

The Year 2000

As you may know, I like old books of futurism. In the year 2008 I borrowed one such book from a friend: "The Year 2000: A Framework for Speculation on the Next Thirty-Three Years", by Herman Kahn and A. J. Wiener. It was published in 1967 and has many fascinating bits, but the easiest ones to demonstrate are these three tables of predictions near the beginning of the book. I've color-coded the predictions with my subjective impressions of whether each was a **hit**, a **partial hit**, or a **miss**. Out of 135 predictions there are 27 hits and 22 partial hits.

Table XVIII: One Hundred Technical Innovations Very Likely in the Last Third of the Twentieth Century

1. Multiple applications of lasers and masers for sensing, measuring, communication, cutting, heating, welding, power transmission, illumination, destructive (defensive), and other purposes
2. Extreme high-strength and/or high-temperature structural materials
3. New or improved superperformance fabrics (papers, fibers, and plastics)
4. New or improved materials for equipment and appliances (plastic, glasses, alloys, ceramics, intermetallics, and cements)
5. New airborne vehicles (ground-effect machines, VTOL and STOL, super-helicopters, giant and/or supersonic jets)
6. Extensive commercial application of shaped-charge explosives
7. More reliable and longer-range weather forecasting
8. Intensive and/or extensive expansion of tropical agriculture and forestry
9. New sources of power for fixed installations (e.g., magnetohydrodynamic, thermionic and thermoelectric, and radioactivity)
10. New sources of power for ground transportation (storage battery, fuel cell, propulsion [or support] by electro-magnetic fields, jet engine, turbine, and the like)
11. Extensive and intensive use of high altitude cameras for mapping, prospecting, census, land use, and geological investigations
12. New methods of water transportation (such as large submarines, flexible and special purpose "container ships", or more extensive use of large automated single-purpose bulk cargo ships)
13. Major reduction in hereditary and congenital defects
14. Extensive use of cyborg techniques (mechanical aids or substitutes for human organs, senses, limbs, or other components)
15. New techniques for preserving or improving the environment
16. Relatively effective appetite and weight control
17. New techniques and institutions for adult education

18. New and useful plant and animal species
19. Human "hibernation" for short periods (hours or days) for medical purposes
20. Inexpensive design and procurement of "one of a kind" items through use of computerized analysis and automated production
21. Controlled and/or supereffective relaxation and sleep
22. More sophisticated architectural engineering (e.g., geodesic domes, "fancy" stressed shells, pressurized skins, and esoteric materials)
23. New or improved uses of the oceans (mining, extraction of minerals, controlled "farming," source of energy, and the like)
24. Three-dimensional photography, illustrations, movies, and television
25. Automated or more mechanized housekeeping and home maintenance
26. Widespread use of nuclear reactors for power
27. Use of nuclear explosives for excavation and mining, generation of power, creation of high temperature-high pressure environments, and/or as a source of neutrons or other radiation.
28. General use of automation and cybernation in management and production
29. Extensive and intensive centralization (or automatic interconnection) of current and past personal and business information in high-speed data processors
30. Other new and possibly pervasive techniques for surveillance, monitoring, and control of individuals and organizations
31. Some control of weather and/or climate
32. Other (permanent or temporary) changes--or experiments--with the overall environment (e.g., the "permanent" increase in C-14 and temporary creation of other radioactivity by nuclear explosions, the increasing generation of CO₂ in the atmosphere, projects Starfire, West Ford, and Storm Fury)
33. New and more reliable "educational" and propaganda techniques for affecting human behavior--public and private
34. Practical use of direct electronic communication with and stimulation of the brain
35. Human hibernation for relatively extensive periods (months to years)
36. Cheap and widely available central war weapons and weapon systems
37. New and relatively effective counterinsurgency techniques (and perhaps also insurgency techniques)
38. New techniques for very cheap, convenient, and reliable birth control
39. New, more varied, and more reliable drugs for control of fatigue, relaxation, alertness, mood, personality, perceptions, fantasies, and other psychobiological states
40. Capability to choose the sex of unborn children
41. Improved capability to "change" sex of children and/or adults
42. Other genetic control and/or influence over the "basic constitution" of an individual
43. New techniques and institutions for the education of children

44. General and substantial increase in life expectancy, postponement of aging, and limited rejuvenation
45. Generally acceptable and competitive synthetic foods and beverages (e.g., carbohydrates, fats, proteins, enzymes, vitamins, coffee, tea, cocoa, and alcoholic liquor)
46. "High Quality" medical care for undeveloped areas (e.g., use of medical aides and technicians, referral hospitals, broad spectrum antibiotics, and artificial blood plasma)
47. Design and extensive use of responsive and supercontrolled environments for private and public use (for pleasurable, educational, and vocational purposes) [I'm not really sure what this means. --LR]
48. Physically nonharmful methods of overindulging
49. Simple techniques for extensive and "permanent" cosmetological changes (features, "figures," perhaps complexion and even skin color, and even physique)
50. More extensive use of transplantation of human organs
51. Permanent manned satellite and lunar installations--interplanetary travel
52. Application of space life systems or similar techniques to terrestrial installations
53. Permanent inhabited undersea installations and perhaps even colonies
54. Automated grocery and department stores
55. Extensive use of robots and machines "slaved" to humans
56. New uses of underground "tunnels" for private and public transportation and other purposes
57. Automated universal (real time) credit, audit, and banking systems
58. Chemical methods for improving memory and learning
59. Greater use of underground buildings
60. New and improved materials and equipment for buildings and interiors (e.g., variable transmission glass, heating and cooling by thermoelectric effect, and electroluminescent and phosphorescent lighting)
61. Widespread use of cryogenics
62. Improved chemical control of some mental illnesses and some aspects of senility
63. Mechanical and chemical methods for improving human analytical ability more or less directly
64. Inexpensive and rapid techniques for making tunnels and underground cavities in earth and/or rock
65. Major improvements in earth moving and construction equipment generally
66. New techniques for keeping physically fit and/or acquiring physical skills
67. Commercial extraction of oil from shale
68. Recoverable boosters for economic space launching
69. Individual flying platforms
70. Simple inexpensive home video recording and playing

71. Inexpensive high-capacity, worldwide, regional, and local (home and business) communication (perhaps using satellites, lasers, and light pipes)
72. Practical home and business use of "wired" video communication for both telephone and TV (possibly including retrieval of taped material from libraries or other sources) and rapid transmission and reception of facsimiles (possibly including news, library material, commercial announcements, instantaneous mail delivery, other printouts, and so on)
73. Practical large-scale desalinization
74. Pervasive business use of computers for the storage, processing, and retrieval of information
75. Shared time (public and interconnected?) computers generally available to home and business on a metered basis
76. Other widespread use of computers for intellectual and professional assistance (translation, teaching, literature search, medical diagnosis, traffic control, crime detection, computation, design, analysis and to some degree as intellectual collaborator generally)
77. General availability of inexpensive transuranic and other esoteric elements
78. Space defense systems
79. Inexpensive and reasonably effective ground-based BMD [Ballistic Missile Defense -LR. "One way not to make a reputation is to find a hole in the airdefense system. It's all holes." --Herman Kahn]
80. Very low-cost buildings for home and business use
81. Personal "pagers" (perhaps even two-way pocket phones) and other personal electronic equipment for communication, computing, and data processing program
82. Direct broadcasts from satellites to home receivers
83. Inexpensive (less than \$20, long lasting, very small battery operated TV receivers)
84. Home computer to "run" household and communicate with outside world
85. Maintenance-free, longlife electronic and other equipment
86. Home education via video and computerized and programmed learning
87. Stimulated and planned and perhaps programmed dreams
88. Inexpensive (less than one cent a page), rapid high-quality black and white reproduction; followed by color and high-detailed photography reproduction--perhaps for home as well as office use
89. Widespread use of improved fluid amplifiers [?? -LR]
90. Conference TV (both closed circuit and public communication system)
91. Flexible penology without necessarily using prisons (by use of modern methods of surveillance, monitoring, and control)
92. Common use of (longlived?) individual power source for lights, appliances, and machines
93. Inexpensive worldwide transportation of humans and cargo
94. Inexpensive road-free (and facility-free) transportation

- 95. New methods for rapid language teaching
- 96. Extensive genetic control for plants and animals
- 97. New biological and chemical methods to identify, trace, incapacitate, or annoy people for police and military uses
- 98. New and possibly very simple methods for lethal biological and chemical warfare
- 99. Artificial moons and other methods for lighting large areas at night
- 100. Extensive use of "biological processes" in the extraction and processing of minerals

Table XIX: Some Less Likely but Important Possibilities

These are all misses, except for #22, which I would classify as a partial hit due to the development of IVF.

- 1. "True" artificial intelligence
- 2. Practical use of sustained fusion to produce neutrons and/or energy
- 3. Artificial growth of new limbs and organs (either in situ or for later transplantation)
- 4. Room temperature superconductors
- 5. Major use of rockets for commercial or private transportation (either terrestrial or extraterrestrial)
- 6. Effective chemical or biological treatment for most mental illnesses
- 7. Almost complete control of marginal changes in heredity
- 8. Suspended animation (for years or centuries)
- 9. Practical materials with nearly "theoretical limit" strength
- 10. Conversion of mammals (humans?) to fluid breathers
- 11. Direct input into human memory banks
- 12. Direct augmentation of human mental capacity by the mechanical or electrical interconnection of the brain with a computer
- 13. Major rejuvenation and/or significant extension of vigor and life span--say 100 to 150 years
- 14. Chemical or biological control of character or intelligence
- 15. Automated highways
- 16. Extensive use of moving sidewalks for local transportation
- 17. Substantial manned lunar or planetary installations
- 18. Electrical power available for less than .3 mill per kilowatt hour
- 19. Verification of some extrasensory phenomena
- 20. Planetary engineering
- 21. Modification of the solar system
- 22. Practical laboratory conception and nurturing of animal (human?) fetuses
- 23. Production of a drug equivalent to Huxley's soma

24. A technological equivalent of telepathy
25. Some direct control of individual thought processes

Table XX: Ten Far-Out Possibilities

The authors write: "We do not believe that any of them will occur by the year 2000, or perhaps ever. But some of them are discussed today; and such a list does emphasize the fact that some dramatic and radical innovation must be expected." A revealing statement. Most of the dramatic post-1968 innovations were correctly predicted on the *first* list. What wasn't predicted were the radical second-order effects of those innovations.

As you'd expect, all of these are misses, especially since most of them are more extreme versions of predictions from the previous list. (Though the authors might be surprised at how close #8 seems as of 2008.)

1. Life expectancy extended to substantially more than 150 years (immortality?)
2. Almost complete generic control (but still homo sapiens)
3. Major modification of human species (no longer homo sapiens)
4. Antigravity (or practical use of gravity waves)*
5. Interstellar travel
6. Electric power available for less than .03 mill per kw hour
7. Practical and routine use of extrasensory phenomena
8. Laboratory creation of artificial live plants and animals
9. Lifetime immunization against practically all diseases
10. Substantial lunar or planetary bases or colonies

* Footnote in original: "As usually envisaged this would make possible a perpetual motion machine and therefore the creation of energy out of nothing. We do not envisage this as even a far-out possibility, but include antigravity, even though it annoys some physicist friends, as an example of some totally new use of a basic phenomena or the seeming violation of a basic law."

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