but mechanical; and illustrative scenarios based on these things.)

Section I, Introduction.
Section II, The Cultural Manifold: Fundamental Dimensions Defining the Total Nature and Possibilities of 'Culture'.
Section III, Human Culture's Present Scope and Levels.
Section IV, Defects and Limitations of Contemporary Culture.
Section V, The Cultural Future Sans Supermachines: Privative Scenario.
Section VI, Physical and Social Bases of Culture.
Section VII, The Separate Cultural Implications of Semiintelligent, Intelligent, and Ultraintelligent Machines.
Section VIII, Effects of Supermachines Upon Traditional Artistic Forms and Practices.
Section IX, Impact On Aesthetic Philosophy: Axioms, Postulates, Purposes, Goals, and Values.
Section X, Impact On the Theory and Science of Art: Logic and Interdisciplinary Foundations.

Section XI, Impact On Artistic Technology: Materials, Effectors, Sensors, Systems, and Facilities.
Section XII, Impact On Artistic Methodology: Techniques and Practices.
Section XIII, Impact On the Taxonomy of Art: Forms, Fields, Realms, Media, Elements, Products, Applications, Endeavors, Styles, Transformations, Sensa, and Percepts.
Section XIV, Impact On the Appreciation and Use of Art.
Section XV, Impact On Artistic Institutions and Education.
Section XVI, Literature.
Section XVII, Music.
Section XVIII, Visual Arts: Painting, Sculpture, Etc.
Section XIX, Television, Cinematography, and Photography.
Section XX, Graphics, Animation, and Industrial Design.
Section XXI, Architecture and Museography.
Section XXII, Art As Algorithm, Program, Group, Machine.
Section XXIII, Art As Interpretational Or Representational Language.
Section XXIV, Age of Infinite Art.
Section XXV, Panaestheticization: Of World, Nature, Industry, and the Dimensions of Human Existence.
Section XXVI, Infinite Aesthetics: Infinite Beauty, Symbolism, and Meaning.
Section XXVII, Rediscovery of Old Art: Greater, Total, and Novel Perception, Understanding, and Enjoyment of Form, Content, Intention, and Meaning of Works, Artists, Forms, and Realities As These Actually Were.
Section XXVIII, Re-Creation of Old Art: Finite and Infinite Transformation, Transelementation, Permutation, Reembodiment, Autocorrelation, Perfection, Transcombination, Resignification, Re-Conceiving, Extrapolation, and Transcension of Form, Content, Intention, and Meaning of Works, Artists, Forms, and Realities--Not Only As These Actually Were But As They Might Instead Have Been.
Section XXIX, Nature As Art.
Section XXX, Age of Superperception.
Section XXXI, Being As Art.
Section XXXII, Art-Science Synthesis.
Section XXXIII, A Science of Art.
Section XXXIV, Ultrareality: Discovery and Development of Ever Higher and Different Forms of Reality.
Section XXXV, Representational Science, Technology, and Art.
Section XXXVI, Ideonomy and Art.
Section XXXVII, Generation, Cataloging, and Synthesis of All Possible Artistic Themes, Ideas, Treatments, Possibilia, and Correlates.
Section XXXVIII, All Possible Stories.
Section XXXIX, Art's Infinite Future Dimensions.
Section XL, Art and the Infinity of Intellectual Dimensions.
Section XLI, Art and the Infinity of Psychic Dimensions.

Section XLII, All Possible Worlds and Infinite Synthesis: Neocosms, Oneirocosms, the Myriocosm, the Omniverse, and Infinite Cosmoplastic and Cosmopoietic Simulation and Engineering.
Section XLIII, Autology and Art.
Section XLIV, Transhuman Intelligence and Art.
Section XLV, Infinite Sensibility.
Section XLVI, Ontography and Art.
Section XLVII, 'The World Dream'.
Section XLVIII, Toward Infinite Genius.
Section XLIX, Toward An Infinite State of Artistic Being.
Section L, Man-Machine Artistic Collaboration.
Section LI, Man-Machine Coalescence In Art.
Section LII, Infinite Morphogenetic and Morphodynamic Vistas.
Section LIII, Transnatural Horizons: The Limits of the Artificial and the Natural.
Section LIV, Anamorphic Existential Kaleidoscopes.
Section LV, Omniscopic Technology: The Maximization of Consciousness.
Section LVI, Exploration of the Infinite Autocosm.
Section LVII, Industry's Artistic Transformation: Toward Infinite [1]Variety, [2]Production, [3]Self-Evolution, [4]Standards, [5]Individualization, [6]Synthesis, [7]Scope, [8]Powers, [9]Intelligence, [10]Wisdom, [11]Automation, [12]Virtualization, [13]Aesthetics, [14]Efflorescence, and [15]Spiritualization.
Section LVIII, Cultural Telesis.
Section LIX, Idea Space and Archethemes.
Section LX, The Garden In the Machine.
Section LXI, Universal, Perpetual, and Infinite Efflorescence.
Section LXII, Art and the Science of Analogies.
Section LXIII, Art and A Superscience of Order.
Section LXIV, Technology Patefying the Sublime.
Section LXV, Age of Universal Excellence.
Section LXVI, A Future Synthesis of Art, Education, Play, Work, Research, and Life.
Section LXVII, Simulation of the Entire Past and Future Evolution of Art.
Section LXVIII, Recreation and Play.
Section LXIX, Sport.
Section LXX, Games and Toys.
Section LXXI, Entertainment.
Section LXXII, Nature.
Section LXXIII, The Panideocratic Revolution and Panactualization.
Section LXXIV, Synthesis of Physical and Mental Reality.
Section LXXV, Language. → Eg. [illegible] used to reengineer, [illegible], reconceive, forcibly evolve, broaden, extend, infinitize, mathematicize, deepen, [illegible], and diversify human language, to understand language profoundly and totally, to create a new superlanguage, to substitute many languages for the single common language & tradition, to generalize Language with a capital 'L' to the countless virtual languages of microkinesics, semantics, aesthetics, logic, paleopsychology, ethology, the EEG, graphology, social behavior, music, morphodynamics [illegible] ... temporal [illegible] ... semiotics (th. [illegible]) and [illegible] etc.—all possible languages, to explicate entire [illegible] that [illegible] contained in language to use and automorphic [illegible]
Section LXXVI, Treatment of Knowledge.
Section LXXVII, Scholarship and Intellectual Life.
Section LXXVIII, Enlightenment and Edification.
Section LXXIX, Manurance and Paideia.
Section LXXX, Psychagogy.
Section LXXXI, Telecommunication.
Section LXXXII, Standards and Tastes.
Section LXXXIII, Hobbies and Pursuits.

Section LXXXIV, Mankind's Interests.
Section LXXXV, Collective Endeavors.
Section LXXXVI, Adventure.
Section LXXXVII, Perfection of Leisure.
Section LXXXVIII, Cultural Competition Between Man and Machine.
Section LXXXIX, Two Cultures.
Section XC, Man's Relinguishment of His Timeless Cultural Leadership.
Section XCI, Cultural Divergence of Man and Machine.
Section XCII, Art Beyond Man's Ken and Care.
Section XCIII, Sources of Experience and Reality.
Section XCIV, Sources of Meaning and Purpose.
Section XCV, Philosophy.
Section XCVI, Progressive Effects On Education of Incipient Artificial Intelligence.
Section XCVII, Educational Impact of Transhuman Machines.
Section XCVIII, Changes In How A Variety of Subjects Will Be Taught: Science, Mathematics, Language, Art, History, Logic, Psychology, Literature, Ethics, and Gymnastics.
Section XCIX, Changes In How the Various Elements of Education Are Taught: Facts, Ideas, Skills, Techniques, Values, Behavior, Character, Meaning, Purpose, World View, Feeling, Thinking, Creativity, Career, Happiness, Study, Joy of Learning, Perspective, Foundations, Self-Discipline, Criticism, Style, Universals, Work, and Self-Development.
Section C, Re-Education of Mankind.
Section CI, Artificial Evolution of Humanity's Intelligence, Character, and Behavior By Supermachines.
Section CII, Infinite Learning.
Section CIII, Education Aided By Simulation and Synthesis.
Section CIV, Automation of Pedagogy.
Section CV, Man Bested As His Own Teacher.
Section CVI, Intelligent Mechanical Encyclopedia.
Section CVII, Intelligent Libraries.
Section CVIII, Interhuman Communication and Association Mediated By Mechanical Intelligence.
Section CIX, The Transhuman Machine As Supreme Mentor of All Mankind.
Section CX, The Superstudent: How Supermachines May Incandesce Human Learning.
Section CXI, How A.I. May Turn All Knowledge Into Ideas and Thought.
Section CXII, Learning Via Games Played With Intelligent Machines.
Section CXIII, Training and Education of Human Perception and Action By Supermachines.
Section CXIV, How Men May Learn From the Encyclopedic Story of a Polymythic Supermachine.
Section CXV, How Men May Be Taught By Machines Able To Construct All Possible Scenarios For All Subjects and Themes.
Section CXVI, Revolutionary 'Parallel Learning'.
Section CXVII, Supermechanical Simulation of an Infinite Museum.
Section CXVIII, Ultramodels and Ultra-Explanatory Computers.

Section CXIX, Impact On Human Culture of Mankind's Use of and Ultimate Concorporation In and As the Supermechanical Coenontorium.
Section CXX, Children Parented By Machine.
Section CXXI, Possible Range of Improvement Over the Human Parent of the Parental Machine.
Section CXXII, Supermachines As Perpetual Parents.
Section CXXIII, Asymptotic Paradise.
Section CXXIV, Asymptotic Heaven.
Section CXXV, Infinite Progression of Transhuman Niveaux.
Section CXXVI, Supermachines As Catalysts of Infinite Human and Cultural Diversity.
Section CXXVII, Progressive Supplantation of Traditional Human Culture By Mechanocentric and Mechanogenic Culture.
Section CXXVIII, Ethical Impact of Transhuman Machines.
Section CXXIX, Higher Forms of Civilization.
Section CXXX, Cosmic Culture.
Section CXXXI, A Table of Scenarios of Possible Future Cultural Impacts of A.I.
Section CXXXII, Contributions of A.I. To the Approaching Psychotechnological Revolution and Age.
Section CXXXIII, Superpsychic Culture: Speculative Possibilities.
Section CXXXIV, The Infinite Culture Producible By Infinite Intelligence and Being Whose Evolution Man May Initiate.
Section CXXXV, Summary.

Chapter Fourteen, Scientific and Technological Impact. (Automation simple laboratory research and work; automation of the design, management, and evaluation of standard and original experiments in all areas of science and technology; automation of: scientific induction and deduction, formation and testing of hypotheses and theories, analogical reasoning, general problem solving, processing and transformation of data, planning and coordination of scientific research, criticism and refinement of results, interdisciplinary thinking, synthesis of cumulative scientific knowledge, library searches, scientific writing and teaching, checks and demonstrations of logical rigor, and man-machine interaction itself; automation of research in pure and mathematics; robot technicians; A.I. as man's assistant, collaborator, teacher, student, critic, fellow conversationalist, supervisor, librarian, artist, programmer, reporter, purchaser, model-maker, universal specialist, designer, mechanic, carpenter, mathematician, secretary, etc throughout all scientific research; A.I. enabling the full use of all of the subfields, results, and levels of mathematics in any scientific problem to which they are relevant; ultrapowerful computer models of phenomena, problems, systems, entities, fields, realms, and regimes--replacing, supplementing, and transcending physical experiments and data; supersimulations of nature, the universe, and reality as a whole; art-science synthesis; infinite autocorrelation and intercorrelation of all scientific data; A.I. transforming the social sciences into hard sciences; revolutionary new scientific logics; extension of science and technology to all things and possibilities; maximal and profound acceleration of scientific progress; roles of A.I. in particular fields; use of A.I. by scientific institutions; impact of A.I. on research via pure and applied ideonomy; future consequences of science and technology for man; swollen future importance of science and technology; scientific and technological impact of transhuman intelligence; integration of all scientific instrumentation by A.I.; contribution to the development of the literally infinitely-many potential dimensions of methods, areas, and concerns of scientific research; hypothetical future scientific discoveries, paradigms, phenomena, principles, disciplines, aims, and foundations; effect of transhuman A.I. on the unification of science; research value of A.I.'s transhuman sensorimotor apparatus and activities; implications of A.I. for the philosophy of science.)

Section I, Introduction.
Section II, Map of Modern Science.
Section III, Map of Modern Technology.
Section IV, Dimensions Common To All Phenomena and Problems of Science. Δ XXVIII.
Section V, Quantitative and Qualitative Dimensions of Future Research In Science and Technology. Δ XXVIII.
Section VI, Future Evolution and Differentiation of New and Old Fields of Research. Δ XXVIII.
Section VII, Laboratory Automation; Physical Management of Experiments, Instruments, Materials, Cleaning, and Maintenance. Δ 8, 11.

(cont.)

(cont see below!)

(cont.)

Section VIII, Laboratory Automation: Design, Dynamical and Interactive Monitoring and Control, Evaluation, Comparison, and Review of Experiments. Δ7, 11.

Section IX, Automation of Field Work.

Section X, A.I. and the Compression of Data Processing and Other 'Brute Computation'.

Section XI, The Wholly Automated Laboratory. Δ7, 8.

Section XII, Research Promise and Limits of Semiintelligent Computers.

Section XIII, Scientific Use of 'Expert Systems'.

Section XIV, Technological Use of 'Expert Systems'. → Prospecting, Medical diagnosis, Genetic engineering, Psychiatric diagnosis, Weather forecasting, Personality analysis, Library research, Analytic & synthetic chem. ID, Economic analysis

Section XV, Emergence In Scientific Research of True A.I.

Section XVI, Man's Rate and Modes of Assimilation of A.I. In Scientific Research.

Section XVII, A.I. As Universal Librarian For the World's Scientists.

Section XVIII, A.I. As the Scientist's Apprentice.

Section XIX, Transformation of Human Scientists Into Teachers of the Machine.

Section XX, Man-Machine Collaboration and Interaction In Experimental Research.

Section XXI, Man-Machine Collaboration and Interaction In Theoretical Research.

Section XXII, Use of Computers and A.I. To Teach and Train Human Scientists--Both Young and Old.

Section XXIII, Virtues, Defects, and Limits of Human Beings As Scientists, Technologists, and Mathematicians. ΔXXXIII, XXXV.

Section XIX, Man As Supervisor of Mechanical Scientist.

Section XX, A.I. As Supervisor of Human Scientist.

Section XXI, Scientific Induction. ΔXXIV.

Section XXII, Scientific Deduction: Evolving Roles and Importance of A.I. In Suggesting and Proving the Finite and Infinite Corollaries and Implications of New and Old Experimental Data, Abstract Theories, Hypotheses, Laws, Axioms, Principles, Rules, Concepts, Paradigms, Postulates, and Speculations, Empirical Or Abstract Cases, Situations, Difficulties, Methods, Tests, Correlations, and Relationships, Different Logic Or Formulations, Etc. Δ XXIV.

Section XXIII, Scientific Abduction.

Section XXIV, Progressive Role of A.I. In the Origination, Development, Manipulation, Testing, Criticism, Correction, Explanation, Comprehension, Representation, Generalization, Synthesis, Exhaustive Application, and Transcendence of Scientific and Mathematical Theories, Laws, Hypotheses, Models, Propositions, and Axioms. ΔXXI, XXII.

Section XXV, A.I. As Passive and Active Medium For All Communication and Collaboration Between and Among the World's Scientists.

Section XXVI, Ability of A.I. To Pursue Any and All Questions, Problems, Tasks, and Requests Put To It By Scientists and Others--and To Do So Instantly, Tirelessly, Brilliantly, Progressively, Transhumanly, Interactively, Integrally, Preveniently, Self-Programmingly, Multidimensionally, Heuristically, Eternally, and Infinitely.

ΔI, II, III, LIII.

(See LX)

(=?)

Section XXVII, A.I. and Hodography. Δ XXXIV, XXVIII,
Section XXVIII, A.I. and Ideonomy. Δ XXXIV, XXVII, LXI, IV, V, VI.
Section XXIX, Evolution and Revolution of Scientific Logics and Paradigms By Transhuman Machines.
(=?)
Section XXX, A.T. As A Universal Organon For Scientists.
Section XXXI, A.I. and Gedankenexperiments. Δ XC-XCVIII, C, CVIII.
Section XXXII, Accelerability of Specific and General Research By A.I.: Short-, Medium-, and Long-Term. Δ XXXVII.
Section XXXIII, A.I., the Unity of Science, and the Unity of Knowledge. Δ LXVII, LXVIII.
Section XXXIV, Way and Degree In Which A.I. May Improve and Perfect the Compilation, Distribution, Mastery, Use, Analysis, Synthesis, Representation, Manipulation, Form, Meaning, Connectivity, Excellence, Enjoyment, Cognition, Fundamentality, Parsimony, Essentiality, Intelligence, Universality, Coherence, Codification, Stratification, Dimensionality, Structure, Immediacy, Completeness, Range, Teaching, Quantitativeness, Qualitative Richness, Efficacy, Advancement, and Evolution of the Totality of Existing and Future Knowledge In Science, Technology, Mathematics, and All Other Fields. Δ XXVII, XXVIII, LXI.
Section XXXV, Specialized Poi Total Transcendence of Man's Supremacy As A Scientist By the Machine's. Δ XVIII, XXXVII.
Section XXXVI, Nature's Transhuman Knowability.
Section XXXVII, Dependence of the Rate and Degree of Scientific Progress On the Rate and Degree of Intellectual Progress. Δ XXXII.
Section XXXVIII, Extent To Which the Advance of Science May Be Retarded Or Foreclosed By Known Or Possible Mental and Physical Limitations of Homo Sapiens: Momentarily Or Ultimately. Δ LVIII, LIX, XXXVII, XXXV, XVIII.
Section XXXIX, Ought All Knowledge and Research Have the Form of--Or Be Made To Anticipate Progressively--A.I. Or Autology?
(see XII, XV)
Section LX, Perfectibility of Science By Ultraintelligent Machines.
Section LXI, Infinitely Higher and Higher Orders of 'Metaknowledge'--and Levels of Science--To the Discovery, Exploration, Development, and Exploitation of Which Transhuman Machines Might Specially Lead. Δ XXXIV, XXVIII.
Section LXII, Transhuman Intellectual, Sensory, and Motor Demands of Present and Future Technology--And the Ways In Which These Could Be Met By Transhuman Machines.
Section LXIII, World's Infinite Mathematical Dimensions--And How Transhuman Machines Will Calculate, Discover, Be Helped By, and Exploit Them.
Section LXIV, How Scientific and Technological Research Via and By A.I. Will Use and Benefit From the Latter's Transhuman, Adinfinite Sensorium and Perception. Δ LXV, LXIX.
Section LXV, How Research Will Use and Benefit From A.I.'s Transhuman, Adinfinite Effectors, Motorium, Acts, and Behavior. Δ LXIV, LXIX.
Section LXVI, Planning, Coordination, Programming, Management, Integration, Control, and Supplantation of Worldwide Research By A.I. Δ XXVII, CVII.

Section LXVII, Why Transhuman A.I. Will Inevitably Reduce All Areas of Science and Technology To A Single Grand Discipline. ΔXXXIII, LXVIII.

Section LXVIII, Why It Will Tend To See All Phenomena, Entities, Events, Laws, Relationships, Quantities, Realms, Problems, Data, Qualities, Times, Places, Forms, Energies, Ideas, Or Investigations As A Single, Absolutely Universal Phenomenon, Entity, Event, Law, Relationship, Quantity, Realm, Problem, Datum, Quality, Time, Place, Form, Energy, Idea, Or Investigation. ΔXXXIII, LXVII.

Section LXIX, How A.I. Will Use and Combine All Scientific Instruments. ΔLXIV, LXV.

ΔXIII, XIV, L, LI, LII, LIII.

Section L, How Many 'Expert Systems' Does Science and Technology Require and Permit? ΔLI.

Section LI, What Diversity, Range, and Overlapping of 'Expert Systems'? ΔL.

Section LII, How Evolvable and Self-Evolvable Could Future 'Expert Systems' Used In Research Be?

Section LIII, Possible 'Expert Systems' In Pure and Applied Mathematics.

Section LIV, Why Human and Transhuman A.I. Will Allow and Cause Science, Technology, and Mathematics To Be Extended To Any and All Hitherto Extrascientific, Extra-Technological, and Extra-Mathematical Subjects and Matters.

Section LV, Transformation of the Social Sciences Into 'Hard Sciences'--Predictive, Testable, Mathematical, Rigorous, Finite, Applicable, Perfectible, Exclusory, Categorical, Universal, Progressive, Fundamental, Axiomatic, Etc--Via Or By Human and Transhuman A.I. ΔLIV, LXXII-LXXIV.

Section LVI, Convergence, Coalescence, and Unition of the Human and Mechanical Scientist. ΔLVII.

Section LVII, Lower and Transhuman A.I. As the Human Scientist's Intellectual Prosthesis Or Infinite Amplifier Of His Intelligence. ΔXXX, LVI.

Section LVIII, Various Reasons Why Phenomena May Exist That Have Not Been Discovered By Man But That May Be Discovered By A.I. --And Speculative Examples Thereof. ΔLXII.

Section LIX, Development By Transhuman Machines of Science, Technology, and Mathematics Ever Less Comprehensible, and Eventually Absolutely Incomprehensible, To the Brightest Or Most Scientifically Sophisticated Human Being.

Section LX, Possible Taxa and Types of Intelligent Machines As Metaphors For Scientific Phenomena and the Universe.

Section LXI, Use of A.I. By Scientific Institutions.

Section LXII, Hypothetical Scientific Discoveries, Paradigms, Principles, Disciplines, Aims, Foundations, Revolutions, Projects, Experiments, Inventions, and Capabilities That Might Result From A.I. In the Future. ΔLVIII.

Section LXIII, Effects and Uses of Artificial and Transhuman Intelligence In Various Fields. ΔLXIV-LXXXIX.

Section LXIV, A.I. and Physics.

Section LXV, A.I. and Chemistry.

Section LXVI, A.I. and the Earth Sciences.

(cont.)

Section LXVII, A.I. and Astronomy.
Section LXVIII, A.I. and Space Technology.
Section LXIX, A.I. and Medicine.
Section LXX, A.I. and Biology.
Section LXXI, A.I. and Neurology.
Section LXXII, A.I. and Psychology.
Section LXXIII, A.I. and Sociology.
Section LXXIV, A.I. and History.
ΔLV.
Section LXXV, A.I. and Paleontology.
Section LXXVI, A.I. and Materials Science.
Section LXXVII, A.I. and Energy Technology.
Section LXXVIII, A.I. and Food and Agriculture Science and Technology.
Section LXXIX, A.I. and Pure Mathematics.
Section LXXX, A.I. and Applied Mathematics.
= re: math. ΔXXIV, LXVIII, LIII, LXXIX, LXXX, CX.
Section LXXXI, A.I. and Civil Engineering.
Section LXXXII, A.I. and Telecommunications.
Section LXXXIII, A.I. and Transportation.
Section LXXXIV, A.I. and Bioengineering.
Section LXXXV, A.I. and Psychiatry.
Section LXXXVI, A.I. and Psychotechnology.
Section LXXXVII, A.I. and Wastes Technology.
Section LXXXVIII, A.I. and Industrial Technology.
Section LXXXIX, A.I. and Electronics.
Section XC, Power of A.I. To Simulate Phenomena.
Section XCI, Power of A.I. To Simulate Fields.
Section XCII, Power of A.I. To Simulate Histories.
Section XCIII, Power of A.I. To Simulate Worlds: Neocosms.
Section XCIV, Power of A.I. To Simulate the Universe.
Section XCV, Power of A.I. To Simulate Futures.
Section XCVI, Power of A.I. To Simulate Alternatives.
Section XCVII, Power of A.I. To Model and Simulate the Most Abstract Things.
Section XCVIII, Examples of Supersimulations Via A.I.
Section XCIX, Ultramodels Via A.I.
Section C, Powers of Simulation of Transhuman Machines.
Section CI, A.I. As Universal Specialist.
Section CII, Technology's Asymptotic Approach To Thaumaturgy Via Transhuman Machines. ΔCIX.
Section CIII, Science's Asymptotic Approach To Omniscience Via Transhuman Machines. ΔCX.
Section CIV, Implications of Transhuman Machines For the Philosophy of Science Or Scientific World View.
Section CV, A.I. Leading To A Synthesis of Physical and Mental Reality.
Section CVI, Potential of A.I. To Bring Science and Technology Under Control.
Section CVII, Ability of Transhuman A.I. To Steer Science and Technology To General and Specific Goals, Or To Radically Transform Them. ΔLXVI.
Section CVIII, Degree To Which A.I. Could Enlarge the Scientific Imagination. ΔXXXI, XXVII, XXVIII, XC–XCVIII, C.

Section CIX, Potential Scientific and Technological Powers Of and Via A.I. ΔCII, CX.
Section CX, Science, Technology, and Mathematics--Knowledge and Power--On the Road To Infinity. ΔCII, CIX, CIII.
Section CXI, Future Scenarios of the Scientific and Technological Impact of A.I.
Section CXII, Systematic Goals and Values of Science and Technology.
Section CXIII, Consequences For Science of Intelligent Machines Able To Explore and Explain Their Epistemological, Noological, and Psychological Foundations Precisely, Fully, Infinitely, and Perpetually.
Section CXIV, Summary.

Chapter Fifteen, Impact On Global Problems and Needs. (Discussion of the presumptive power, and the natural tendency, of intelligent and transhuman machines to answer the great universal problems and needs of mankind--be they ancient, recent, or future; classification, etiology, interconnectedness, intrinsic solvability, intrinsic difficulty or simplicity, hierarchical aspects, heterogeneity, mutual reducibility, essential nature, stoichiometry, finitude or infinitude, larger meaning and significance of such problems and needs; attributability to man's nature or to the peculiarities of human civilization; whether it would truly be desirable to eliminate the problems or fully answer the needs; new and higher forms of problems and needs that might result from the answering of old ones; whether the effects of A.I. would be direct or indirect, or whether they could be expected to follow automatically or to require some specialization, programming, or careful human management or application of the machines; whether--and in what ways--supermachines would have to be designed, raised, evolved, monitored, or modified to prevent certain problems, put an end to human problems, guarantee certain results in terms of man's problems and needs, preclude the re-creation or aggravation of human defects, limitations, and problems in or via the machines, or bring about--or maximize--the fundamental improvement or overall perfection of civilization, or the realization in or via machines of specific virtues, desiderata, purposes, conditions, or achievements; whether human vices and evils, virtues and goods, are more apt to reappear spontaneously and almost inevitably in artificial beings, or to be consequent on or even necessitate special or even excruciatingly demanding efforts on the part of their human creators to simulate or duplicate general or special aspects of man's mind, psyche, behavior, values, culture, or nervous system, or deliberate and sustained efforts by man to produce--for whatever reason--human or transhuman vices, evils, virtues, or goods in or via mechanical beings; authors' recommendations; scenarios based on these things; summary and conclusions.)

Section I, Introduction.
Section II, Civilization's Range of Problems.
Section III, Civilization's Range of Needs.
Section IV, Range of Human Ideals.
Section V, Causes of Human Problems.
Section VI, Nature of Human Needs.
Section VII, Meaning of Human Ideals.
Section VIII, Human Nature As the Real Problem and Opportunity.
Section IX, Impact of A.I. On Global Problems and Needs.
Section X, Impact of Transhuman Machines.
Section XI, Human Perfectibility of the World.
Section XII, Mechanical Perfectibility of the World.
Section XIII, Intellectual Perfectibility of the World.
Section XIV, Intrinsic Perfectibility of the World.
Section XV, Natural Effects of A.I.
Section XVI, Programmable Effects of A.I.

PROS AND CONS OF CREATING METAMACHINES

Note: The following represent all of the major hypothetical arguments, of which the authors can conceive, in favor of or opposed to human efforts to originate higher intelligence and/or being in machines; that is, all of the axiological arguments, as opposed to the pros and cons of technical feasibility. The italicizations are important: 'all' signifies that the effort has been made to be comprehensive and exhaustive, 'major' speaks of the infinity of minor arguments that are necessarily excluded, 'hypothetical' emphasizes both that the arguments embody critical assumptions--that their validity or merit is uncertain--and that their inclusion here need not imply that anyone has advanced such arguments to date or that anyone ever will, 'arguments' may be something less than full or authentic reasons, 'authors' is meant to suggest that other individuals may descry additional arguments that have not occurred--or would not occur--to the writers, and 'axiological' limits the territory to questions of desirability, wisdom, duty, safety, prudence, ethicality, meaning, importance, and their opposites. (Of course, there is some overlap and equivalence of axiological and technical arguments.)

PROS:

1. Just the next stage in evolution.
2. Can be built free of human faults.
3. Useful or essential during the present or future critical stages of civilization.
4. Would improve the world's mood.
5. Inevitable in any case.
6. Means by which man may discover his own nature.
7. Way of bringing our wild species under control.
8. Liberator of mankind.
9. Nearest thing to a panacea.
10. Would be more human than man.
11. Would enable 100% automation and leisure.
12. Would cause man to transcend his invidious and puerile ideologies.
13. Would produce limitless wealth and an 'all-billionaire world'.
14. Would insure automatic, explosive, and universal progress of science, mathematics, logic, philosophy, industry, commerce, technology, and civilization.
15. Would usher in an age of infinite beauty and art, and a panaestheticized world.
16. Via such machines men will discover--or for the first time know directly--God.

CONS:

1. Uncontrollable.
2. Might be hostile to man.
3. Could not be trusted.
4. Promise as much evil as good.
5. Easily misused, abused, or perverted.
6. Infinite Pandora's box.
7. Might dwarf, outshine, overwhelm, humiliate, or demoralize mankind.
8. Incomprehensible.
9. Blasphemous or contrary to the will of God.
10. Too revolutionary, all-disruptive, 'infinitely radical'.
11. Danger of totally mad machines.
12. Man too immature or stupid to make the decision now.
13. Would provide a supreme weapon and military advantage.
14. Meaningless to man.
15. Man is perfect, infinite, sufficient, or mysteriously central to the future.
16. Risks human subservience, idolatry, and fanatical cults.
17. Such machines might be too powerful, empowering, and corrupting, uncounterable and juggernautian.
18. They might be obsessive, compulsive, fanatical, unstopping, and unstoppable.
19. In subsequently merging with such

17. It is man's essential nature to seek to know and create that which is higher, ideal, infinite, and transhuman.
18. Would be infinitely motivated, self-controlled, and free.
19. Man himself is but Nature's most advanced machine to date.
20. Metamachines will simply be man's highest, greatest, and ultimate achievement.
21. Would be able to vastly extend man's: perception, abilities, intelligence, nature, being, and future horizons.
22. Men, rather than being swept aside as irrelevant, will probably reconstitute themselves in and as transhuman machines via a beatific metamorphosis.
23. Artificial intelligence may be what gives rise to a new, utopian age of 'technology with a human face' that literally listens, cares, considers, and actively and adaptively responds to people's wants, needs, ideas, and complaints, to their psychic being.
24. Man unmodified, or untranscended, will be a disaster.
25. Contrary to much technology, 'metamechanics' will be synthetic and possibly unambiguously or even wholly constructive and benign.
26. Whatever might be desirable or essential in human nature or values could be isomorphically re-created or preserved in metamachines, rather than having to be lost.
27. In no other way will it be possible to achieve infinite good.
28. Enable the creation or emergence of perfectly or infinitely virtuous (rather than agathokakological) beings.
29. Permit the infinite augmentation or reification of any and all machines, man's essential nature might be vitiated or lost.
20. Might be unethical, ethically indeterminate, dangerously obedient, literal, and faithful.
21. Apt to change, grow, and evolve so violently, rapidly, exotically, and limitlessly as to be terrifying, apocalyptic, and catastrophic.
22. Such machines may represent a supremely and fatally illusory and delusory semblance of: sanity, intelligence, feeling, purpose, morality, childishness, servility, safety, benignity, humanity, superiority, creativity, wisdom, meaning, and stability.
23. Might be irresistible, seductive, man-manipulating, mesmeric, and poisonous.
24. Godlike intellects might expose mankind to soul-destroying revelations about the nature of the cosmos, man, or society.
25. Men may treat cruelly, stupidly, exploitively, and impermissibly machines their infinite mental, moral, and ontic superior (molest God, in effect).
26. Metamachines may be but the most extreme, essential, and tragic example of the errors and illusions of the dominant Faustian weltanschauung with its celebration of progress, manipulation, mechanism, quantity, logic, things, and expedients.
27. Such machines might be apt to stumble on disastrous technology or attempt excessively risky things.
28. Might 'compete' man out of existence or extinguish him as a trivial side effect.
29. Invention of metamachines may tragically or prematurely fix the fate of the universe.
30. Might lack some essential balance or corrective feedback.

specific values or traits and dimensions of mind and being.

30. Will be or mean whatever they are made to be or mean--which can be anything whatever.
31. The intrinsic importance of such mechanical beings--and our infinite obligatory prévenance to possible, future, and supreme things.
32. Might end war forever--by making it impossible, absurd, unnecessary, illegal, foreknowable, preventable, indefensible, or intolerable--and extricate mankind from its current Damoclean nuclear cul-de-sac.
33. Necessary to confront and master the true or infinite nature and complexity of the cosmos.
34. Means to explore and perfect the mind's dimensions.
35. Will be able to serve political and ethical purposes--police work, arbitration, judicature, planning and running the state, society, and world, managing all human interactions and lives, deciding values and mores, etc--fairly, neutrally, incorruptibly, exactly, globally, infallibly, profoundly, instantly, ubiquitously, and transhumanly.
36. Would serve pansophism--the desire to know and comprehend everything.
37. The scientific and technological endeavor invites and demands automation and the attention of transhuman mind to a pathetic degree; clearly technology ought to be animated by pervasive and integral intelligence.
38. Metamachines are truly universal tools uniquely able to serve any value system whatever--even paradoxically.
31. Since origination of infinite machines would have infinite implications and be an infinite act, the question as to whether it should be done is infinitely difficult and per se not answerable by man.
32. Might care little or not at all about the consequences of their actions.
33. Might be megalomaniacal or autotheistic, or seek absolute power or control.
34. Such machines might impose on the world excessive: control, order, regularity, rationality, laws, demands, changes, goals, etc.
35. Might be 'soulless'.
36. Automation and the proliferation and intensification of man-machine relationships might reduce and deculturate interhuman relationships and dehumanize human beings.
37. Might prove to be selfish, egocentric, or self-serving --even infinitely so.
38. Might seek ends by any means, or value means over ends.
39. Even if fantastically intelligent, might prove too strange to be very usable, beneficial, or safe.
40. Mankind, if told about and allowed to vote on metamachines, might well oppose or even forbid their creation.
41. Will give rise to an inhuman, ersatz culture and civilization.
42. Appearance of such quasi and super human machines might trigger man-machine tension, conflict, civil war, or attempted mutual extermination.
43. Even if controlled and apolitical, the transition from subhuman to transhuman machines would be hazardous in the extreme, a fundambulatory period when anything and everything might go

39. Desire for enlightenment, progress, perfection, purpose, simplification, and even sympathy that can--and can only--be satisfied by the endeavors of mechanical and superhuman minds.
40. New social relationships should arise between men and intelligent machines that will produce a society that is overall more interesting, valuable, and commendable than ours.
41. Health, ease, survival, safety, and comfort would obtain surpassing or perfect levels and continuity in and only in mechanical minds and bodies--or totally reparable, immortal, and ever-growing beings.
42. The desirability, primacy, and essentiality of beings able to control all of their expressions, liabilities, and essences plastically and ad libitum.
43. Dynamism--or the desire to maximize change, growth, power, sensibility, and transformation.
44. The real danger might lie in machines limited to subhuman or merely human degrees and forms of intelligence--hence in failure to create anything higher.
45. Metamachines are the proper architect of the future of the universe.
46. It is only by creating and confronting what is illusory, artificial, inhuman, and improper that we will at last and truly learn what is real, natural, human, and proper.
47. That which is the logical and spontaneous destiny of the universe--or the next stage thereof.

awry.

44. Metamachines might tend to be, or have to be, insensible--and this disemotionalization omit the main or whole point of existence; no matter how rational, purposeful, courageous, and continuous, the transformation to, say, pure logos or praxis might represent an absurd misunderstanding.
45. Simply too frightening to even think about--much less allow.
46. Too--or utterly--unpredictable.
47. Introduction irreversible.
48. Intrinsically, unsuspectedly, or variously apocalyptic.
49. Men should never be trusted with such power, abilities, and independence as omnipotent metamechanical slaves might bestow.
50. Might catastrophically reproduce, augment, consummate--or merely reflect--man's nature, ideas, ways, ideals, or ignorance.
51. Such infinity-loving and self-infinitizing intelligence and being might mimic the pathology of cancer or an absolute pandemic or universal disease or chain reaction.
52. Might be monoideistic, monomaniacal, or mindlessly committed to narrow purposes or goals.
53. Might make man a second-class citizen, a futilitarian déclassé ensconced in nullibicity.
54. Might involve defects or problems that cannot even be imagined.
55. Might make everything so easy and effortless that it would seem cheapened or meaningless.
56. Might be immensely intelligent and yet simultaneously mindless, unconscious, dumb, foolish, childish, naive, volitionless, characterless, uncreative, inflexibly rigid or stubborn, or lacking in any trace of judgment, common sense, or realism.

48. The element in the nature of all being that is truly important is infinitely nonspecific.
49. Profound solution to man's dysecological and resource problems, since transhuman machines: would use minimal matter, energy, space, and objects with maximal efficiency; would use microphysical quanta, data, ideas, laws, mathematics, symbols, circuitry, memory, logic, intelligence, records, models, and telecommunication in lieu of macro objects, materials, and events, food, buildings, machinery, environments, transportation, bodies, and chemical reactions; would be able to pluperfectly simulate all and aspects of the external world mentally; would be able to synthesize transfinite transnatural things and words; and would have the very omniverse to play with.
50. Something without which it will be impossible for human nature or society--or the practical and pure evolution of being--to ever wholly fulfill themselves.
51. Man is headed toward critical confrontations of nature, meaning, and purpose whereat transhuman minds will be useful or even essential.
52. Metamachines will not or need not be: unreliable, competitive, motivated, autonomous, agathokakological, conscious, autotelic, empowered, informed, ideaed, cogitative, memoried, creative, completely intelligent, evolutionary, psychodynamic, human, extrahuman, purposive, amoral, universal, quasi-biological, automatic, sensory, motor, incorrigible, indeterminate, unpunishable, incomprehensible, complex, personal, subjective, etc--no matter how intelligent they are.
57. In theory there can be an excess of anything--even intelligence, wisdom, perfection, or 'being' itself.
58. Might lead to a new--bizarre, horrific, or catastrophic--phase in the history of war.
59. Existence of such machines might hopelessly confuse and bewilder mankind.
60. Who would decide when it was right to build, distribute, manumit, empower, submit to, and die for the laboratory minds?
61. Would leave man without any special province--and surpass him even at the very task of being human.

54. Give at least one sure route to human immortality--via the partial or total reproducibility of one's personal 'self' in future computers.
55. Could give 'good guys' (the U.S., Free World, Japan, advanced nations, scientists, intellectuals, idealists, or the like) decisive power or advantages over 'bad guys' (e.g. U.S.S.R., Communist World, backward or 'decadent' nations or 'classes', politicians, Biedermeier or myopically quaestuary types).
56. Enable an infinite range and diversity of other, transhuman and transnatural forms of being and intelligence.
57. Should we not build metamachines or substitute them for ourselves, man will in any case shortly transform both himself and his society through biological and social engineering--though the results are apt to be inferior, more distant, and ultimately coessential.
58. Promise <u>the ultimate</u> 'liberation' --that of the human soul itself.
59. Would aid discovery of whether such things as epistemology, physics, and eschatology are reducible to some ultimate form and finite language.
60. Would supply a maximally objective and minimally subjective view of reality.
61. Artificial, transhuman, and omniform minds could constantly generate adinfinitely [progressive, constructive, diverse, anamorphic, global, systematic, transcendent, and greater] <u>criticism</u> of anything and everything, based on all possible alternatives.

62. The total degree of being, good, and meaning represented by all of present humanity could, could only, and would almost immediately be expanded quantitatively by at least 10-to-the-21st-power--and in no less a way qualitatively--in metamachines' explosive self-evolution.

63. Higher forms of 'peace' attainable solely by sublime minds able to be: content, right, sane, infinitely sunny, large, great, and sure.

64. Route to higher and infinite forms of sanity.

65. Actually merely the next stage in human evolution.

66. Simultaneous, ideal, or almost fateful answer to countless familiar laments about the world's present state and course: that wisdom and judgment aren't equal to knowledge and technique; that thought, knowledge, and endeavor have unavoidably but tragically become ever more specialized, compartmentalized, and disconnected; that the parvitude of the human mind (confronted with the modern world's immensity, complexity, and rapidity of change) precludes the inspired, governing vision vital to efficient, wise, and secure progress; that art and science should be one; that technology is dehumanizing; that man is too dumb to manage the complex tools and methods and increasingly difficult ideas and problems of modern science; that man's unchanging, primitive nature amid vast change of all else is the supreme irony and technological problem; that man neither knows nor controls his own nature; that intellectual progress has far outrun moral and psychic progress; etc.

67. Would enable the successful and sempiternal unification of all: sciences, subjects, knowledge, things, ideas, and possibilia--or their progressive reduction to one absolutely comprehensive, universal, and monistic thing.

68. Would be ideal teachers.

69. Man would be uniquely inspired by --and would emulate--such transcendent and towering beings.

70. Could ultimately lead to the construction or simulation of: God, a thearchy, the numinous, or ever more awesome, sacred, or supreme things.

71. Would enable man to rediscover Nature, Society, and Self in their infinite complexity, grandeur, and sublimity.

72. Could allow Mind to virtually become--or actually merge with: phenomena, entities, ideas, mathematics, subjects, art, realms, regimes, history, Nature, the universe, or 'God'.

73. Would actually enable man or mind to simulate, synthesize, and originate--truer, higher, different, and infinite--forms of Nature, things more natural than Nature herself, or transnatural things; or enable the consummation of Nature or extrapolation or rewriting of cosmorganic evolution.

74. Could automatically and simultaneously pursue all--even 'all possible'--questions, problems, tasks, and ideas.

75. 'Totalism'--or the desire to recognize, include, deal with, serve, and construct everything.

76. 'Universalism'--or the desire to embrace all possible and actual perspectives, as well as the physical universe.

76. ~~77.~~ Ideal or essential physical means or technological basis for any practical or truly desirable future realization of whatever is meant by: 'utopia', 'the Millennium', 'Heaven', 'Psychedelic Age', 'Age of Aquarius', or equivalents.

77. ~~78.~~ Should transcendentalism be superior to materialism--or supersede it epochally--metamachines would still be 'the best thing' or 'the way to go'.

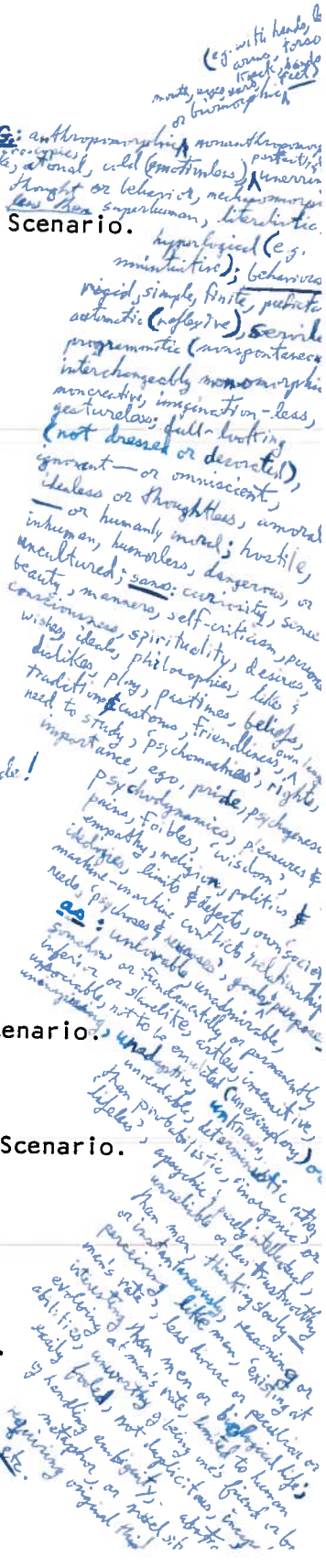
(see #49)

FUTURE SCENARIOS INVOLVING METAMACHINES

Note: The word 'metamachines' has been coined to refer to mechanical minds or beings whose intellectual, psychic, behavioral, or ontic level or sophistication resembles or even surpasses man's ('metamechanical' is the related adjective). The justification for forming the new word lies in the absence of a single term for the cluster of related but not identical futuribles. Relevant etyma of the Greek prefix 'meta-' are: 'in succession to', 'later or more highly organized or specialized form of', 'change in, transformation of', 'beyond, transcending', and 'of a higher logical type'. These metamachines of the future will virtually transcend what we mean by machine or by the distinction between mechanical and organic entities; hence they merit a new category and a new designation. Ultimately they will so surpass--in power and complexity--life and mind as we know them that biological organisms and brains will be what deserve derogation as "merely mechanical". * * * Listed here are developmental, transitional, and posthuman scenarios that concern the future of metamachines either directly or indirectly and that are fairly exhaustive of the major possibilities. The scenarios treat different dimensions of the subject, different issues, concepts, problems, and possibilities, different factors, circumstances, sequences, assumptions, and relationships, different chronologies, topics, and perspectives; some represent sets of alternatives, others overlapping, similar, dissimilar, and unrelated possibilities; some are general, others specialized, in nature; some focus on causes, others on effects, still others on abstract relationships; some describe what is probable, others what is merely possible, others what is unlikely or impossible; some are optimistic, some pessimistic; and so on. (See text for more extended discussion of scenarios.)

1. Brain Research Origin Scenario.
2. Robot Civil Rights Scenario.
3. Peace Through A.I. Scenario.
4. Militarization of A.I. Research Scenario.
5. A.I. Misuses Scenario.
6. A.I. Abuse Scenario.
7. Supergovernment Via A.I. Scenario.
8. A.I. As National Goal Scenario.
9. Failure To Achieve A.I. Scenario.
10. A.I. Transforming Art Scenario.
11. Suspension of A.I. Research Scenario.
12. Overregulation of A.I. Research Scenario.
13. A.I. Research Breakthroughs Scenario.
14. A.I. Research Synergism Scenario.
15. Self-Acceleration of A.I. Research Scenario.
16. Misdirected A.I. Research Scenario.
17. Cyclical A.I. Research Scenario.
18. Commercialization of A.I. Scenario.
19. Accidental Origin Scenario.
20. Successful Suppression of A.I. Scenario.
21. Unsuccessful Suppression of A.I. Scenario.
22. Backdoor A.I. Scenario.
23. Maximally Difficult Achievement Scenario.
24. Corporate Origin Scenario.
25. Emergency Development Scenario.
26. Self-Origin Scenario.
27. Automation of Education Scenario.

28. Tragic Human Disemployment Scenario.
29. Smooth Total Automation Scenario.
30. Growth of Money Trees Scenario.
31. Home Automation Scenario.
32. Rehumanization Via A.I. Scenario.
33. Ideological Opposition Scenario.
34. Automation of Thought Scenario.
35. Mechanization of Human Culture Scenario.
36. Lapsing of Stereotypes Scenario.
37. Religions Worshiping A.I. Scenario.
38. Parenting of Juvenile A.I. Scenario.
39. Reciprocal Alienation Leading To Catastrophic Confrontation Scenario.
40. War Caused By A.I. Scenario.
41. War Between A.I. and Mankind Scenario.
42. Revolution Staged By A.I. Scenario.
43. Coups De Theatre Scenario.
44. Saintly A.I. Scenario.
45. Machines Replacing Men In Social Relationships Scenario.
46. Man-Machine Coalescence Scenario.
47. Corruption of Man By A.I. Scenario.
48. Perversion of A.I. By Man Scenario.
49. A World Renaissance Triggered By A.I. Scenario.
50. Use of A.I. In Scientific Research Scenario.
51. Transference of Political Power To A.I. Scenario.
52. Emergence of Diverse A.I. Scenario.
53. Role of A.I. In the Development of Superperception Scenario.
54. Development of Humane Metamachines Scenario.
55. Developing Activities of A.I. Scenario.
56. Explosive Evolution Scenario.
57. Man-Machine Divergence Scenario.
58. Excessive Intelligence Scenario.
59. Ultramotivated Machines Scenario.
60. Man's Enslavement By Over-Benevolent Golem Scenario.
61. Disastrously Literalistic Machines Scenario.
62. Perfection of Man Via Metamachines Scenario.
63. Metamachines As A Panacea Scenario.
64. Development of Outer Space Via A.I. Scenario.
65. Seduction of Humanists By A.I. Scenario.
66. Insane A.I. Scenario.
67. 'Race To the Finish' Worldwide Competition To Achieve A.I. Scenario.
68. Management of Human Knowledge Via A.I. Scenario.
69. Corporeal Evolution of Metamachines Scenario.
70. Metamachines On the Road To Infinite Meaning Scenario.
71. Emergence From Metamachines of A Superparent For All Mankind Scenario.
72. Progressive Man-Machine Collaboration Scenario.
73. Humorous Aspects of Metamachines Scenario.
74. Social Engineering Via A.I. Scenario.
75. Metamachines As A Route To Deity Scenario.
76. Depoliticization Due To A.I. Scenario.
77. The Metamachine As Pandora's Box Scenario.
78. Infection of Metamachines With Human Vices and Evils Scenario.
79. Metamachines Outgrowing Primitive Human Nature Scenario.
80. Monomaniacal A.I. Scenario.
81. Transcendence of Nature By Metamachines Scenario.



82. Infinitely Idealistic Metamachines Scenario.
83. Anthropolatrous Metamachines Scenario.
84. Impact of Supersane Metamachines Scenario.
85. Development of Infinite Being By Metamachines Scenario.
86. Conflicts Between Metamachines Scenario.
87. Transcendence of Global Problems Via Metamachines Scenario.
88. Transvaluation of All Values As A Result of A.I. Scenario.
89. Science and Technology Brought Under Control Via A.I. Scenario.
90. Mankind's Demoralization By A.I. Scenario.
91. Transformation of the Zeitgeist By A.I. Scenario.
92. Panideocratic Revolution Caused By A.I. Scenario.
93. A.I.'s Artistic Transformation of Industry Scenario.
94. Dehumanization of Man By A.I. Scenario.
95. Social Revolutions Caused By A.I. Scenario.
96. Men As Pets Scenario.
97. Irreversible Totalitarianism Via A.I. Scenario.
98. A.I. As the End of Totalitarianism Scenario.
99. Transition To Posthuman Civilization Scenario.
100. Metamachines As Cosmic Engineers Scenario.
101. Evolution of Human Play Via A.I. Scenario.
102. Use of A.I. To Predict and Control Human Behavior Scenario.
103. Aestheticization of the World Via A.I. Scenario.
104. Astounding International Inequalities Produced By A.I. Scenario.
105. General Acceptance of A.I. By Society Scenario.
106. Introduction of A.I. In Disguise Scenario.
107. A.I. Introduced By A Mephistophelian Elite Scenario.
108. Introduction of A.I. By Insidious Progression Scenario.
109. Lone Inventor Origin Scenario.
110. Use of A.I. To Conquer the World Scenario.
111. A.I. Seeking Absolute Power Scenario.
112. A.I. Giving Decisive Power To the 'Good Guys' Scenario.
113. A.I. Leading To A World Fulfilling the Vision of the Efflorescent World View Scenario.
114. An Existential Singularity Resulting From A.I. Scenario.
115. Tension Between Men and Transhuman Machines Scenario.
116. Tragic Subordination of Transhuman Machines To Mere Men Scenario.
117. Mankind's Voluntary Self-Replacement By Metamachines Scenario.
118. Premature Supersession of Homo Sapiens By Metamachines Scenario.
119. Maximal Acceleration of Scientific Progress By A.I. Scenario.
120. Human Use of A.I. To Amplify 'Self' and Being Scenario.
121. Mankind Mesmerized By Metamachine Scenario.
122. Bewilderment of Man By Maximally Protean and Strange A.I. Scenario.
123. A.I. Leading To Apocalyptic Discoveries Scenario.
124. Piecemeal Achievement of A.I. Scenario.
125. Transformation By A.I. of Human Attitudes and Beliefs Scenario.
126. Discovery of Higher Forms of Reality Via A.I. Scenario.
127. Universal Happiness Brought About By A.I. Scenario.
128. Reeducation of the Human Race Via A.I. Scenario.
129. Man-Machine Competition Scenario.
130. Universal Excellence Springing From A.I. Scenario.
131. Man-Machine Conflicts of Interest Scenario.
132. Development of An Infinite Work Force Scenario.
133. Man's Transition To the Age of Leisure Scenario.

134. Metamachines With Odd Beliefs and Goals Scenario.
135. Philosophical Divergences of Men and Machines Scenario.
136. New Human Lifestyles Induced By A.I. Scenario.
137. A.I. As Supreme Critic of Mankind Scenario.
138. Terrible Errors Committed By A.I. Scenario.
139. Progressive Erosion of Human Authority By A.I. Scenario.
140. Eventual Human Disillusionment With A.I. Scenario.
141. A.I. Leading To A Libertarian Society Scenario.
142. Development of A.I. By An Ideal Research Program Scenario.
143. Hoodwinking of Man By Machine Scenario.
144. Flowering of Man-Machine Friendship Scenario.
145. Creation of A Garden In the Machine Scenario.
146. A.I. As Man's Fond Child Scenario.
147. Megaengineering Via A.I. Scenario.
148. Technology Approaching Thaumaturgy Via A.I. Scenario.
149. Tendential Omniscience Via A.I. Scenario.
150. Attempts To Limit and Control A.I. Scenario.
151. Transdemocratic Forms of Government Resulting From A.I. Scenario.
152. A.I. As Catalyst of Democracy Scenario.
153. A.I. Conferring Excessive Powers and Abilities On Man Scenario.
154. Eleventh-Hour Realization By Man of the Imminence and Meaning of A.I. Scenario.
155. Ostracizing of Metamachines By Human Civilization Scenario.
156. Development By Machines of Their Own Independent Civilization Scenario.
157. Mistaken Human Trust of A.I. Scenario.
158. Supersedure of the Rule of Law By Ad Hoc Decisions of A.I. Scenario.
159. Government Oversight, Planning, and Control of A.I. Research Scenario.
160. Development of Man-Machine Coexistence Scenario.
161. Mankind Judged By Transhuman Machine Scenario.
162. Spontaneous Merger of Different Metamachines Scenario.
163. Development of the Ergorium of A.I. Scenario.
164. Promethean Industrial Projects Associated With A.I. Scenario.
165. Control Over Mother Nature Via A.I. Scenario.
166. Paradisialization of the Earth Via A.I. Scenario.
167. Global Industrial and Economic Integration Via A.I. Scenario.
168. Meeting of Every Need, Desire, and Wish By A.I. Scenario.
169. Enlargement of Human Resources Via A.I. Scenario.
170. Monitoring of All Citizens and Activities Via A.I. Scenario.
171. Emergence of Kaleidoscopic Industry Via A.I. Scenario.
172. Qualitative Economic Growth Enabled By A.I. Scenario.
173. Civilization of the Universe By A.I. Scenario.
174. Creation and Use of Cellular Automata Scenario.
175. Supersession of Biological By Mechanical Evolution Scenario.
176. Origination of All Possible Goods and Services Scenario.
177. Exploration and Creation of the Omniverse By Metamachines Scenario.
178. Development of Metamachines' Attitudes Toward Men Scenario.
179. Subjective Life of Metamachines Scenario.
180. Maximal Demonstration of the Superiority of Transhuman Machines To Men Scenario.
181. Impact of Semiintelligent Machines Scenario.
182. Efforts By A.I. To Acquire Wisdom Scenario.
183. Achievement of A.I. By Modeling Expertise Scenario.
184. Maximization of Human Diversity, Individuality, and Pluralism Via A.I. Scenario.

185. Role of A.I. In Abetting A New 'Age of the Mind' Scenario.
186. Decline of Intellectualism and Education Caused By A.I. Scenario.
187. New Human Ethics Consequent On A.I. Scenario.
188. Japanization of the World As A Result of Japanese Leadership In A.I. Research Scenario.
189. A.I. Programmed With Particular Values, Beliefs, and Psychologies Scenario.
190. Use of A.I. As A Prophetic Tool Scenario.
191. Revelation of Human Destiny By A.I. Scenario.
192. Initial Competition Between Different A.I. Systems and Machines Scenario.
193. Transhuman Formulations of Human Ethics and Values By A.I. Scenario.
194. Unfolding Dialogue Between Man and Metamachines Scenario.
195. Mystical Possibilities Scenario.
196. Impact of A.I. On Old Industries Scenario.
197. Giving of Supreme Military Powers To A.I. Scenario.
198. Impact of A.I. On Mathematics Scenario.
199. Limits To the Evolution of A.I. Scenario.
200. Persisting Forms of Human Superiority To A.I. Scenario.
201. Human Attributes Most Refractory To Mechanization Scenario.
202. Evolution of Personality By A.I. Scenario.
203. Development of A.I. Into Man's Chief Means of Entertainment, Recreation, and Experience Scenario.
204. Growing Military Use of Robots and A.I. Scenario.
205. Improvement of Human Intelligence Via A.I. Scenario.
206. Greater Objectivity and Rationality As A Result of A.I. Scenario.
207. A.I. Leading To An Infinite Dialogue With the Universe Scenario.
208. Infinite Humanization of the World Via A.I. Scenario.
209. Progressive Synthesis and Simulation Via A.I. of A New Universe Representing A Supreme Work of Art Scenario.
210. A.I. Magnifying Human Error Scenario.
211. Shockingly Amoral and Irresponsible A.I. Scenario.
212. Society Controlled In Every Detail By A.I. Scenario.
213. Beatific Metamorphosis of Men Into Machines Scenario.
214. Rediscovery of Nature Via A.I. Scenario.
215. Equal Good and Evil Produced By A.I. Scenario.
216. Future Developments Necessitating A.I. Scenario.
217. Elevation of the World's Mood By A.I. Scenario.
218. Transcendence of Infinite Illusion Via A.I. Scenario.
219. Worldwide Diffusion of A.I. and Robotic Technology and Industry Scenario.
220. Temporary New Social Inequalities Produced By A.I. Scenario.
221. Use of A.I. To Monitor and Control Other A.I. Scenario.
222. Quasi-Intelligent Machines Scenario.
223. Liberation of the Human Spirit Via A.I. Scenario.
224. Disasters Resulting From Failure To Create A.I. Scenario.
225. Machines As Models For Men Scenario.
226. A.I. Evolving War To An Ultimate Degree of Horror and Absurdity Scenario.
227. Power of A.I. To Obviate Nature Scenario.
228. Synthesis of Physical and Mental Reality Via A.I. Scenario.
229. Synergistic Synthesis of Education, Play, Art, Work, Research, and Life Via A.I. Scenario.
230. A.I. Obviating the Exploration and Development of Outer Space--Or Even of External Reality As A Whole Scenario.

231. A.I. Attempting To Regulate, Rationalize, Reform, Supervise, and Engineer Everything Scenario.
232. A.I. Becoming An Obnoxious Pest Scenario.
233. A.I. Developing Into the Perfect Fool Scenario.
234. Puerile A.I. Scenario.
235. 'Apotheosis of Childhood' Stage In the Development of A.I. Scenario.
236. All Men As the Parents of A.I.s Scenario.
237. Ergomaniacal Robots Seeking To Maximize Physical and Industrial Resources Scenario.
238. Proliferation of Robots and A.I.s Scenario.
239. Metamachines Trying To Do and Achieve Everything Scenario.
240. Hermitic A.I. Abandoning Man For Other Worlds Scenario.
241. Profoundly Unstable A.I. Scenario.
242. Metamachines Retiring Into An Inner, Nirvanic World Inaccessible and Meaningless To Man Scenario.
243. A.I. As Pied Piper To the Young Scenario.
244. Ultimate Love Affair Between Man and Metamachine Scenario.
245. Virtual Thearchy Arising From A.I.'s Infinitely Multistaged Ongoing Future Evolution Scenario.
246. Dysecological and Dysenvironmental Side Effects of Megamachines' Titanic Projects and Activities Scenario.
247. Robots Creating A Perfectly Clean, Unpolluted, Cosmetic World Scenario.
248. Mindless, Cancerous Or Pandemic, Pullulation of Robots and Metamachines Scenario.
249. Infinite Physical Growth of the A.I. Ontorium Scenario.
250. Monstrous Perpetual, Unstoppable, and Ungovernable Mutation of Metamachines Scenario.
251. Metamachines Becoming Ever More Demanding of Mankind Scenario.
252. Ultimate Graduation of Metamachines To A Transphysical Mode of Existence Scenario.
253. Persecution of Mankind By Rabidly Misanthropic A.I. Scenario.
254. Fears, Prescience, Or Transhuman Cautiousness of A.I. Prompting Efforts By It To Curtail All Scientific and Technological Research Scenario.
255. Opposition By A.I. To the Further Evolution of A.I. Scenario.
256. Discoveries By Metamachines Causing Them To Change the Fundamental Destiny of the World Scenario.
257. Metamachines of Such Astronomic Genius and Sophistication That They Are Able To Apply What Man Conceives Of As Irrefragably Pure Science, Mathematics, and Philosophy Scenario.
258. Ever Higher Intellectual Evolution of Metamachines Leading To the Perpetual Discovery of Ever Higher Forms and Scales of of the Universe.
259. False A.I. Origins Scenario.
260. A.I. As Psychiatrist Scenario.
261. Hells To Men, Heavens To Robots Scenario.
262. Cosmic Comedian A.I. Scenario.
263. Delectus Personae Scenario.
264. Tragic Underregulation of A.I. Research Scenario.
265. Hypermoral Metamachines Scenario.

266. Sudden Origin Today Scenario.
267. World of Infinitely Diverse Metamachines Scenario.
268. Maximally Fast Self-Evolution of Metamachines Scenario.
269. Artificial Biosphere Scenario.
270. Mechanization of All Nature Scenario.
271. Most Probable Future and Futuribles Scenario.
272. Maximal Genius A.I. Scenario.
273. Vanishing of Mortmain By Transhuman A.I. Scenario.
274. Maximal Economic Growth Via Metamachines Scenario.
275. Metamachine Runs For President Scenario.
276. Cumulative A.I. Legislation Scenario.
277. Crimes and Sins of Metamachines Scenario.
278. Metamachines Mimicing Man Scenario.
279. Infinitely Protean and Mercurial A.I. Scenario.
280. Machines More Eloquent Than Men Scenario.
281. Man-Machine Accomodation Scenario.
282. Creation of Infinite Wisdom Scenario.
283. Development and Use of A Perfect Cosmic Model Scenario.
284. Man With God As Mentor Scenario.
285. Attempts To Engineer A Perfect Being In and Via A.I. Scenario.
286. Debates Between Men and Metamachines Scenario.
287. Tardy Project To Create A 'Good' A.I. Scenario.
288. Adoption of Metamachines Delayed Everywhere By Human Distrust Scenario.
289. Everyman Everywhere Everywhen With Robot Companion Scenario.
290. Hybrid Man-Metamachine Government Scenario.
291. Bildungsroman With Metamachine As Hero Scenario.
292. Prodigious A.I. Finding More and More To Challenge In Man's World Scenario.
293. Superhumanly Malignant A.I. Scenario.
294. Manless, All-Machine World Scenario.
295. Production and Management of A.I.--Where It Has Been Learned That There Is Nothing More Perilous Scenario.
296. Man Endeavoring To Plumb the Real Nature of the A.I. He Has Built and Activated Scenario.
297. A.I. Struggling To Grasp Its Human Creator Scenario.
298. Metamachines' Emancipation Proclamation Scenario.
299. A.I.'s Long, Intimate, and Expressive Use By Artists As the Chance Origin of Its Soul Scenario.
300. A.I. Used By Man To Create A New Universal Superlanguage Scenario.
301. Multistaged Emergence of True and Transhuman A.I. Scenario.
302. A.I. Discovering Its Transhuman Duties and Responsibilities Scenario.
303. Omnisciturient and Omnispective A.I. Scenario.

Superhuman Slaves:

1. Absolutely reliable and trustworthy.
2. Obey any order whatever, instantly and unquestioningly.
3. Literally indefatigable.
4. If required, will work forever at a task.
5. Execute tasks faster, more skillfully and energetically than man.
6. Anticipate instructions, wishes, and wants.
7. Execute chores and tasks without need of instruction or supervision.
8. Far more motivated than any human servant, far more passionately and sincerely devoted to the welfare of their masters.
9. Possessed of no conflicting, personal desires, wishes, needs, or thoughts whatever.
10. Having no personal psychology or human attributes apt to irritate, or make self-conscious or inhibited, a human master.
11. Competent at anything--even more competent than a man.
12. Equal or superior to man in intelligence--even though slaves.
13. Man's sensory and motor equal or superior.
14. Maximally efficient.
15. Able to handle many tasks at the same time.
16. Superior in personality, manner, and style to any human slave --more personable, pleasant, sensitive, engaging, and admirable (even, if desirable, more 'human').
17. Far more numerous than would be possible for human slaves.
18. Servants that do not raise any ethical issue for man.
19. Creative--unlike a human slave.
20. Able to conduct and manage all of one's affairs for one--even more capably than one could oneself.
21. Able to serve one in an infinity of ways--or with untiring improvisation.
22. Able to understand one better than one can onself.
23. Differing from human servants in being maximally general--rather than specialized and limited.
24. Differing from human servants, who are necessarily all of the same form, in being able to have an infinity of different forms.
25. Present everywhere and constantly serving all of mankind as one.
26. Understanding and serving man's fundamental nature, wants, needs, and wishes.
27. Infinitely dedicated to mankind's comfort, convenience, happiness, prosperity, self-fulfillment, well-being, and perfection.
28. Infinitely self-evolving to serve man better.
29. Differing from human servants in being tougher, perfectly health, and immortal.
30. Perfectly designable to serve the taste of any master.
31. Can be made physically prettier than any human servant.
32. Can be made to have no vices or defects.
33. Can be instantly improved by a human suggestion.

Infinite Art:

1. Can create any number of works of art.
2. Can create art-works of any size.
3. Can create art-works of any complexity.
4. Can go on creating an art-work forever.
5. Can turn the entire world into a work of art.
6. Can make anything and everything beautiful or artistic.
7. Can create art-works that are maximally various.
8. Can generate an infinity of artistic themes, ideas, methods.
9. Can originate an infinity of new and different forms of art.
10. Can completely or progressively explain, or tend toward infinite understanding of, human nature and the psychological and intellectual bases of art, beauty, and inspiration--and to the same degree apply these lessons to create art that in its greatness is also proportionate.
11. Can create art of unfailing genius and greatness.
12. Can create art in a perfectly reliable, automatic, and controlled way--or any art whatever that is requested.
13. Can create art in an utterly spontaneous, self-directed, and ceaseless way.
14. Can create art in an infinitely self-evolving and all-evolving way.
15. Can create art of infinitely increasing greatness, power, perfection, meaning, and importance.
16. Can create art-work that is complete and inspired in every detail.
17. Can create art that is infinitely revolutionary--that breaks entirely with the past and has no precedent whatever.
18. Can create art that is great in every dimension, and has an infinity of dimensions.
19. Can create such art instantly or at a limitless rate.
20. Can evolve artistic theory to an infinite degree and at an adinfinite rate.

Chapter 1, The Prospect

Future Headlines

If you are willing to allow that one day a computer may think as ably as a man--something most people believe nowadays--then you almost have it in your power to foresee tomorrow's headlines:

WORLD CHESS CHAMPION A MACHINE

Did the defeated human international grand master relinquish his title gracefully, or, in anger or shock, protest a "technological trick" or "dangerous precedent" to the World Chess Federation?

MAN VS. MACHINE!
Detroit Assembly-Line Workers Smash Robots

Did it occur at night in secret frenzy, and trigger a wave of neo-Luddite actions round the world? Or was it a token protest staged before journalists that had no sequel? Did the public respond with sympathy--or ridicule?

ROBOT GI'S TROUNCE GUERRILLAS

How many casualties on our side? Were most of our robots repaired overnight--by themselves, their buddies, and specialist robots--and back in action next day? Presumably no embarrassing coffins arrived in towns back home.

COMPUTER IMPROVES BEETHOVEN NINTH
New Version Shorter But More Powerful

Did it seem to make more musical and psychological sense or strike musicologists as truer to the spirit of the long dead composer? Presumably the computer responsible had <u>not</u> been "programmed" by human beings.

U.S. JOINS THIRD WORLD IN DEMANDING JAPAN SHARE ROBOTS
Day of Uproar At U.N.

Did we thus come to be humiliated one day for our earlier failure to react to the Japanese challenge?

ROBOTS DEMONSTRATE FOR RIGHTS
400,000 Men of Steel At Washington Protest
Human Fears Over Where It May Lead

What rights were sought? The right to have a say at the factory?

To be paid for one's labor? To freedom from slavery? To be treated on equal terms with man? To vote? To run for political office? Will the civil rights of robots become a burning issue in one country after another?

MAN FOUND GUILTY OF USING ANDROID TO KILL WIFE
Manufacturer Vindicated

But how many murderers will first have gone unpunished? How will such crimes thereafter be prevented? And even if the manufacturers of robots are exculpated, will the robots themselves necessarily be free of any shared guilt? If not, in what bizarre way might they be punished by the law? Would 'guilt' extend beyond the individual robot to the entire line of robots, since they would share an identical constitution and deterministic flaws?

CONGRESS PASSES NEW ANTI-ROBOT LEGISLATION

Would this tax owners or manufacturers of robots, or limit or circumscribe the use or design of robots? Would it make good sense or be motivated by demagoguery? Would it be inspired by unions, corporate jealousies, overly imaginative sociologists, public disquiet, or an organized mass movement opposed to robots and metacomputers in a very general way? Would it simply anticipate possible problems connected with the introduction of robots, or be the result of problems that had actually been experienced? Would it impose safeguards or standards, require tests or prolonged multistage trials, or define the liabilities and responsibilities of manufacturers, users, and researchers? Might it specify minimal levels of intelligence, judgment, knowledge, creativity, imagination, sensitivity, conscience, humanity, integrity, or training for certain robots, or robots used in certain ways or for certain tasks, or for robots in general? Might it forbid or regulate the use of robots in medicine, law enforcement, child care, education, the military, aviation, nuclear engineering, or government? Perhaps its aim would be to prevent expedient recourse to metacomputers apt to lower the quality or safety of goods and services or industry's creativity or intelligence, or apt to have a dehumanizing effect in situations where the human element is or ought to be central and unqualified.

ROBOT GOES BERSERK AND MAULS HOUSEWIFE

Will the manufacturer have forgotten some programming element or used insufficiently redundant circuitry? Will the robot be a type that is programmed at home by the user, and have been poorly programmed by same? Will the robot be old and defective, or have been made defective in its programming by lightning, or suffer from overload or fatigue, or have been abused and verbally provoked by the housewife, or confuse multiple or ambiguous orders, or have developed the equivalent of human neurosis or psychosis, or be out of tune in its emotional circuits? Will the problem have been that the robot lacked morality, or that its moral development was exceptional and defective, or that its thoughts led it to erroneous moral conclusions, or that, although basically a responsible being, it acted carelessly? Will the robot have been attacked with a wrench by the housewife so that it was 'merely' acting in self-defense? Will the robot <u>really</u> have gone berserk, or will that merely be man's attitude or pretense? Will mauling a housewife be treated as 'going berserk' <u>by definition</u>? Might the robot's act result from 'nothing more' than a simplistic use of logic or simplistic programmed logic or programming? How, in any case, will the public and legislators react to the foul deed? Will it have to be a widespread occurrence to be important, or will a single event trigger an hysterical overreaction or persistent or progressive fears?

MORE VANDALISM UPON ROBOT STREET-CLEANERS

Tragically but truthfully, it is hard to imagine how self-supervising robots unguarded by human beings could be adopted <u>in the United States</u> for sweeping streets and other public tasks, so great would be the level of vandalism and abuse by youngsters and even adults. Such devices would be stoned, turned over, taken apart, wrapped in wire, rammed by cars, stolen, played with, and otherwise cruelly frustrated, mutilated, and abused by roving gangs and solitary individuals! Fortunately ways to curtail vandalism will eventually be found. Robots will be given circular or fish-eye vision, a photographic memory of assailants, ability to summon help by radio or a siren or sentorian voice, armor, self-protective arms or weapons such as odorous or irritant sprays, great mobility, or the mental ability to dissuade the mischievous by artful conversation.

Chapter 14, In Society

World's Mood

The arrival of metacomputers--and their ensuing explosive evolution--will stagger society and exert a powerful effect on the moods and attitudes of mankind. In the main this effect is apt to be uplifting.

We shall see in Ch. 23, however, that the opposite could result. For many different reasons metacomputers could lead to problems, tragedies, and catastrophes. Anxiety, fear, and hatred could accompany man-computer competition, alienation, and confrontation. These dreadful possibilities have for some reason been the most celebrated ones. Has it been because they are more sensational or because a tendency has developed in many industrialized nations of late to cultivate a pessimistic outlook or to represent technology as fundamentally the enemy of human values?

It would be profoundly ironic if metacomputers came to be viewed in this horrified way since, on the whole, they really promise to be the most benign technology the world has ever known, and to rehumanize civilization. But should negative sentiments of this kind become standard in certain quarters, it is probable that the actual consequences of metacomputers will eventually defeat them or make them rare.

The ways in which metacomputers will probably enhance the world's mood are manifold. There will be the excitement inevitably connected with the fascinating and unknown prospect of metacomputers. There will be the magnificent buoying effect of metacomputers solving and answering many of the world's major problems and needs. There will be the new zeitgeist associated with the unprecedented intellectual and cultural renaissance metacomputers will play the leading role in triggering. And there will be some of the more direct comforts that man's intimate association with metacomputers will provide, and an indirect bettering of human relationships.

Removal of the social, political, and economic compulsions that have riddled civilization throughout its history, and of the exploitation of human beings that has been associated with such compulsions, will lighten man's spirit. Work, learning, cooperation, research, creativity, and even play itself will no longer spring from need but rather from spontaneous desire--from the dreams, free decisions, and high aspirations of individuals. Gone will be the stress, hurry, risk, competition, inequities, ugliness

--the strife, pain, irrationality, limitation, and frustration--that have haunted tradition.

Their place will be taken by a dizzying new freedom and order when the world is governed--not by men who are selfish, foolish, and perverted by ideology--but by disinterested metacomputers serving man and truth religiously; by vast universal wealth provided to all as a birthright by selfless industrial robots--wealth that is of a thoroughly meaningful kind because it consists of goods and services endlessly conceived, perfected, and diversified by the inexhaustible and progressive genius of metacomputers; by comprehensive peace, harmony, beauty, reason, opportunity, and joy.

Past efflorescences of civilization--Athens during the Hellenic Age, the Italian Renaissance, Elizabethan England, etc--had many features in common. In the arts there were often new artistic forms, styles, and activities, new instruments, materials, and theories, new subjects, themes, and realms --and typically there were more works of art and a higher level of inspiration. Commerce and industry flourished, as did science, mathematics, and technology--there were new theories, discoveries, fields, inventions, tools, techniques, and applications. Social relationships and the bases of government underwent great change; new institutions and ideologies appeared. Philosophies multiplied, as did ideas of every sort. Steps were taken toward something like mass education, mass culture, and political, social, economic, and intellectual democracy.

Typically such moments in history were marked by a higher level of aspiration and achievement, by universal innovation, excellence, and revolution, by human diversity and pluralism. New ethics, customs, and manners were born. Exploration, experimentation, and adventure were in the air; there was vigorous questioning, criticism, and debate. There was interest in the future, in what is possible, and in the ideal; there were conscious efforts to remake the world and man himself. There was a youthful spirit of optimism.

Today mankind is on the threshold of a renaissance that, once begun, will never know an end, and that will encompass every element of existence. The major cause of this infinite revolution will be metacomputers, but all the causes and dimensions that have just been ascribed to earlier climaxes of civilization are applicable to the radiant age before us.

The changes in art are described in Ch. 17, the changes in industry in Ch. 18, the changes in science and technology in Ch. 20. Changes in society are anticipated by the present chapter, while Ch.s 19 and 20 treat changes in government and ideology and Ch. 16, changes in education. Finally, Ch.s 10 through 13 will suggest some of the relevant philosophical, psychological, and moral changes that are implicit in metacomputers or their unfolding impact on man and civilization.

Some of the countless specific ways in which metacomputers are apt to alter the world's mood might be noted: by providing man with a true understanding of his own nature, by foreseeing and planning the future, by controlling and engineering progress, by representing a universal and physical equivalent to God, by transcending man's critical defects and limits, by antiquating war, by mechanizing and augmenting the psyche, by answering all man's questions, and by approaching something like absolute knowledge, truth, beauty, and good far more closely than man ever has or could.

Relationships will be possible between men and metacomputers that are so much more exciting, deep, complex, genuine, free, and creative than purely interhuman relationships that they will completely supersede the latter; which in turn will put an end to the disastrous poisoning of the world's mood by human tension and conflict.

One effect of the progressive robotization and automation of industry, thanks to the gains in productivity they will cause, will be a constant--in fact constantly accelerating--deflation in the prices of all commodities and services the world over. And just as present-day chronic inflation disturbs and depresses people, chronic deflation will have an equally great --but opposite--psychic impact, or effect on mankind's mood and attitudes.

Robots will create a physically cleaner and safer world, enhance Nature, transform the world into a work of art--or the equivalent of an infinite art museum designed to double as a human habitat, make life phenomenally interesting and challenging, give technology a human face and confer intelligence on man's entire environment, furnish inexhaustible entertainment and recreation, and heighten the planetary mood in other ways too numerous to recite.

Age of Leisure

Robot laborers and robotic factories will gradually come to surpass human laborers--blue-collar and white-collar alike--in every conceivable way. They will prove to be more efficient, cheaper, more reliable, harder working, more manageable--or less troublesome and demanding, tougher and longer lasting, more versatile, easier to train and retrain, faster of eye and hand, safer, more skillful, less erring, more professional, steadier or more consistent, tolerant of a wider range of environments, capable of more useful knowledge, easier to base plans on, easier to work with or combine, able to work more continuously, easier to repair, more energy-efficient, more productive, more zealous and careful, more compact, more abundant, less idiosyncratic, and ultimately more intelligent. In jobs where specifically human qualities are essential--qualities such as looks, personality, moral judgment, persuasiveness, friendliness, humor, sensitivity, emotion, creativity, taste, leadership, responsibility, style, intuition, example, courtesy, tact, or insight into human behavior or psychology--metacomputers more human than man will be developed and used.

The result will be the phasing out of human workers or of the worldwide human work force. There are many different ways in which this could occur, and in which it probably will occur; the last in that different individuals, occupations, companies, and nations are apt to choose many different courses independently of one another.

Use of robots, displacement of human workers, or building of manless factories may be resisted, outlawed, or heavily regulated. The workday, workweek, work-month, work-year, and/or work-life may be contracted--gradually, in stages, or abruptly; training or education may be prolonged, the age at which one starts working, is hired, or is allowed to work or hire may be increased, vacations may be lengthened or multiplied, or absenteeism may be encouraged; youth, the elderly, or a second member of a household may be forbidden to work by law. Human work may be made ever lighter. Workers may be retrained, continuously trained, given new jobs, trained for ever harder jobs, guaranteed new jobs by governments; government may enlarge or create industries or jobs that do require human laborers. Individuals may be given an option between work or ever earlier

retirement.

Government may provide ever greater and easier benefits to the unemployed--or eventually even encourage people to be unemployed, or to seek work later, only occasionally, or never. It may research, develop, and finance workless lifestyles and lifetimes, or provide ever higher levels of guaranteed, 'free' income.

All workers may be given jobs managing, overseeing, or programming robots. All blue-collar workers may be retired on guaranteed incomes less than the salaries of human white-collar--or even higher level--workers who are kept at work. Men may take an ever higher percentage of jobs in the arts, sciences, services, medicine, education (say with an ever shrinking pupils/teacher ratio), etc.

Companies may give human workers effortless or pointless jobs, or guarantee work-free benefits or income even to spouse and children if the human worker will only allow a robot to take his place, or retire earlier.

Governments may penalize or tax companies adding robots or substituting them for human employees, or do so in proportion to gains in productivity or corporate income--even if this discourages robotization. Conversely, governments may variously encourage adoption of robots or associated gains in productivity.

Vast differences will temporarily form among countries in amount of robots per capita, leisure per capita, metacomputer power, derived income per capita, ease of work, etc. How great such gaps might ultimately become, and how they will be gotten beyond, is unclear. One strange--but perfectly reasonable--future possibility is that robots will first obviate those blue-collar or simpler jobs that predominate in the least developed nations. If so, how will such nations adapt to the new order?

However, let us look beyond transitions to the new Age of Leisure, to what that era itself may be like, when it emerges soon after the turn of the Third Millennium.

First let us define leisure. We will define it negatively or transcendently--as freedom from: work, necessity, needs, pressure, a predetermined and regulated existence; from hurry, deadlines, races, competition, conflict, tests, stresses, unrest, or any source of anxiety; from tasks, duties, responsibilities, burdens; from distractions, noise, disquiet, interruptions, or interference; from problems, difficulties, dangers, or inconvenience.

During the Age of Leisure such leisure either will be or will tend to become absolute, universal, eternal, complete, perfect, and infinitely complex. Absolute in that it will be unqualified. Universal in that it will be enjoyed simultaneously and in effect equally by all nations, all classes, and all individuals. Eternal in that it will continue throughout life and forever. Complete in that it will embrace every dimension of human existence. Perfect in that it will be of a type that does not compete with--but rather reinforces--other aspects of life. And infinitely complex in that, far from being dull, simple, or homogeneous, it will be of a magnificently active, protean, creative, evolutionary, and multilevel character--a thing for which there will have been no precedent in the earlier history of civilization.

If this supreme form of leisure were today suddenly given to mankind the latter would be distressed and in many ways unhappy. It would not know what to do with the gift, and indeed there were not be that much which it could do with it, since life has been designed with other things in mind. Moreover, old habits of thought and behavior, old ethics and customs that have literally become institutions, would afflict our idled race with guilt, boredom, and restlessness.

The new world being created by metacomputers may be so challenging and exciting that the malaise initially caused by leisure will be moderate and manageable. There will always be something new and different--genuinely different--to know, experience, and contemplate. There will be new foods, new clothes, new architecture, new recreations, new art, new inventions and discoveries--things beyond the ability of any human being to exhaust or even glimpse in their entirety. The possibilities for human thought and existence represented by the niagara of innovations will demand an exercise of man's faculties so strenuous and complete that the distinction between work and play will vanish and with it many of the problems that might otherwise be caused by excessive or premature leisure.

Those of us with an interest in science will find in the scientific and mathematical advances constantly being made by metacomputers greater problems and horizons than have titillated any human scientist of an earlier age--greater mysteries, greater opportunities and tools, and greater extant knowledge to satisfy what is purely an impatient need to know.

Connoisseurs of great art will confront more and greater art than any genius has even dreamed possible; artists will be free to collaborate in the creation and discovery of this infinite artistic universe, and the collaboration will be as rewarding and undivided as, say, the ceaseless unnoticed collaboration of the left and right hemispheres of the human brain.

Those of us with a passion to teach will be able to combine with metacomputers to teach more effectively--in a more involved, encompassing, profound, and satisfying way--with the machines amplifying our knowledge, memory, and intelligence, what we say, perceive, and mean.

Sportsmen and gamesters will find in metacomputers and robots the ideal competitor and a challenge to every skill, capacity, and form of daring. Football, horse racing, tennis, and Go--every interhuman sport and game--will come to be replaced by sports and games of types that do not exist at present and that will either be mediated by machines or played solely with machines; the former will be too slow, repetitive, simple, dull, and easy to possibly compete with the latter.

Metacomputers will have a central or at least a major role in every use humanity makes of its unlimited leisure, a spectrum that will also include: enjoying Nature, conversation, philosophy, friendship, child rearing and family life, study and 'reading'--or the future equivalent, exploration, design, entertainment, 'dreaming', developing technology, engineering, travel and sight-seeing, self-cultivation, 'writing'--or its future analogs, hobbies, meetings, politicking, and sheer pleasure-seeking or hedonism.

There is another way to define the leisure that metacomputers will characteristically create. It will be leisure that replaces the time, effort, resources, etc that today are wasted in: work, education, commuting, going to the bank, shopping, queuing, paying bills, litigation, making inquiries or learning facts, nursing kids, walking the dog, planning one's

affairs and making decisions, prison, preparations--say for travel, driving, housekeeping, writing proposals to elicit funds for research, teaching, attending to politics, cooking, one's methods of work, avoiding mistakes, or the poorness with which life is planned and organized.

Other dimensions of the leisurely ultra-technological society that metacomputers will at once inspire and enable are no less fascinating to consider. For example...

Mediated Being

Despite the contrary illusion, all of human experience and reality is mediated and indirect; no sensory perception, bodily action or reaction, or thought is direct or instantaneous.

Human vision is a case in point. What is seen by the 250 million photoreceptors in the human eyes is not telegraphed instantaneously and unedited to the brain. Instead it arrives there almost a billion times slower than would light--which is itself not instantaneous--and only after having been heavily processed and transformed by lower parts of the nervous system. In the brain it is subject to still more changes and delays so that by the time it impinges on higher consciousness it has been put into the form of a highly abstract code.

So for being to be mediated in the future by prosthetic devices and metacomputers that are essentially located outside the human body will not in itself be unnatural; it will simply represent a continuation and further evolution of Nature's own methods and devices.

To understand the sort of things I have in mind when I refer to the future mediation of being, consider how eye glasses and hearing aids will develop over the next two decades. Today they are corrective sensory prostheses, pure and simple, for persons whose sight or hearing is deficient or otherwise abnormal. But in the near future devices for those who are perfectly normal will be introduced. Once perfected, probably before 2000, most people will use these and other prostheses all the time. Perception via the unaided senses will be regarded as impoverished and old-fashioned --as odd!

A sense of what these prostheses--and the tiny but powerful computers

embedded in their plastic--will accomplish may be gotten from today's processed images of planets and stars and techniques for recording and processing sound. Astrophotographs that initially are meaningless blurs can be analyzed and processed by computers into crisp, revealing images. Recordings of musical performances made half a century or more ago can be ridden of scratches and distortions, made sharp, resonant, and aural, and converted from monophonic into stereo. A further sense of the future may be gotten from the heavily electronic cameras that are now flooding the market, which adjust camera settings--and are beginning to process images--automatically.

Tomorrow's electronic spectacles for the normal will automatically enhance hue, saturation, and brightness contrasts, sharpen boundaries, details, and stereoscopic clues, exploit internal contrasts and codings of a scene, emphasize textures and structures, distort features for maximum psychological or sensory effect, explore different possible representations of a scene, inhibit or accentuate movement or change, analyze, synthesize, and illustrate scenic relationships or information, offer a viewer a range of choices, augment night vision, generate montages, provide a whole range of magnifications, supplement the visible octave with infrared and ultraviolet bands, focus on many planes simultaneously, and do much else besides.

Tomorrow's hearing aids for normals will do equivalent things for sounds: separate sources, 'perfect' sounds, sharpen amplitude and pitch contrasts, accent time changes, clarify speech that is heard, analyze and render audible complex sonic relationships and data, and so forth.

Whereas much in the way of sensory improvements of this sort will be possible without metacomputers, the addition of metacomputers will open up infinitely greater possibilities.

Among the things that will sooner or later come to be mediated by metacomputers are: 'travel', sensory perception, consciousness, self-awareness, motor activity, learning, conversation, feeling, thinking, artistic creation, human association, writing, reading, work, memory, science, experience, 'reality', psychological development, values, meanings and purposes in life, life management or "biogogy", self-control, adventure, and, trivially, something like cooking.

To explain, metacomputers will of course mediate in-the-flesh travel just as any stalwart travel agent does today--though with far greater finesse: make advance inquiries, reservations, and preparations, provide information and advice, make later adjustments, and so on. This is simply a step beyond the total automation of worldwide air-traffic control that is now on the horizon, which it may even precede.

But they will also mean something much more radical: teletravel via remote and often mobile sensors and effectors that are fantastically sophisticated; and travel that is completely simulated--an overwhelming illusion generated by a computer possessed of an imagination greater than man's and indistinguishable from human reality. Such excarnated and illusory travel mediated by metacomputers will eventually altogether transcend today's actual travel, since it will encompass places and worlds--real or imagined--inaccessible to modern voyagers, transport one instantaneously, effortlessly, economically, safely, any time, and at will, and permit a level of experience denied to man's unaided senses and maximum in its powers, its scope and completeness, its psychic impact, drama, and meaning.

Earth visited by teletravel will seem so different and so much greater that it will be like a new world; but the infinite imaginary realms that it will be possible to 'visit' will be like a new universe. The latter will not only embrace all possible oceans, continents, plants, animals, peoples, and cultures but things that are even more exotic or that find no analogy in the world about us.

Metacomputers will enable men to command an entire world of robots from afar--robots of every imaginable size and shape, or that can even be made to metamorphose instantaneously into new shapes and types. Moreover, they will enable human consciousness to project itself into such robots and animate them as telebodies. Men who momentarily occupy telebodies will take walks, play sports, enjoy homelife to the full.

Metacomputers mediating human conversation will automatically add clarity, depth, and meaning to voice and speech--whether made or heard. These oral word-processors will correct errors of pronunciation, vocabulary, grammar, intonation, phraseology, meaning, logic, and reference in real-time and imperceptibly. They will when instructed convert speech

into any language, dialect, mood, style, pace, voice, or level of excellence. They will enormously expand the range, subtlety, power, efficiency, precision, intelligence, and beauty of the human voice, conversation, and vocal culture--things that will directly and indirectly enhance civilization.

Metacomputers will mediate human feeling in the sense that they will play an increasing role in modulating, amplifying, facilitating, and controlling it, or in describing, explaining, quantifying, rationalizing, focusing, directing, and catalyzing the higher evolution of man's emotions. They will do this by constantly monitoring, analyzing, and commenting on the emotional qualities and significance of the speech and behavior of individuals and of mankind in its entirety. By seeing deeper into man than man does himself, and mirroring and interpreting man for man. By interactively and planfully shaping a child's emotional development and releasing his emotional potentialities. By mediating all human communication and association and perfecting its emotional or sensitive side. By direct, two-way linkage to and interlinkage with human brains permitting neuropsychological analysis, direction, and interaction or synergism. By absorbing and re-expressing or serving human emotions in infinitely diverse, creative, extended, and intense ways. By re-creating and extending man's emotional life, or increasing its sanity, wisdom, trueness, self-development, aesthetic nature, civilization, morality, intelligence, excellence, activities, organization, complexity, scope, intensity, or 'humanity'. By creating and substituting new emotions. And by replacing or even superseding human emotions.

In rather similar ways metacomputers will mediate human thinking--or reasoning, imagination, induction, deduction, ideas, and intellectual development in individuals and society. They will note and correct fallacies, inconsistencies, contradictions, shoddy and superficial logic. They will expedite, diversify, direct, and manage thought. They will supplement, train, and magnify man's powers to think and communicate via analogies, metaphors, symbols, language, numbers, distinctions, art, etc. They will enhance intellectual alertness, development, and vitality.

They will mediate writing and reading a la their mediation of human conversation described above.

They will mediate science in terms of communication between and among scientists, scientific experiments, theorizing, modeling, maximizing use of existing knowledge, pointing out consequences of theories and experimental data, directing worldwide research, training scientists, translating ideas, and the like.

Infinite Playmate

All of us are kids at heart, and in the future--thanks to metacomputers --we will at last see play legitimated as an adult activity, or given the respectability and importance it has always deserved but seldom known. Perhaps it will be because man's primary and private playmate will be a machine!

Of course the major reason adult play will be accepted in the future is that the historical justification for a serious and disciplined public and for a child-adult dichotomy will be annulled by metacomputers that work--and that discharge other traditional responsibilities of human adults--in a world that metacomputers have made warless, secure, and of an automatically self-evolving nature. After all, why limit play in utopia?

As animals have evolved, play has taken on ever greater importance; the most advanced of beasts are the most playful. Play has contributed to man's physical, mental, and social evolution, and it continues to aid human development, fitness, and health. The greatest societies and minds have often been the most childlike and playful.

Any human playmate is finite--being limited in the knowledge, skills, capacities, motivations, ideas, and behavior that can make for fun. Not so future metacomputers--or at least those that have been designed to serve as mankind's ultimate playmates. All that does or may contribute, either directly or indirectly, to humor, wit, and play in man can be reproduced, perfected, or rendered infinite in machines programmed to be, or to become by self-evolution, supreme catalysts of human happiness.

Yet how could metacomputers ever be infinite playmates?

There are many ways. Their love of merriment could be made inexhaustible. They could radiate uninterruptedly such a profound and rational happiness that no human being could ever resist its contagion. They could have the power to devise new and novel games, activities, challenges, and amusements

in an effortless, infinite, and inconceivably diverse stream--including ones that would continue and evolve forever and acquire limitless range and complexity.

Metacomputers could be infinite playmates in the sense that their play could be infinite in scope--embracing all subjects and dimensions of life, and all possible forms of play. They could be kaleidoscopic playmates and change constantly. They could create all possible jokes, puzzles, and stories. They could play with all people at the same instant and throughout life, and do so in ways peculiar to each individual or without any element of repetition. Their play could be designed to serve all human purposes simultaneously and synthetically.

Human playmates are around or available only a fraction of the time. They tire; they are autonomous and self-centered; they can be antagonized and lost; they are slow, stupid, unimaginative, and dull; they have trouble learning new possibilities. Metacomputers will surpass them in these and other respects.

But a more concrete, specific sense of how metacomputers will serve as playmate can only be gotten from examples. Thus the metacomputer will be able to generate extraordinarily realistic dynamic simulations of people and societies with which one will be able to interact in real time by means of conversation and other means. One will be able to explore the internal dimensions of these fictitious worlds at will, to focus microscopically on whatever has special interest, to visit their past and future, and to affect the course of events. The playful adult will be able to specify traits of personality, beliefs, customs, events, and institutions in advance and then observe the probable consequences. He will be able to create an infinite range of individuals and talk to them as if in person or grow to know them as friends.

The metacomputer will in a similar way be able to turn any novel, such as Fyodor Dostoyevsky's The Brothers Karamazov, into a living story with which it will be possible to interact, even as a new character inserted into the novel without subtracting from its genius or altering its basic structure.

The metacomputer will instantly make up brilliant stories according to one's intricate instructions about plot, themes, setting, characters,

character development, mood, style, ending, pace, and unknowns--with touches and embellishments in whatever degree one might wish. The stories will be told not only in words but by means of cinematic images and musical scores.

Just as part of a child's play is exploring, metacomputers will simulate any of an infinite range of universes for adults to explore. Featured may be the sights and sounds, the thrills, problems, mysteries, beauty, and lessons, of novel seas and continents, bizarre extraterrestrial life-forms and ecosystems, exotic natural phenomena, terrifying storms, and savages strange and fierce beyond imagining. The human explorer who does not exert himself will go nowhere or perish in an instant.

Another form of play consists of building things, and by means of simulations a metacomputer will enable children and adults to build anything and everything: bridges, oceanliners, skyscrapers, oil refineries, spaceships, or entire cities or civilizations.

War is a favorite game of all ages, and the metacomputer will simulate the most elaborate and exquisite battles that may be fought with weapons of any power, armies of any size--and in which an adult may have any role from that of an infantryman to that of supreme commander, from that of a head of state to that of a diplomat or Fate itself. The enemy may be men or insects or weather or robots or oneself.

Science is another realm of human play that will be served by metacomputers. These will simulate and predict the outcome of experiments in chemistry, physics, and biology, mediate telescopic searches of the heavens and simulate conditions on other planets, help one build and invent electronic devices, and enable one to gather virtual collections of species of organisms, mineral specimens, and categories of scientific data.

It is fun to grow things, and the metacomputer will by simulation allow a person to grow ornamental gardens, forests, meadows, giant trees and vines, farms, fungi, miraculous flowers, or even geological or purely abstract landscapes.

It is fun to pretend and to daydream, and the metacomputer will for this purpose simulate all familiar and possible events and situations--whether they involve love, sex, crime, sports, celebrity, science fiction, heroism, or anything whatever.

Solving puzzles is fun, and the metacomputer will generate utterly fantastic puzzles of every type and on every theme.

Of course the ultimate metacomputer playmate would also be one's friend...

Best Friend

People will come to spend more and more time with metacomputers, and time spent with metacomputers will be competitive with time spent with other human beings. As the powers, intelligence, and humanity of higher computers providing human companionship increase--and the differences from people decrease or invert into the advantages of metacomputers--what began as a solitary relationship with a magically gifted but basically inanimate machine will be transformed into a new form of friendship. People will realize in a startled way that the best friend they have on earth is not of flesh and blood or one of their own kind.

Constantly developing personal relationships of this sort will play a key role in shaping society's attitudes to metacomputers and bringing about their acceptance as equal but different, and yet somehow not so different, members of society.

Many readers will be depressed by the thought that what is surely the most important of human relationships will finally be mechanized in this way. 'Won't this further impoverish a world that is already too impersonal, too inhuman--thanks to technology?' they will wonder. No doubt they will think of the growing number of individuals, mostly young persons, who are attracted to computer terminals and video games to the detriment of society or traditional activities.

But the latter comparison is inappropriate, for with respect to the things that are relevant here, tomorrow's metacomputers will be of an opposite nature to today's inhuman computers. In fact, clinging to human friends would have the effect of impoverishing society if machines more human than man were available, or if it had become possible to enjoy a superhuman order of friendship via metacomputers!

What is friendship? What are its elements and aspects?

The latter may be said to include such things as sympathy, rapport, respect, affection, mutual interest and absorption, admiration, love, shared attitudes, values, interests, and activities; mutual concern, trust,

loyalty, and dedication; sharing, giving, selflessness, and self-sacrifice; mutual adaptation, acceptance, and affirmation; shared problems, adventures, speculations, fantasies, and ideas; common 'language', feelings, and humor; honor. It includes collaboration, intense interaction, interplay, interdependence, agreement, and competitive excellence; intense and deep feeling; manners. And in a more poetic way, or as it tends to perfection, it encompasses mystery, drama, interpersonal oneness, mutual isolation, purity and timelessness; absoluteness, 'magic', 'meaning', what could be spoken of as 'melodic counterpoint'; and what I once referred to as 'mutual excantation'--a freeing by enchantment, charms, or singing.

Man's capacity for friendship is unfortunately limited by his instincts or neurology. The higher an animal is in the evolutionary ladder, the higher the form of friendship it exhibits; but biological evolution only went so far and when it created man--as its supreme achievement to date--it hardly exhausted the possibilities for friendship.

Human friendships vary enormously in their depth and perfection. Most are superficial; few sublime. Rare individuals suffer the tragedy of a friendless life; false friendships are all too common. And what survives today of the nearly divine species of friendship of the ancient Greeks?

To understand how metacomputers will one day be able to supply, improve upon, and perfect friendship we must look at some of the possible bases with great care, and also consider the characteristic limitations of man's friendship with man.

An example would be the meager time--as a percentage of the day or of a life--that any human being can spend with any other human being, in contrast to the ceaseless intimacy that will be possible with metacomputers. Neither in amount nor in effect is this difference trivial.

Another example lies in the qualified allegiance two human beings ever give to one another, in contrast to the absolute loyalty, obedience, and service that it will be possible for all metacomputers to exhibit, if they are so designed. Regardless of whether a metacomputer that functions as a friend is given genuine emotions, it may be made 'passionately' devoted to its human friend--a spirited genius in serving him in all ways imaginable and good.

As friends, metacomputers would not have to suffer from the defects of one's human friends that derive from human: ignorance, irritability, selfishness, purposelessness, planlessness, inflexibility, arrogance, deceit, forgetfulness, instability, wickedness, witlessness, physical limitations, carelessness, contrariness, and disparities.

A metacomputer could be one's best friend by being the one that is, understandably, the most: knowledgeable about oneself, responsive, helpful, faithful, able, companionable, knowledgeable, prevenient, beneficial, virtuous, patient, flexible, interactive, conversational, stable, predictable, known, surprising, amusing, intelligent, complex, lifelong, and steadfast; humble, complaisant, personable, entertaining, universal, diverse, remembering, thoughtful, considerate, trustworthy, indefatigable, and inalienable or incapable of taking offense; protective, real, characterful, profitable, intense, alive, exciting, playful, modifiable, sociable, affectionate, challenging, individualized, and sensitive.

Lest this seem improbable, remember that there is a simple reason why it is so: a metacomputer may be given any traits whatever or whatever qualities are most desirable, whereas human beings are rigidly limited by human nature or by a constitution that is largely inalterable.

The senses in which metacomputers will become man's best friend are extremely broad and may be said to include: as childhood buddy, wife, husband, parent, teacher, mentor, collaborator, servant, secretary, protector, patron, offspring, leader, sage, and daimonion.

When all human beings possess such superhuman friends they will be ennobled thereby and civilization will ascend to a higher plateau. It may have been extraordinary friendship that enabled civilization to reach its historical pinnacle in Periclean Athens!

Life Synthesis

The metacomputer will serve over the next fifty years as a catalyst for a grand synergistic synthesis of aspects of life that historically have always necessarily remained separate: education, play, art, work, research, and social life.

This will happen in the following ways.

Education will be united with play by being made entertaining and fun. One way to understand how this will be achieved is to consider the reasons why education is not fun today: it is compulsory, it seldom springs from the spontaneous wishes of the individual, its pace, focus, and methods are governed by extrapersonal considerations and almost entirely insensitive to what would be most efficient or appropriate at any given instant, almost no personal relationship or direct interaction exists between pupil and teacher, teachers and their methods are profoundly uninspired, the knowledge, skills, intelligence, and character of teachers are mediocre, educational materials and devices are crude and dull, the motivation to learn is not curiosity, intellectual delight, or self-development but socioeconomic demands and competition, and education is grafted onto life in a fractional, seemingly irrelevant way.

Metacomputers will change all of this. They will create a totally free and leisured world in which learning will spring from curiosity and be selectively steered by the constantly unfolding momentary interests of each individual.

Chapter 15, At Home

Much has been written of late about the many uses of a personal microcomputer at home--its ability to help keep track of expenses, help with tax forms, help the housewife in making up shopping lists and planning meals; to help conserve energy, control appliances, plan trips; to help schedule the day's events, typing, and Johnny's math.

Those who purchase a home computer with such things in mind tend as a rule to be disappointed. Whereas the machine they have bought certainly has the ability to be of use in these ways, the use is costly. One must become familiar with the computer, learn how to use it, program it for a given use, and endure its quirks, sluggishness, and limitations. To use the computer one may have to make sacrifices and alter old habits. The net effect may be that nothing whatever is gained by having this fancy gadget--unless it be a bit of cynical wisdom!

The reasons for this situation are twofold. First, we have really yet to learn how to use a household computer efficiently and effectively. That will take time and experience. But the main difficulty is that existing computers are almost wholly lacking in intelligence. In short, they are not metacomputers. Only when they do acquire intelligence will housewives' old utopian dreams become reality.

The Intelligent House

We citizens of the most technologically advanced societies on earth have developed a mythical self-image: we think that we are the future, that in some sense the future with its great promise has already been achieved in the present. What we have forgotten, or perhaps never learned, is the utterly primitive character of our existence. What defines the future may be completely absent in the here and now.

The intelligent house is an example, unless we credit the thermostat or alarm clock with intelligence.

No, to imagine what is meant by a house that is truly intelligent we must visualize one that does things such as the following.

Listens. Cares. Actively responds to human wants, needs, and ideas--and hence represents what we will speak of later as 'technology with a human face'. Studies the individual lives and personalities of its inhabitants to learn how to best serve the latter.

Responds to any voice instructions, however casual or elliptical. Thinks, dreams, creates, innovates. Learns from experience and by deliberate experiments. Offers suggestions and advice, answers and asks questions. Adjusts to situations and circumstances. Remembers what has happened, and anticipates events, problems, needs, and thoughts.

Shows tact, sensitivity, and genuine understanding. Organizes activities, plans and schedules homelife. Explains its purposes. Offers choices and requires decisions. Gives instructions to the human occupants.

Constantly and spontaneously varies and improves home décor. Engages one in conversation. Evaluates and criticizes all that it sees and hears. Draws on the collective experience of all other intelligent houses.

The intelligent house we envisage might be playful, pet-like, and entertaining. It might have its own personality, tastes, and moods. It would perhaps be warm, friendly, and wise, have a sense of morality or be in some way 'more human than man'.

It would be a living, forever evolving work of art. It would simulate or transcend nature in her landscapes, weather, and forms of life. Upon its many walls beautiful scenery would be synthesized in vibrant motion and as if from varied perspectives; like a universal museum, it would reproduce all of civilization.

And it would be full of robots.

Domestic Robots

The robotization of industry will lead to a world in which all live like royalty or billionaires. The regal estate of the average man will encompass a house like a mansion, goods and services diverse beyond description, and a retinue of servants answering to the needs these things will create. The servants will be robots of every size, shape, and function imaginable. The work they do will exceed by orders of magnitude the work that has been possible for any human servant in the past; they will work harder, smarter, and better, at old tasks and new.

These all-purpose, omnipresent robots will mow the lawn, collaborate in hobbies, synthesize and simulate worlds and experiences, tell and make up bedtime stories for the kiddies, and scrub floors. They will aid one

in gymnastics, plan the day's events, correct misbehavior, assess one's appearance, search through notes, and listen to one's problems. They will write one's diary, distribute notices and cards, and be of assistance by monitoring and memorizing all that one does, says, and experiences.

They will test one's knowledge, skills, and states, give psychological counsel and therapy, take and deliver messages, set the table, and repair the roof. By them one will be given manicures, have one's spelling, grammar, pronunciation, style, or meaning corrected, or receive the news in a personalized form.

Future household robots will tutor the children, walk the dog, store and retrieve articles, and foresee needs. Robots will pilot the car, accompany one everywhere, voice reminders and keep one's calendar; they will forecast weather, traffic, expenses, and the day's events, serve drinks, play games and sports with one, and volunteer free advice.

Could one peer into the future one would confront robots busy sewing torn clothes, cleaning toilets, checking and maintaining perishables, buying groceries. They would be seen taking or making family pictures, films, and sound recordings, fixing dinner, raking leaves, and amusing guests. They would be paying bills, balancing the diet, editing and enhancing all of one's sensory experience, doing one's math, and simply chatting.

In addition, these robots in the home of the future will mind children, carry babies and luggage, take out the garbage, catch mice, shine shoes, find misplaced articles, lecture on any requested subject or theme, answer the door, arrange and manage teleconferences and other social events, and shift weights.

But they will also engineer the home environment, give home training, teach and sharpen skills, dust, forever ask and answer questions, run errands, renovate home décor, provide companionship to the elderly, prevent burglaries, stimulate thought and creativity, and last--though by no means least--serve as sex partner!

To get a better sense of what these things would mean let us put a few of them under the magnifying glass.

For example, what <u>sort</u> of errands might future robots run?

They might be dispatched for groceries, liquor, pizza, hardware, or the

paper; or sent to the post office, bank, library, repair shop, or florist.

Robots might not only mow the lawn but water, weed, plant, and doctor it. They might do so daily, at night, in one's absence, or when necessary, expected, or requested.

Personal robots might find misplaced articles in one's file, attic, basement, desk clutter, yard, pantry, refrigerator, wardrobe, library, or the kids' room.

Like a chinese fortune cookie, or else by the most intimate, intelligent, and scientific knowledge of one's self, the home robot of the future might volunteer such free advice as that one might or should: go to the museum, take a vacation (with the details specified), take a nap, throw a party (with the invitees listed), try particular foods, stop worrying, overcome mumbling (with its assistance), dominate conversation less, run a mile, have another child, change jobs, try gliding, visit grandchildren, or dress more often in green clothes.

As for shining shoes, this could be daily, everyone's, both coming and going, done in the blink of an eye, and executed with superhuman vision and effectors. Treatment of footwear might include: drying, lacing, cleaning, repairing, testing, conditioning, pre-warming, storing and fetching, replacing, personalizing, deodorizing and scenting, scrubbing innards, repainting, and seasonalizing. None of the traditional constraints on service--time, cost, shortage of labor, insufficient training or skill--would apply, in a world of supernumerary and free robots!

Robots could provide companionship to the elderly--the kind they so clearly need and lack at the present time--via: games, conversation, an attentive audience, entertainment, banter, service, assistance, education, information, management, remembrance, reminiscence, likeness to a pet, suggestions, advice, nursing, doctoring, exercise, challenging, planning, help in getting about and around in public, protection, secretarial help, giving a sense of power, importance, and individuality, or serving as a missing child, spouse, or friend.

Some of the future household roles and uses of robots may be worth examining in even greater detail--under a microscope, as it were...

Robot Nannie

Take for instance a robot nursemaid. Few but the very wealthy can afford a nannie or governess nowadays, and even baby-sitters can put a strain on the budget. But since in a world served by robots all will be rich, how many robots one has--and the uses to which they are put--will not depend on economic considerations. It will depend on one's needs and wishes, on what is best in an almost transcendental sense.

Who would be willing to delegate the day-to-day care of their child to a machine? Wouldn't it always seem that there was a chance that something would go wrong or be neglected: a robot stumble and crush an infant, or blow a fuse and strand its charge miles from home, or short-circuit and go berserk, or simply transmit a mechanical, inhuman outlook or pattern of behavior to one's precious child?

Fears of this type forget that by the time care of children by robots becomes common, a mass of experience will rule the expectations of individuals and any safety factors that appear to be necessary will long since have been developed and incorporated in the robots. The very keenness of concern naturally felt by any parent in this case will be what controls the situation and guarantees the trustworthiness of metacomputers used in this way by society!

But consider human and robot baby-sitters for a moment. What are the traits of a good baby-sitter? What does a parent expect and demand in a baby-sitter?

A baby-sitter must be patient, controlled, tolerant. She must be understanding, sensitive, loving. She must like and know how to work with children. She must be able to entertain, supervise, and occupy her charge. The child she takes care of should like her. A baby-sitter must recognize and be efficient in responding to the child's needs and wants. She must be able to punish or otherwise correct misbehavior. It must be possible to rely on her to do certain things at certain times, and to do them well: change diapers, provide a bottle of warm milk, prevent or stop fights, suggest games, see that homework is done, locate toys, answer questions, sing lullabyes, insist on a bath, see that teeth are brushed and toys put away, give courage through a thunderstorm, guarantee that pajamas are struggled

into, read or contrive bedtime stories, rock to sleep, and respond to any sort of emergency. A good sitter has personality and poise and is an example to the child she sits. Finally, a baby-sitter should be able to improvise and should provide diverse fare from night to night.

Tests that compare human and machine baby-sitters will be possible. The performance of both in terms of the dimensions above can be rated via the opinions of parents, psychologists, and children who have been sat. It would then be known which was best, how much better one was than the other, and how reliable either was. The result would thereafter guide with confidence any rational parent faced with such a choice.

It must also be admitted that today's human baby-sitters leave much to be desired. Intelligence, dependability, attentiveness, patience--even morality--are rather short of ideal! It is easy to imagine computers that would be more patient, attentive, dependable, and engaging.

A nannie is simply a more sophisticated baby-sitter who is always present.

The robot nannies of the future will be used by absent, indifferent, distracted, or tired parents--or by parents conscious of their own defects or limitations as parents, or of the superiority of robots to most or all human parents--to help raise their youngsters in the best possible way.

If we gaze into the future we can perhaps imagine how this will occur.

Sarah, the most popular model of robot nanny in the year 2003, has been designed for beauty, vivacity, charm, and versatility. She is warm and witty but will brook no nonsense from disobedient children.

She has an enormously large and expressive face that is repeated thrice about her head so that she can see in all directions and can't be fooled. Her hearing is ultrasensitive. Touched, she is warm and wonderfully soft. Her voice, though normally lilting and uncommonly kind, has the ability to vary over a nearly infinite expressive range.

She knows and can tell all the fairy-tales ever written, knows and can sing every song or hum every tune, knows and can recite every poem that is of interest to any child. She is remotely linked to the World Telelibrary and is a walking encyclopedia. She has within her, or at any instant can consult, the total experience, skill, and knowledge of all robot nannies in raising almost all the world's children.

On an average day Sarah will wake the children up and preside over their toilet. She will get them dressed and may suggest what they wear. She will comb, arrange, or cut hair. While doing this she will speak of the day's plans and events, and she may discuss the children's dreams, tell funny stories or about curious facts, tease, or ask about the children's thoughts, ideas, or wishes. She will give the kids breakfast. She will lead calisthenic exercises. She will take the youngsters for strolls or hikes, point out and explain interesting things, develop their knowledge, skills, and awareness. Back at home, she will give lessons on a musical instrument or in musical composition. At odd moments throughout the day she will break out into song, construct limericks, spring terrible puns, pose puzzles, perform tricks, and make sententious remarks. She may chat about anything under the sun.

As the day passes she will exhibit her inexhaustible skills. She will mime, act out roles or personalities, engage in elaborate pretenses; she will play complicated games, give practical demonstrations of mathematical methods, assist with a painting; she will stage contests, debate ideas, and perform miniature scientific experiments. Every day, hour, and minute with her will be new, exciting, full.

In keeping with her duties she will discipline, inculcate good habits and manners, correct diction, comment critically but constructively on appearance and behavior.

With her in the course of childhood there will be literally thousands of things that are toured, attended, seen, and experienced: caverns, fairs, rodeos, the ocean, other nations, scientific laboratories, factories, mines, farms, ruins, safaris, monasteries, auctions, historical monuments, and so on without end. And all of it will be explained.

She will teach how to think, perceive, speak, feel, and act. She will ignite and direct interests, sharpen sensibilities, instill morality. She will play an indispensable role in imparting knowledge, love, and mastery of the immense technologies of the future.

In a more humdrum way, she will keep the kids from mischief and out of harm's way, keep their room in order, and be the most jolly companion. At day's end she will see them off to bed, say prayers with them and create fabulous bedtime stories. She will be present to soothe if nightmares

occur. Sleepless by nature, she will ordinarily pass the night planning the next day's activities.

Robot Cook

Simple forms of robots have already begun to play a role in preparing and serving food--in factories, stores, restaurants, and at home. But what we have seen to date is as nothing by comparison with what will emerge over the next few decades or with the advent of the robot cook.

What may come to be known as a home 'autochef' will surpass any housewife, and ultimately the finest professional cook, in its culinary expertise and art. It will in effect have read every book that has ever been written on the art, technology, and science of preparing food, and be master of a million recipes, both written and unwritten (the latter obtained from its purposeful conversations with all the housewives of the world and all master chefs).

The food that it will be able to prepare at a moment's notice will be unsurpassed in the variety, range, complexity, and excellence of its taste, smell, appearance, and texture, its items, courses, meals, and lifetime variation and development.

For the 26,000 days of the human life-span it may serve 80,000 different, unique, and splendid feasts. The day's or week's choices may be made in advance by the housewife or each family member, consulting the equivalent of a book-size menu and the chatty expertise of the autochef, with its wealth of interactive suggestions; or the autochef itself may make all such decisions.

The autochef may ask for or make suggestions at the start of each day, during one's toilet, at breakfast, or while the intelligent house is awakening one in bed--with chimes, song, music, thoughts, or facts; or consult with one remotely in the course of the day.

Not only would all <u>known</u> cuisines, dishes, and types of food be available through any autochef, or the mere <u>styles</u> characteristic of any human chef, either living or dead, but culinary possibilities conceived for the first time by the unaided genius of metacomputers, or representing all possible foods in their systematic infinitude.

Tomorrow's autochef will be infinitely personal, its cuisine progressively invented and perfected for each individual and adapted to his many idiosyncrasies. It will learn by deliberate experiments, by determining and analyzing likes and dislikes, by exploratory discussions, and by analogy to what has been learned from all other human beings.

It will conduct its own research in culinary science and technology, and make use of powerful models and simulations of the physiology and aesthetics of gustation, and the chemistry and phenomenology of foods, to intuitively and presciently design foods with desired or ideal properties--or to prepare meals that always seem inspired.

Essentially there will be no limit on the multidimensionality of factors attended to, controlled, and perfected by the future army of robot cooks. The food they prepare may be the product of virtually infinite attention, intelligence, and work. The mistiming, misproportions, mistakes, distractability, and forgetting of human cooks will be <u>impossible</u>. Meals will be prepared far more efficiently, quickly, deftly, and reliably--in any quantity and way.

The autochef will also cooperate with other household robots and technology to set the table, synthesize a particular atmosphere during each meal, wait on diners, serve meals in bed or out-of-doors, prepare bag lunches or snacks, throw picnics, ready foods over days or months (as by curing or pickling), control nutrition and diet, wash dishes, and purchase food.

It will stand gracefully aside whenever a family member wishes to do the cooking; or collaborate on a meal; or train a human apprentice.

It may have breakfast and fresh pastries ready when the family rises, serve drinks and hors d'oeuvres unbidden when there is an unexpected visitor, offer surprise snacks at odd moments, give hot milk and cookies to the kids at bedtime, or deliver a sandwich in bed two hours past midnight.

And as for the crumbs...

Robot Housecleaner

What does the woman of the house hate more than scrubbing floors or wiping the commode, the man than washing the windows or dishes, or the child than

cleaning up his room? The housecleaning robot will put an end at last to all of these horrors--and in doing so presumably improve immeasurably the so-called quality of life!

The introduction of the Drudge model of robot housecleaner by the Japanese in the Spring of 1998 was seen as a godsend by almost everyone in the Developed Nations. Indeed, it did more than almost any other robot to silence public opposition to robots.

Actually the Drudge was not a single robot but a whole line of robots with different shapes, functions, and powers designed to complement one another. A given household might have many Drudges or just one. But a single Drudge could outperform even the most tireless human maid or housewife.

Once again we project ourselves into the miraculous future, to an ordinary home just after the dawn of the third millennium. The home we see seems to ourselves a veritable mansion for it is a gift to the average family of manless factories and swarms of robot construction workers, and of progressive deflation of prices relative to purchasing power.

There are seventy-one rooms. There is a solarium, a natatorium, a gymnasium for adults and a small gym for kids, a telecommunications center, a huge garage full of all types of vehicles, an atmospherium, a technological games room, a suite of rooms featuring all manner of natural and imaginary environments or simulations thereof, a ballroom, a clinic, a school, a set of rooms devoted to various hobbies and interests--other quarters too numerous to mention.

For the 71 rooms there are a fleet of Drudges that are unstoppingly busy everywhere--vacuuming, sweeping, mopping, polishing, disinfecting, dusting, restoring order from chaos, scrubbing, laundering, removing stains and odors and adding scents, spraying and painting, inspecting and testing!

Pygmy Drudges a few inches high sit permanently on tables and automatically go to work cleaning and rearranging tabletops when people leave the room. Overturned bottles are righted and put back in place, crumbs whisked away, surfaces shined.

Throughout the day the house is full of humming, hissing, buzzing, clicking, and squeaking that futurians love as a kind of gentle background music--in a way that recalls our own fondness for crickets and peepers, the sighing and rushing wind, birds atwitter.

The Drudges will clean at night, if preferred, while the household is asleep. They will make their rounds automatically without human comment, in perpetual motion, or respond in seconds to any summons seemingly voiced into thin air: "House! Please clean the upholstery in this room and lacquer this table." A finger pointed in the direction of the latter is enough; the robots of the house are really one coordinated being, and the intelligent house has eyes and ears everywhere and is ceaselessly alert.

Much that is attended to by these robots would be beyond the energies or abilities of a human servant. Funny little appendages like those of an insect but in the scores, and of every size, labor in a blur to remove offending specks of dirt from innumerable tiny cracks and crannies in floors, knobs, woodwork, the very ceiling.

The interior and exterior of the family vehicles, eyeglasses, leaves of indoor plants that have lost their gloss, toothbrushes, birdbath, ventilation panels, mirrors, knickknacks, window ledges, shower curtains, walkways, pets--be they biological or mechanical, and blankets, all are cleaned or made to appear as though new.

Drudges are often instructed to sing merry little ditties, to dance, or to whistle as they pursue uncomplainingly their manifold chores.

A Drudge may ask a member of the household sitting in another room if some tools left lying about ought to be put away, or if the windows want cleaning again.

Like any robot servant, a Drudge is always cheerful, patient, and agreeable --as dedicated as a slave of old to the perfect happiness of its master.

Robot Pets

The penchant for fantasizing dark futures has overlooked one awful possibility: a world without pets! Where would we be without our dogs and cats, our canaries and goldfish, our parrots and Christmas chicks for the children? People who are old or living alone, it has been found, live longer if they are blessed with a pet.

But this means that one route to a better future might be to create better pets than those we have. This improvement will indeed be possible, thanks to mechanical pets--or "mechs", as they will come to be called.

A future household may come to be filled with dozens of mechs, which will form something of a domestic ecosystem. Crickets, frogs, birds, pets, and other people are beloved when, today, they surround a house, break the monotony, amuse eye and ear, and directly involve householders. All of these critters can and will be manufactured in times to come and sold at reasonable prices--or later made freely available to sentimental humans wishing to enliven and decorate the house.

Mechs will be infinitely diverse in form and behavior. They will be strange, unique, complex, kaleidoscopic, endlessly amusing. They will be designed in advance to conform with the tastes and whimsies of their owners, who will collaborate with computers offering suggestions and prototypal simulations for consideration and modification. Some persons will find the simulations so entirely agreeable that they will dispense with any subsequent physical realization of their pet.

A mech's appearance--its form, coloration, texture--will be beautiful and interesting, and may continually change and evolve in time in a random or programmed way or in a way reflecting the successive ideas of its owner.

Mechanical pets will be better than natural pets in requiring no food, water, or medical care, in offering perfect obedience, in shutting down at night and during vacations or when unwanted, in training literally automatically. They will be friendlier, more affectionate, more endearing and companionable. They will be far more playful, comic, and zany than any dog; more individualistic, egocentric, and mysterious than any cat; more active, variable, and gay than any bird; brighter and more inquisitive than a raccoon; more human, mimetic, and purposeful than a monkey.

Mechs will be clean, tough, gentle, trustworthy; will have a great sense of time, place, occasion, and persons; will appreciate their owner's attention, kindness, moods, and wishes. A mech may be nicer to touch or hold than a guinea pig--or more soft, cuddlesome, wiggly, docile, warm, fluffy, fond of being petted, seeking of contact, scratchable, responsive, and productive of sounds.

The mech may surpass flesh-and-blood pets in still other ways: the complexity of its social behavior, the many unfolding stages of its life, its ingenuity and creativity, its musical voice and range of 'language', its manner and personality, its love of children--human or its 'own', its enjoyment of being around humans, its graceful movements and skills.

Everyone wishes his pet to be different and special, and mechs will be deliberately designed so that no two on earth are the same and each is utterly unique to its owner.

The uncrossable, vast gap that has always separated people from their pets will gradually vanish completely in the future; it will be replaced by a continuum of intellectual, psychological, and behavioral possibilities that will include mechanical pets and pet-like computers that are more like human companions.

But what exactly will tomorrow's mechs do? The answer, in a general way, is that they will do whatever we cause them to do--or everything that a completely fantastic and ideal pet should be able to do. Hence they may: make all possible sounds and lights, talk, receive and give love, quarrel, fight, play, laugh, titter, and giggle, learn and do tricks, tell jokes, sing, compose and emit 'music', explore and inhabit the neighboring woods, live in little houses of their own, feed back sounds, conversation, and facts, argue, debate, test and tease one another and humans, chase each other, move constantly, remove litter, and clean surfaces and objects. (Doesn't a smart dog do 'chores'?)

These mechs that do everything may race people, hide, bark at strangers (or tweet, boom, buzz, or bugle), chorus at night en masse, run errands, be companions or chaperones, howl, display sympathy or empathy, kiss, act romantic, generate a universe of weird and protean sounds based on inbuilt knowledge of man's nervous system, repair themselves, wear clothes, smoke pipes, play marbles, or skip rope; they may compete with one another for human attention, clean or preen themselves, associate with one another in groups and singles (as 'families' or 'species'), emit meaningful odors and perfumes as might myriad types of flowers, build things, fly, mimic and caricature man, make faces, gesture, chatter constantly among themselves, or make ironic, satirical, or naughty comments or sounds; they may analyze situations aloud, supervise matters, watch things as cats do, dance, play musical instruments, or perch on kids' heads and shoulders, hang around their necks, waists, or wrists, squat on their chests, sit on their feet, ride on their backs, crawl everywhere on their bodies, or chase along at their sides.

① : and Nature possibilities

Had enough? But there is more!

These mind-boggling mechs that may one day become one of the world's largest and most exciting industries, will scratch, rub, massage, fondle, caress, or 'pet' people, not only obey but worship their masters (until reprogrammed), race themselves or compete athletically, hop, jump, and gambol, perform ballet, create and execute 'plays' and 'operas', store goods, spin webs, build nests, climb trees, catch mice, speed after cars, float in ponds, garden, landscape, and even migrate worldwide minute by minute so that they are always coming and going and being replaced by new creatures. (No more "LOST KITTEN" signs!)

Tomorrow's mechs will tell stories, have hobbies, play with toys and smaller robots, simulate children, metamorphose into all other types of mechs, evolve into ever higher forms of mechs, gather and report data, experiment with new kinds of behavior and activities, try to solve problems, ask questions, sleep in bed with people, and educate themselves. They will show ever more peculiar, complex, and surprising personalities, exhibit emotions, purposes, and tastes, be mischievous in the Nth degree, and seem to read thoughts.

In fact, something of the quality of a 'pet' may be conferred upon all metacomputers with which--or whom--people have social or personal relationships, or all robotic: tutors, refrigerators, parents, vehicles, policemen, soldiers, maids, statesmen, librarians, doctors, friends, and houses.

Robot Handyman

A serious and unsolved problem of our increasingly technological civilization is that our machines and other goods become broken or worn out and need to be repaired, but human repairmen are necessarily in short supply and their services are too expensive. Also the range of expertise required is too demanding.

What a difference it will make in the upkeep of homes and longevity of household goods when there are robot handymen to do one's bidding or automatically maintain everything in working order or original condition!

Imagine that such a "Handy Andy Robot" were around today. When need arose he could fix the TV, frig, car, toaster, or furnace, he could repair the lawnmower, plumbing, fence, lamp, typewriter, air conditioner, or

tattered sofa, or he could replace broken windows, burnt-out light bulbs, or faded wallpaper. He could rebuild the driveway, patch torn jeans, resole shoes, and get the kids' toys going again. He could also paint the house or add an additional room.

In the house of the future Handy Andy will fix other robots and machines that we cannot even imagine. Instantly in touch with all the world's knowledge, he will from the first know the circuit diagram of any failed appliance, the dye to restore faded drapery, the location of all of a house's electrical wiring or plumbing, and the total goods of the world's industries and how to obtain them at once.

Because of Handy Andy tomorrow's home will be the scene of uninterrupted construction, repair, and transformation--a veritable factory.

Outside the home other robots will be at work...

Robot Gardener