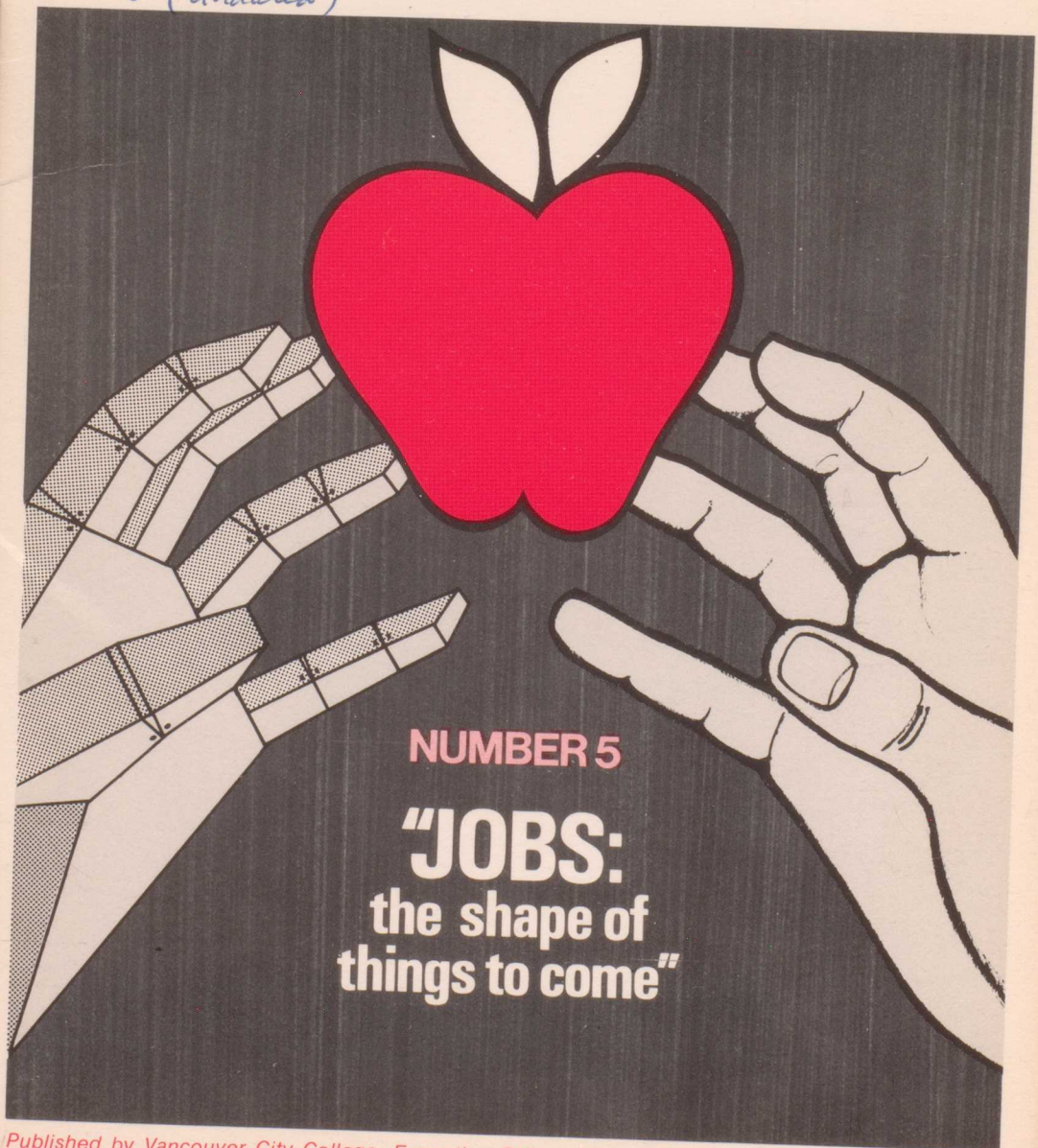
TOOLS FOR LIFE

A Series of Self-Help Booklets designed to help students beyond the classroom into Life

#5 (undated)



NUMBER 5

"JOBS: the shape of things to come"

Published by Vancouver City College. Executive Office, 1595 West 10th Avenue, Vancouver 9, B.C.

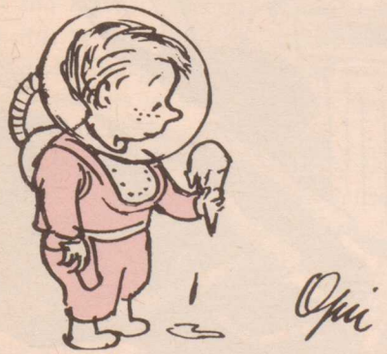
To romance of the future may seem to be indulgence in ungoverned speculation for the sake of the marvellous. Yet controlled imagination in this sphere can be very valuable exercise for minds bewildered about the present and its potentialities.
OLAF STAPLEDON, "Last and First Men", 1930

Carriages without horses shall go
And accidents fill the world with woe;
Around the world thoughts shall fly
In the twinkling of an eye;
Iron in the water shall float
As easy as a wooden boat;
Underwater men shall walk
Shall ride, shall sleep and talk;
In the air men shall be seen
In white, in black, and in green . . .
OLD MOTHER SHIPTON,
16th Century Prophetess

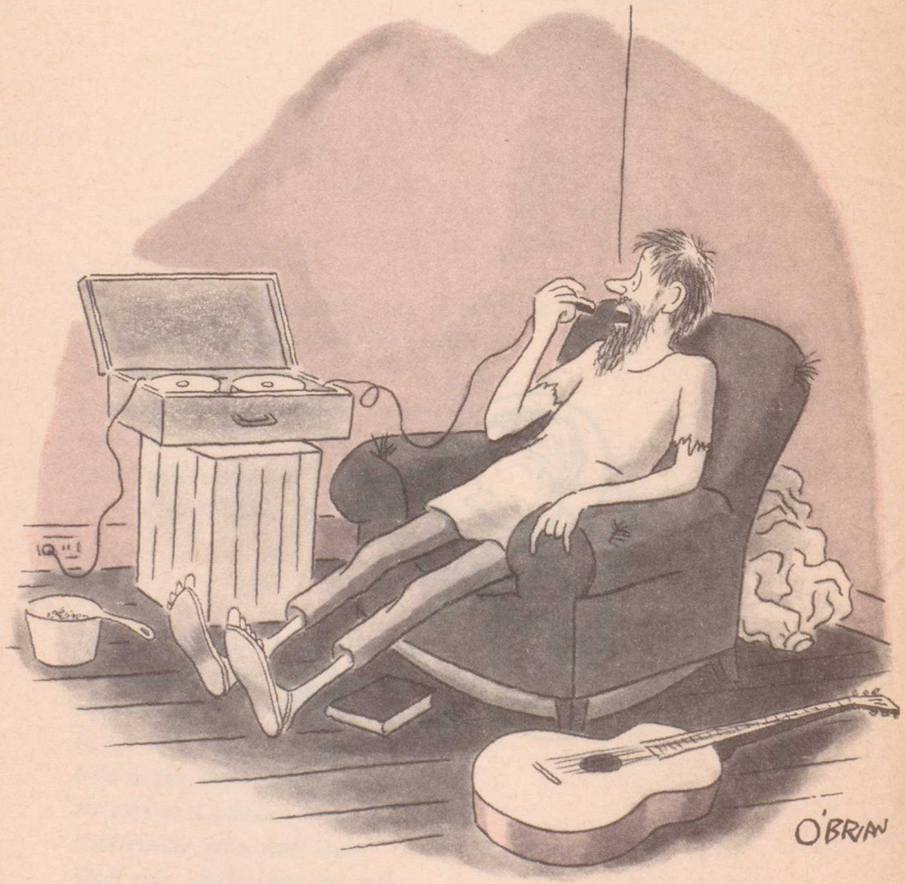
TOOLS FOR LIFE/Number 5

"JOBS: the shape of things to come"

By Geoff Spencer
Publications Editor, Vancouver City College



(Most of the drawings and miscellaneous graphics are reproduced with grateful acknowledgement to the NEW YORKER *magazine)*



"Hello, me in 1990. I suppose by now you are making piles of bread and going reactionary, so let me remind you . . ."

To anyone desperately looking for work in the present, when work is still a necessity rather than an indulgence, a flight of fancy which attempts to speculate on the type of jobs which might exist fifty years hence may seem of irritatingly little use. An old Chinese proverb maintains that "the flowers of all our tomorrows are in the seeds of today." This being the case, some practical purpose may be served by deliberately bending the mind in new directions; in stimulating the imagination to take flight on its own, even if the attempt resembles nothing so much as trying to balance ladders on flimsy foundations to reach the stars. However, even if this introduction is so much froth, perhaps the charts and job descriptions that follow may provide grains of irritation out of which a few practical pearls may be formed in the present.

The truth is that the future may only dimly be perceived by projecting present trends. Any single block-bursting discovery may change the entire direction overnight. It does, however, seem likely that routine production jobs as we know them today will diminish as automation takes over. Correspondingly, what might be called "Service-to-People" jobs will increase. Assuming, perhaps over-optimistically, peace, food, population control and rational planning, to me at least it does not seem inconceivable that by the end of the century 20% or less of the adult population will be engaged in production work, leaving 80% or more to occupy themselves in some corner of the enormously expanded field of non-production, *i.e.* recreation.

The Greek regional planner, CONSTANTINOS DOXIADIS, goes further. In a report prepared in 1972 for the United Nations food, agriculture, health and meteorological organizations, he suggests that by the end of the next century a world of 21 billion people may have to be carved up into three vast zones. Half the land surface would be a virtually uninhabitable nature reserve and water catchment area; another 40% would be a highly industrialized and even automated food growing area employing 2 billions; the third region, comprising only 10% of the landmass and tentatively called "Ecumenopolis" or "Universal City", would house 19 billions sprawled along the shores of the world's oceans, lakes and rivers, drawing food and water in huge quantities from the other two regions. Under the circumstances it seems reasonable to suggest that those catering to the recreational activities of the vast majority of non-working people may find themselves confronting the greatest number of future job opportunities. It

is also likely to be the area in which job discrimination by sex may at last disappear.

For the next two or three decades, it seems probable that jobs will more easily be found by those following vocational or technical training than by those striving for higher degrees in the universities. Some balance may have to be achieved by planning, and the educational machine geared accordingly. There are already indications that the days may be numbered in which an individual may choose his career by whim. The "Open Door" may become a "Metered Valve". Allocations will depend on overall need and individual aptitude.

On what premises is this whole speculative edifice raised? For one, despite considerable evidence to the contrary, I am going to assume that we shall not succeed in blowing ourselves into oblivion. If there is no viable future for man, there is no point in speculating on the shape of jobs to come. I believe, however, that when the crunch comes, man will persist, adapt and develop; that with his back to the wall on such seemingly insoluble problems as the exploding population, diminishing food and Everests of toxic waste, he will somehow pull the rabbit of salvation out of the hat of ultimate disaster.

Without pretension to being either profound or comprehensive, what follows, in no particular order, is a grabbag listing of some of the jobs that one man believes might exist for our children's children. It is a purely personal, keyhole view. Its purpose, at the risk of repetition, is to stimulate the reader's own imagination.

All the flowers
of all the tomorrows
are in the seeds of today

—Chinese proverb

NUMERICAL DISTRIBUTION OF CANADIAN LABOUR FORCE: 1901-2041 (IN THOUSANDS)

1901-1961 based on data from "Census of Canada, 1901-1961"
1981-2041 based on a purely personal projection by the writer.

	FACT				FORECAST			
Occupation Division	1901	1921	1941	1961	*1981*	*2001*	*2021*	*2041*
WHITE COLLAR OPERATIONS:	272	794	1,058	2,446	*4,280*	*6,800*	*6,490*	*6,650*
Proprietary and Managerial	77	228	225	500	*900*	*1,500*	*1,000*	*1,800*
Professional	82	171	282	634	*1,100*	*1,800*	*2,400*	*3,000*
Clerical	57	216	303	818	*1,500*	*2,500*	*2,000*	*1,000*
Commercial		159	223	439	*700*	*900*	*1,000*	*800*
Financial	55	18	23	52	*80*	*100*	*90*	*50*
BLUE COLLAR OPERATIONS:	496	810	1,134	1,716	*2,400*	*2,400*	*2,400*	*2,400*
Manufacturing and Mechanical	283	359	672	1,036	*1,500*	*1,400*	*1,200*	*1,000*
Construction	83	147	196	335	*500*	*700*	*1,000*	*1,300*
Labourers	128	304	265	343	*400*	*300*	*200*	*100*
PRIMARY OCCUPATIONS:	789	1,137	1,275	830	*590*	*525*	*450*	*310*
Agricultural	718	1,025	1,074	648	*450*	*400*	*350*	*250*
Fishing, Hunting and Trapping	27	28	51	36	*20*	*15*	*10*	*5*
Logging	16	36	78	79	*65*	*60*	*50*	*30*
Mining and Quarrying	27	46	70	64	*55*	*50*	*40*	*25*
TRANSPORTATION AND COMMUNICATION	78	172	266	496	*900*	*1,500*	*2,000*	*2,500*
SERVICE	284	403	827	1,387	*2,300*	*3,200*	*4,500*	*5,500*
Not Stated		7	11	167	—	—	—	—
ALL OCCUPATIONS	1,782	3,143	4,183	6,458	*9,470*	*13,525*	*15,840*	*16,560*
NON-PRODUCTION ELEMENT OF POPULATION	3,589	5,645	7,324	11,780	*16,530*	*28,475*	*49,160*	*83,440*
TOTAL POPULATION	5,371	8,788	11,507	18,238	*26,000*	*42,000*	*65,000*	*100,000*

The following information, with the exception of the forecast for the years 1981 and 2001, which is a purely personal projection by the writer, is drawn from the March 1972 District Bulletin of Mr. G. W. Nobbs, District Economist to the Pacific Region of the Department of Manpower and Immigration.

EMPLOYMENT IN GOODS-PRODUCING INDUSTRIES IN BRITISH COLUMBIA: 1961-2001

	Estimated 1961 ('000)	Estimated 1971 ('000)	Change % 1961-1971	1981 ? ('000)	2001 ? ('000)
Agriculture	21	25	+ 19.0	17	15
Forestry	19	26	+ 36.8	38	40
Fishing	5	3	− 40.0	2	1
Mining	11	12	+ 9.1	9	8
Total Primary	55	66	+ 20.0	66	64
Manufacturing	100	150	+ 50.0	169	175
Construction	21	61	+190.5	89	105
Total Goods-Producing Sector	176	277	+ 57.4	330	344

EMPLOYMENT IN SERVICE-PRODUCING INDUSTRIES IN BRITISH COLUMBIA: 1961-2001

	Estimate 1961 ('000)	Estimate 1971 ('000)	Change % 1961-1971	1981 ? ('000)	2001 ? ('000)
Transport, Communication and Utilities	61	88	+ 44.2	96	104
Trade	87	162	+ 86.2	180	220
Finance, Insurance, Real Estate	23	45	+ 95.7	48	50
Education, Health, Welfare, Business & Personal Services	108	225	+108.3	281	400
Public Administration	46	49	+ 6.5	55	60
Service-to-People Sector	325	569	75.1	660	834

Some occupations in British Columbia employing relatively large numbers and/or showing favourable growth prospects in the 1970's*

Professional, Technical and Managerial Occupations

- Accountants
- Conservation and Environmental Control Occupations
- Counselling Occupations
- Physicians and other medical specialists
- Dentists
- Dental Hygienists and Assistants
- Nursing Assistants and Aides
- Therapists
- Industrial Engineers
- Engineering, Medical and Science Technicians
- Architects, Planners and Related Occupations
- Computer Programmers
- Systems Analysts
- Bank Officers

Clerical and Related Occupations

- Office Appliance Operators
- Computer Operators
- Stenographers and Secretaries
- Typists

Sales Occupations

- Insurance and Real Estate Salesmen
- Sales Clerks

Service Occupations

- Chefs and Cooks
- Cosmetologists
- Hospital Attendants
- Waiters and Waitresses
- Protective Service Occupations

Craftsmen

- Carpenters
- Bricklayers and Masons
- Plumbers and Pipe Fitters
- Motor Vehicle Mechanics
- Maintenance Electricians
- Maintenance Mechanics
- Instrument Repairmen
- Millwrights
- Welders
- Aircraft Mechanics
- Business Machine Servicemen
- Autobody Repairman
- Operating Engineers

*Source: March 1972 District Bulletin of the District Economist, Pacific Region, Department of Manpower & Immigration.

The 4-day week. It'll really put us to work.

We saw it coming more than four years ago. More play time.

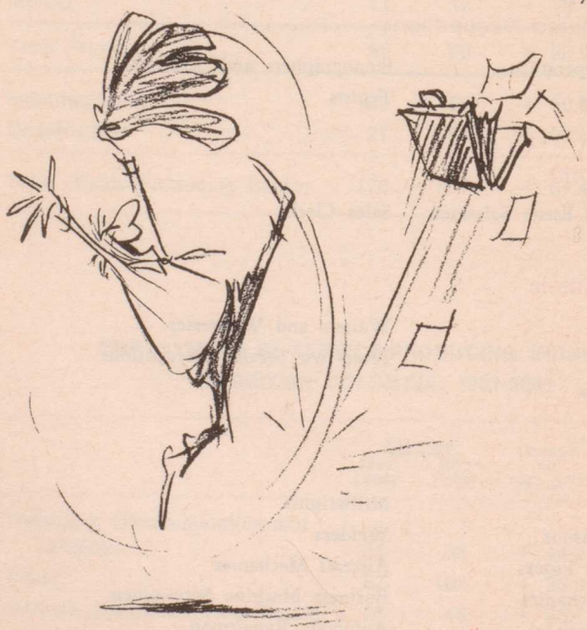
So we went into the entertainment business. United Artists gives us a voice in movies, records, tapes, cassettes and TV.

Then we got into vacation travel. On the ground with Budget Rent-A-Car. In the air with Trans International Airlines. (It's now the largest passenger charter line in the world.)

The 4-day week.

For a service company like us, it means a 3-day working weekend.

Transamerica Corporation
At your service.



"Thank God it's Thursday!"

(Signpost to the future? An example of the way one major corporation is diversifying to exploit the coming leisure explosion.)

COMMUNICATION AND THE MEDIA

The newspaper of the future will probably either be scanned in the home on large TV screens, or reproduced at will on a connected printout facility. This in turn will be linked with microfilm libraries for virtually unlimited information access. One result may be fewer JOURNALISTS, but of higher calibre. However, if the thirst for information is sufficiently demanding, there seems no reason why the BRIDGE RIVER & LILLOOET NEWS shouldn't be available on the same hookup as the NEW YORK TIMES. In this eventuality a substantial number of NEWS PERSONNEL would continue to be in demand by the local press.

TV and radio will continue to expand, but not in ratio to population growth.

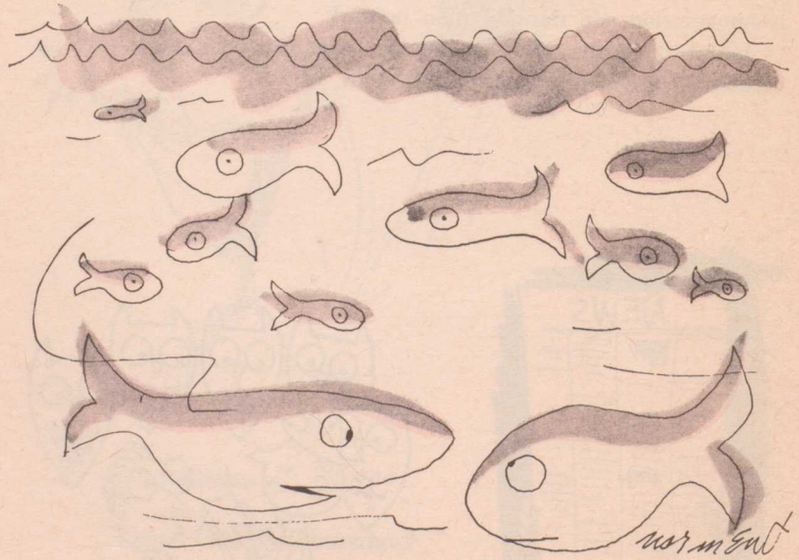
The telephone/videophone will continue along the road leading to full automation: fewer SWITCHBOARD PERSONNEL, fewer SUPERINTENDENTS, more RESEARCH, more CONSTRUCTION, INSTALLATION and MAINTENANCE of equipment.

The ADVERTISING fraternity may well disappear by the end of the century, as product and consumer are directly linked in the communication and transportation network.

All in all, a shrinking job market, with vastly increased capacity capable of being operated by fewer hands.

THE UNDERWATER WORLD

The next 50 years will see a systematic exploration and exploitation of the underwater landmass of the continental shelf. Those drawn to the sea will undoubtedly find a wide selection of jobs both new as well as those developed from existing landbased skills, such as MINING. OCEANOGRAPHY will increase prolifically, as will MARINE BIOLOGY, not the least important function of which may be collaboration with the "OXYGEN WATCH" (See 'OXYGEN CONTROL' under "ECOLOGY"). FISH-FARMING, MINERAL RECLAMATION, OIL PROSPECTING, and much else will beckon the underwater brigade of the future. A substantial number of para-professional functions may enter the vocational and technical training programs as a result.



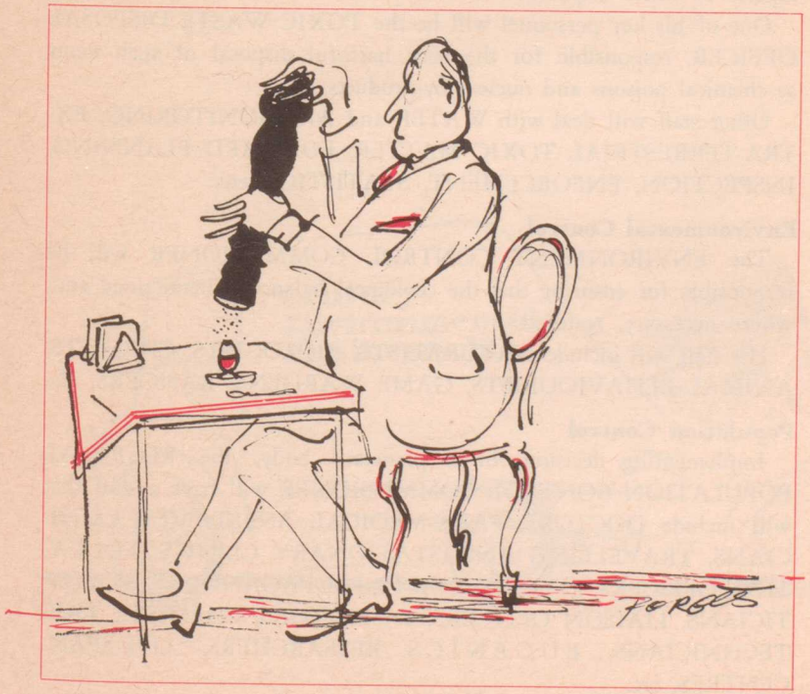
"I've been out of the water and I've been in the water, and, believe me, in is best!"

FOOD

The story, briefly, is greater production, largely automated, with fewer people. More jobs will be created in RESEARCH, but FOOD PRODUCTION, generally speaking, may be a shrinking area from the job point of view.

FOOD, ACCOMMODATION AND ENTERTAINMENT

It seems likely that all the jobs we know today may be multiplied by a mighty "X" in the future. The preparation and serving of food, the running of hotels, and the world of entertainment will require many more people than at present. The only area that might conceivably shrink is that of entertainment, where more efficient communication may be able to spread fewer entertainers more widely. However, as against that, a penchant for "live" entertainment may set in, rather in the same way that the arts and crafts movement represents a reaction against the dreary uniformity of the mass-produced article.



BEHAVIOURAL NAVIGATOR

ERICH JANTSCH, a member of the European Common Market team, has put forward the idea of "SOCIAL NAVIGATION CENTRES", or "LOOKOUT INSTITUTIONS", staffed by BEHAVIOURAL SCIENTISTS. Their function would be to chart any drift towards social flashpoint by measuring indices of behaviour. Their work would tie in directly with the VIOLENCE CONTROL CENTRE described elsewhere.

A secondary level of assistants (BEHAVIOURAL TECHNICIANS) might well be trained at the Technical Institute level. It seems a logical field for those drawn to social welfare and community problems.

THE ECOLOGY

Pollution Control

Subject to continental and regional control, the DISTRICT WASTE CONTROL COMMISSIONER will be responsible for controlling all aspects of waste disposal.

One of his key personnel will be the TOXIC WASTE DISPOSAL OFFICER, responsible for the least harmful disposal of such items as chemical poisons and nuclear by-products.

Other staff will deal with WATER and AIR MONITORING, EXTRA-TERRESTRIAL TOXIC MATTER, FORWARD PLANNING, INSPECTION, ENFORCEMENT, STATISTICS, etc.

Environmental Control

The ENVIRONMENT CONTROL COMMISSIONER will be responsible for ensuring that the ecological balance is maintained and, where necessary, restored.

His staff will include NATURALISTS, BIOLOGISTS, CHEMISTS, ANIMAL BEHAVIOURISTS, GAME WARDENS, RANGERS, etc.

Population Control

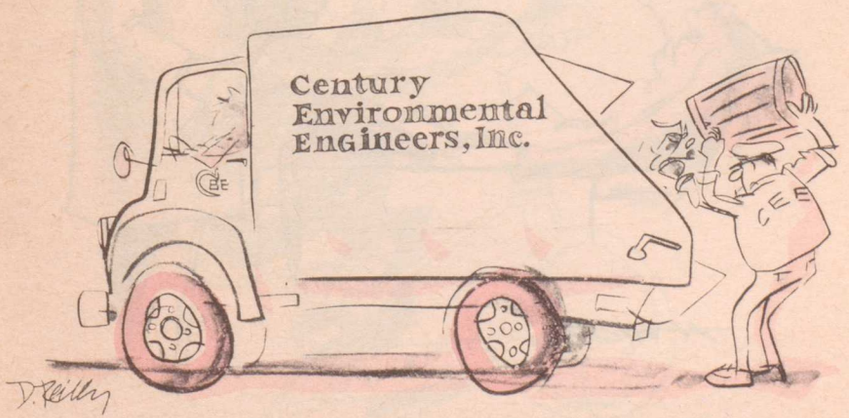
Implementing decisions of a planetary body, the REGIONAL POPULATION CONTROL COMMISSIONER will have a staff that will include DOCTORS, PARA-MEDICAL ASSISTANTS, CLINICIANS, TRAVELLING AND STATIONARY CLINICS, EDUCATION OFFICERS, PSYCHOLOGISTS, PROPAGANDISTS, STATISTICIANS, LIAISON OFFICERS, INSPECTORS, CHEMISTS, LAB. TECHNICIANS, EUGENICS RESEARCHERS, LIFE-SPAN CENTRES, etc.

Water Generation and Control

A similarly structured body, with effective implementation in the hands of REGIONAL WATER COMMISSIONERS. Their staff will consist of CHEMISTS (including DESALINIZATION SPECIALISTS), HYDRO ENGINEERS, RECYCLING TECHNICIANS, CATCHMENT AREA CONTROL OFFICERS and BORDER GUARDS, STATISTICIANS, METEOROLOGICAL LIAISON OFFICERS, etc.

Oxygen Control

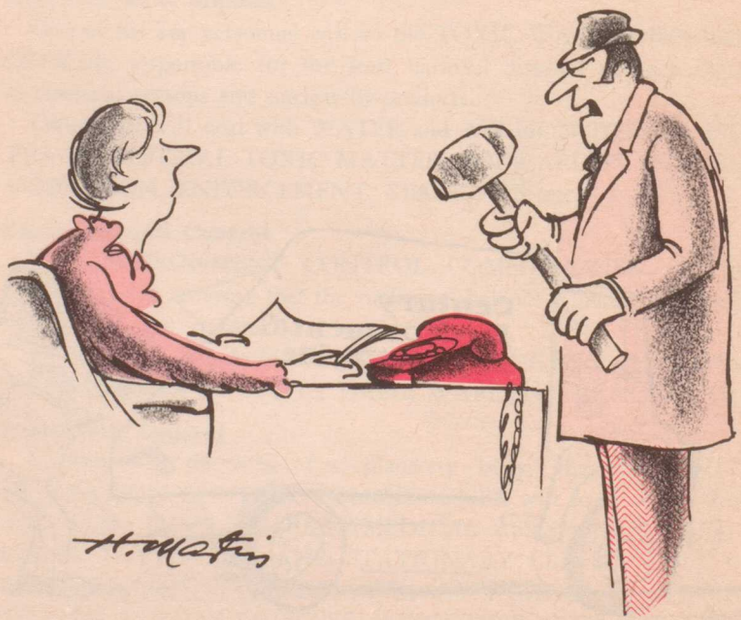
Largely concerned with monitoring and research, but directly responsible to the planetary body for recommendations when the oxygen/carbon dioxide system is imperilled. A network of monitoring stations will be maintained, staffed by OXYGEN CONTROL TECHNICIANS (The "Oxygen Watch").



COMPUTERS

The future will depend not merely on the old symbiosis (working relationship) of man with plants and animals, but increasingly on his new relationship to cybernetic systems. Those working with computers will find an increasing number of jobs up to perhaps the end of the century, beyond which time computer capacity may reduce the number of operators. The following chart tells the story, the projections representing a personal opinion:

	FACT		FORECAST	
Computers	1966	1970	1980	2000
United States	27,000	45,000	75,000	150,000
Western Europe	6,000	18,000	45,000	90,000
Japan	1,900	4,750	9,000	20,000
Canada	900	3,000	6,000	18,000



"I am Account No. 327-94-33AT, and I would like a word with your computer."

CLIMATE CONTROL

At the action level, this may involve MATHEMATICIANS, COMPUTER PROGRAMMERS, PILOTS, CHEMISTS, COMMUNICATORS, LIAISON OFFICERS, PHOTOGRAPHERS, INTERPRETERS, STATISTICIANS, etc., organized in a planetary web.

Under the supreme planetary authority, a closely linked, interwoven relationship will exist with other public service departments such as RECREATION, ENVIRONMENT, FOOD DEVELOPMENT, TRANSPORTATION and others; by district, region and continent, with jobs at all levels.

TRANSPORTATION

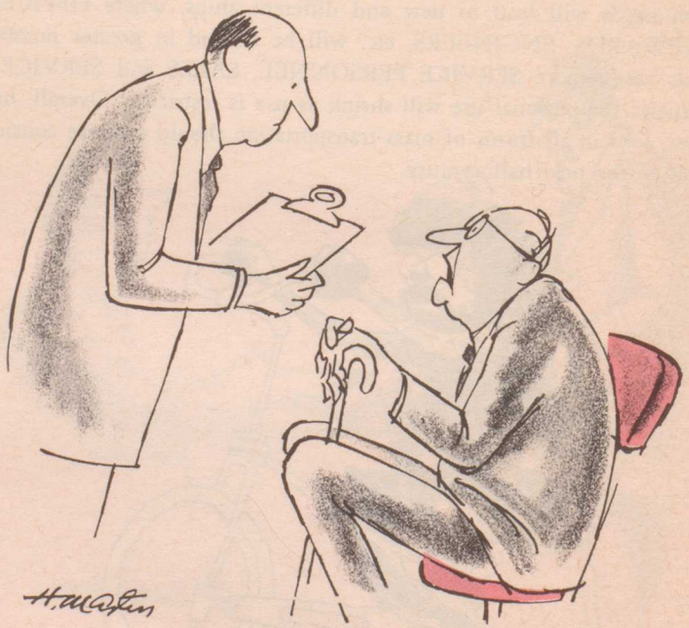
Under population pressure, emphasis will likely swing to mass transit. Surface transportation will stage a comeback, with more jobs as DRIVERS, CONDUCTORS, MAINTENANCE ENGINEERS, CONTROLLERS, etc. for the "trains" of the future. Programmed highways will still require personnel for the Greyhounds of 2001. Recreation needs will lead to new and different ships, where OFFICERS, STEWARDS, ENGINEERS, etc. will be needed in greater numbers, plus vastly more SERVICE PERSONNEL. SALES and SERVICE of vehicles for personal use will shrink as use is restricted. Overall, however, jobs in all forms of mass transportation should increase considerably in the next half century.

CRYONICS TECHNICIAN

From the Greek word "cryonis", meaning cold. This is the technology of placing bodies into a state of suspended "life" for re-animation at some point in the future in the expectation of either greater health or greater happiness. Several "Life Extension Societies" are already operating under the motto: "Freeze - Wait - Re-animate".

Current technology is a somewhat primitive process of immersing bodies in liquid nitrogen and storing them at minus 320 degrees in stainless steel capsules, with the nitrogen replaced every three months by tanker truck.

This is on Herman Kahn's list of "probables". If it does develop beyond eccentricity, there will be jobs for those preparing the bodies immediately after clinical "death", and other jobs for those concerned with the freezing process, equipment maintenance, storage, record-keeping, etc.



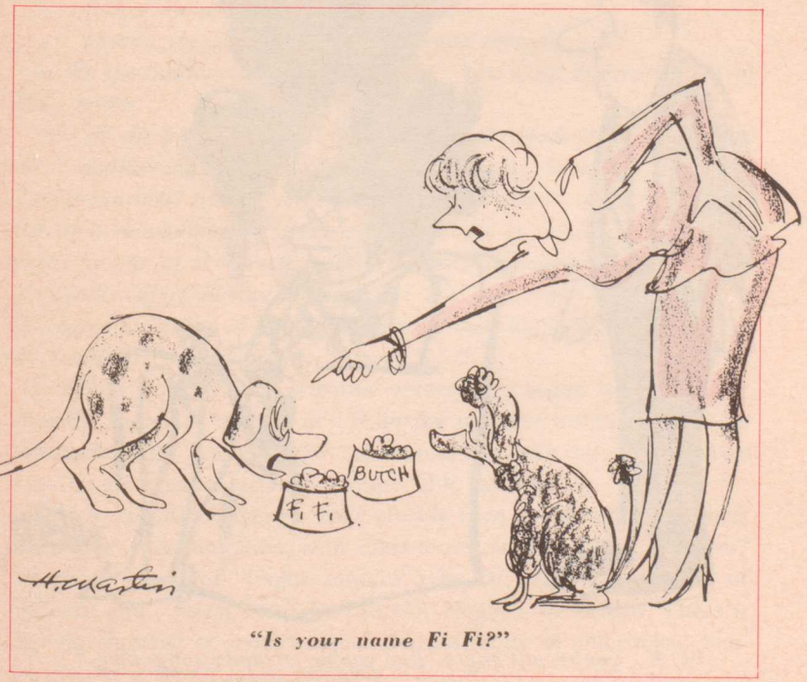
"My joints ache, my hair seems to be going, I've been noticing crow's-feet around my eyes. Doc, what's happening to me?"

ROBOTICIAN

The person responsible for the custodianship and control of one or more robots used in repetitive production processes. Though grounded in engineering, electronics and a smattering of mechanical sciences, the robotician will, at the upper end of the scale, determine feasibility of applications; at the lower end, he may be responsible for routine maintenance, though this function will probably be delegated to technicians.

THE PET INDUSTRY

De-personalization in the future may be countered by encouraging a vast pet industry, largely in private hands. Apart from those breeding pets, there will be an enormously increased demand for VETERINARIANS, PARA-VETERINARIANS, PET HOSPITALS, BOARDING FACILITIES, HEALTH AIDS, GROOMING, EXHIBITING, etc. A growth area worth watching.



"Is your name Fi Fi?"

THE VIOLENCE CONTROL CENTRE

This may embrace the widest conceivable variety of talents. If the SOCIAL NAVIGATORS at the "Lookout Centre" detect a whiff of sulphur, VIOLENCE CONTROL ENGINEERS will spring into action with any combination of proved "drains". These may range from the mass application of sedatives in the water supply to the ritual enactment of violence arena-style by a team of behaviourists and theatre arts people. Probably under "Health and Welfare", the VIOLENCE CONTROL CENTRE will employ PSYCHOLOGISTS, BEHAVIOURISTS, CHEMISTS, ACTORS, DIRECTORS, COMMUNICATORS, MYSTICS, SUBLIMATORS, MYTHOLOGISTS, FIREMEN, DREAM MERCHANTS, HUMOURISTS, TOWN FOOLS, etc.

"O.K., you're not angry. But you're certainly something."

CRYPTANALYST/CRYPTOGRAPHER

The fancy words for code-maker and code-breaker, possibly the world's second-oldest profession, dating back to the first wars conducted with organized military forces.

At first sight this might appear to be a somewhat narrow and specialized field of job opportunity, appealing mainly to high-domed mathematicians operating in cubicles. Consider, however, that in World War II Britain alone employed 30,000 men and women on communications intelligence. The total number employed on all sides may have reached 100,000.

The job possibilities for the foreseeable future are good. Communications intelligence will no doubt continue to absorb its quota, but there will be a substantial number of cryptanalysts required for coding and deciphering in diplomacy and commerce, plus the usual small number of specialists working on cryptanalysts of archeological remains. The Mayan language, for example, remains unsolved.

The most exciting possibilities of all may exist for those entrusted with deciphering messages from outer space, men who, like Ulysses

". . . follow knowledge, like a sinking star,
beyond the utmost bound of human thought . . ."

In the concluding chapter of his book, "The Code Breakers", David Kahn writes:

"Of all the problems challenging man in the modern realm of space and communication, perhaps the most intriguing is the one that lies at their junctures how to solve messages from other worlds. The detection of a communication from another planet in another solar system would be one of the greatest events in human history . . . and would profoundly affect human thought. At the same time, it would open unimaginable vistas of technical growth that might help man solve the problems of war, disease, hunger . . ."

It should be noted that scientific opinion has begun to swing away from the theory of scarcity of life in the universe towards one of its prevalence. The possibility of communicating with other life forms is no longer science fiction but respectable doctrine.

Two interstellar languages have already been developed with which to attempt communication with extra-terrestrial life forms, "Lincos" (an abbreviation for "lingua cosmica") by Dr. Hans Freudenthal, of Holland; and "Astraglossa" by Lancelot Hogben, of Britain. There is thus no shortage of evidence that the possibility of interstellar communication is being taken seriously.

Qualifications

A successful cryptanalyst will probably, but not necessarily, have a mathematical bent. What he must have is a clear-thinking, logical mind added to considerable tenacity of purpose. These qualities at their best were represented by the late Michael Ventris, a dedicated young amateur cryptanalyst who successfully deciphered the Linear-B tablets found on Knossos and Mycene.

THE PROFESSIONAL SCIENTIFIC LIAISON OFFICER

A job which ranks in importance with that of the PROFESSIONAL SCIENTIFIC POPULARIZER.

The P.S.L.O. will usually be employed as a generalist in the same field as the "Popularizer". Where, however, the Popularizer directs his aim outwards to the public and other scientific disciplines, the P.S.L.O. turns inwards to those in his own field. His job will be to familiarize himself with material in other specialist fields and bring to the attention of his specialized colleagues matters where, in his opinion, harmony, conflict or duplication exists. This would be the first step towards collaboration and rationalization of an otherwise splintered overall scientific effort.

PROFESSIONAL SCIENTIFIC POPULARIZER

Together with that of the PROFESSIONAL SCIENTIFIC LIAISON OFFICER, this is a job that, while numerically insignificant, may be of profound social importance.

In brief, its function will be to bridge the gaps torn by an age of increasing specialization. As knowledge advances, the fraction that a man can know must grow less. As a result, any specialist tends to get an unbalanced view of the world he lives in. He cannot, in other words, judge the consequences of the work in which he is engaged. Nor can he judge whether part of his work may have application in other equally specialized fields.

The PROFESSIONAL SCIENTIFIC POPULARIZER, or "PROP", will be a person sympathetic to the humanities but trained as a scientist in such a way that he can distinguish between the wood and the trees. He will "popularize" the specialist findings in his field so that they can be understood by specialists in other fields and preferably even by the educated layman. A kind of scientific ombudsman.

The Hit Parade of Probables, Possibles and Far Out Chances

(Reproduced with acknowledgement to HERMAN KAHN and ANTHONY J. WIENER of the HUDSON INSTITUTE from their book "THE YEAR 2000 — a Framework for Speculation on the Next Thirty-three years.")

The "Probables"

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, fibres, and plastics).
4. New or improved materials for equipment and appliances (plastics, glasses, alloys, ceramics, intermetallics, and cermets).
5. New airborne vehicles (ground-effect machines, VTOL and STOL, superhelicopters, 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 worldwide 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 esotric 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 CO_2 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).
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.
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 computers 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.
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.

The "Possibles"

Some Less Likely but Important Possibilities

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. Electric 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?) foetuses.
23. Production of a drug equivalent to Huxley's soma.
24. A technological equivalent of telepathy.
25. Some direct control of individual thought processes.

The "Far-Out Chance"

Ten Far-Out Possibilities

1. Life expectancy extended to substantially more than 150 years (immortality?).
2. Almost complete genetic 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.

*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.

So how can I prepare now
to meet the future . . ?

HERE IS A 4-POINT PERSONAL INITIATIVE PROGRAM:

(1) READ EVERYTHING THAT YOU CAN LAY YOUR HANDS ON ABOUT THOSE AREAS OF THE FUTURE THAT INTEREST YOU . . . Your librarian can be of great help: don't be afraid to ask for reading lists; compile your own bibliography that you can tackle in your own time;

(2) START YOUR OWN PERSONAL FILING SYSTEM and file any clippings, articles, ads, etc. under appropriate headings; you will be surprised how rapidly this can build up into a comprehensive survey;

(3) USE THE RESOURCES AND AGENCIES WITHIN YOUR COMMUNITY. Once you have nailed down the areas of interest, you can be specific in requesting material and services from a wide range of private and public resources: professional groups (engineers, architects . . .), libraries, Manpower, counsellors of all kinds, dedicated amateur societies (for example, WILLI LEY and WERNER VON BRAUN were active members of the German Rocket Society of the twenties and early thirties), and many others;

(4) USE YOUR COMMUNITY COLLEGE'S CONTINUING EDUCATION RESOURCES either by attending existing programs which deal with your area of interest; or, if none are available and you have reasonable grounds for believing that others share, or could be tempted to share, your interest, DISCUSS WITH THE COMMUNITY EDUCATION RESOURCES PEOPLE THE POSSIBILITY OF STARTING A SUITABLE PROGRAM. Don't wait for something to happen: help make it happen!

THAT WAY YOU TOO WILL BE SHAPING THE FUTURE . . . TODAY!

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(1) Creative Job Search
(2) The Effective Job Application
(3) Getting to See the Man and Selling Yourself at the Interview
(4) Creating Your Own Job
(5) Jobs: The Shape of Things to Come

Written and researched by GEOFF SPENCER
designed by MARTIN JACKSON, and printed
by BROADWAY PRINTERS LTD., Vancouver, B.C.

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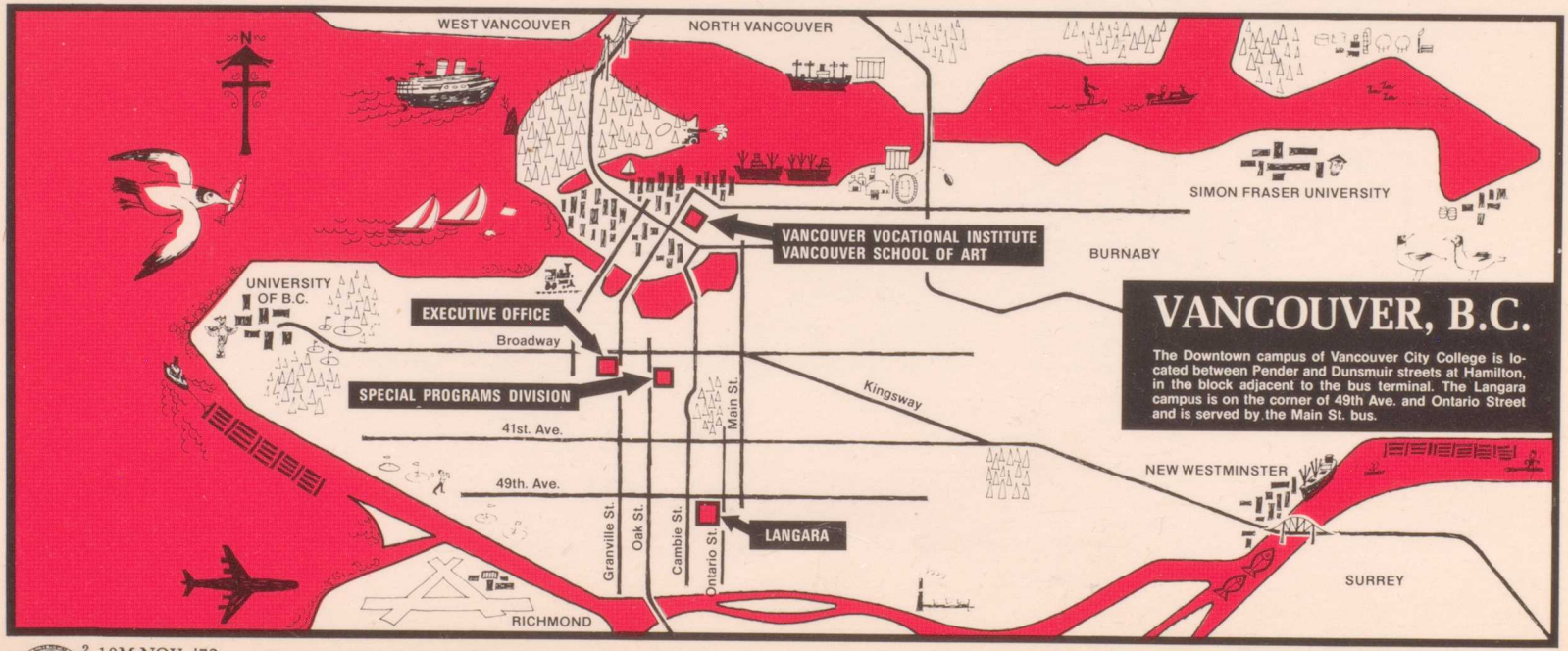

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