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ABSTRACT

The readings in this narrative unit are concerned with the machine's role today and its future use in shaping man's environment. The general teaching objectives are to enable the student: 1) to adapt to a society directed toward total living, rather than one in which he earns a living; 2) to understand that uncontrolled technological advance may result in alienation and a devaluation of the human world; 3) to see himself as the beneficiary, rather than the victim, of a new social environment brought about by automation and invention; and, 4) to trust in man's ability to choose the changes the machine brings. The selections for the unit have been organized under three main titles: 1) The Machine: Friend or Foe; 2) Automation: Life with a Black Box; and, 3) The Culture of Machine Living. The first two parts include the traditional "Ballad of John Henry," an exposition of automation, and selected science fiction stories of previous years. The third part includes essays which present two problems of living in our culture: increased leisure time, and the intrusions in our environment by mass communication and excessive mobility. Discussion questions to encourage inquiry, a resource guide, and a vocabulary list are included. SO 001 492 through SO 001 494 are related units. (Author/SBE)

TEACHER'S GUIDE TO ACCOMPANY

TECHNOLOGY: THE CULTURE OF MACHINE LIVING

Program in American History and civilization

Division of Secondary Social Studies

The Lincoln Filene Center for Citizenship and Public Affairs
Tufts University
Medford, Massachusetts 02155

I

General Teaching Objectives

1. To enable the student to adapt to a society directed toward "total living," rather than one in which he "earns a living"

2. To enable the student to understand that uncontrolled technological advance may result in alienation and a devaluation of the human world

3. To enable the student to see himself as the beneficiary, rather than the victim, of a new social environment brought about by automation and invention

4. To enable the student to understand the machine as man's creation

5. To enable the student to trust in man's ability to choose the changes the machine brings

II

Explanatory Notes on the Narratives for Students

Technology in American life is a theme which presents conflict between a vision of America as Eden and the reality of America as the chief beneficiary of the scientific revolution which brought the machine into "the garden." Some men, such as Jefferson, Mark Twain, Melville, and Thoreau, who reacted against the dominance of machines over the visible world, could not envision the machine as a mark of America's progress in the world.

The rapid development of technology resulted from the beginning in "alienation," self-estrangement, and the devaluation of the human world. The garden disappeared. In the factories, the drive shaft and the pulleys were no longer visible. Power was transmitted through wires and tubes, often hidden, and the whole was covered up and shielded so that the machine gave the appearance of being autonomous. The machine was self-contained. In the nineteenth century, the machine, the factory, and the city became identified as a single entity oppressing man.

The simple contrivances of two centuries ago--the spinning Jennies--were little more than tools used by one man to refine or increase the product of his labor. They did not alter the relationship between man and his environment that had held for many thousands of years.

The most revolutionary inventions are seldom perceived at the time as radical because of the human tendency to feel that the future will be simply a

larger and improved version of the immediate past. For example, the horseless carriage practically stole upon the world.

We are familiar now, however, with the profound changes brought about by machines since 1800. Movement, communication, farming, production, and warfare are all mechanized. We confront the world and act upon it, not directly, but by remote control. So statements about machines are, by implication, statements about the conditions of human life.

These stories and essays are not primarily concerned with presenting the history of scientific invention, although the American environment in the beginning offered a vast and free laboratory. This history machine is adequately presented in such books as Lord Ritchie-Calder's Evolution of the Machine, Lewis Mumford's Technics and Civilization and Dirk Struik's Yankee Science in the Making. Neither are these narratives an attempt to present a general attitude of distrust or condemnation of the machine. They are designed to underscore the point that discriminating use of the machine will contribute to man's preservation, an indiscriminate use to man's destruction. In the post-industrial age, as the technicians describe our future culture, the machine may alter man. The reading materials, therefore, are concerned with the machine's role in the garden today and its future use in shaping man's environment.

Many compilations have been made on the subject of man's future environment. The summer, 1967, issue of Daedalus presents findings in disciplines concerned

with life projections to the year 2001. Fortune Magazine and Saturday Review periodically devote issues to topics on technology. And indeed, continual reference is made in current publications to changing technology. The readings, then, can serve as only a small sampling of the numerous considerations of authorities in the field of technology today.

The selections for the unit have been organized under three main titles, "The Machine: Friend or Foe?"; "Automation: Life With A Black Box"; and "The Culture of Machine Living."

The first two parts, which include the traditional "Ballad of John Henry" an exposition of automation, and selected science fiction stories of previous years, should suggest the following:

1. The conflict and competitiveness which labor-saving machinery inspires in man
2. The romanticizing of brute force in the attempt to dignify labor over all considerations of "progress"
3. The technological know-how which allows man to imitate his own body and brain as the equivalent to mechanical man
4. The dependence man feels upon the machine, sometimes extended to decision making

The third part includes essays which present two problems of living in our culture: increased leisure time, brought about by the mechanization of routine skills; and the intrusions in our environment by mass communication and excessive mobility. The essays may suggest the following:

1. A decreasing sense of privacy in our lives
2. An increasing sense of tribal conformity
3. An increasing need for education
4. A changing perspective on TIME and SPACE

III

Teaching Strategies

A. Part I, The Machine: Friend or Foe?

1. Discussion questions to check basic understanding of the narratives:

a. "Ballad of John Henry"

1) How do John Henry's actions reflect his attitude toward labor? Toward the steam drill? Toward the railroads? Toward the mountain?

2) Does the theme of the ballad present the steam drill as man's enemy or as man's friend? Explain.

3) Why is it important that John Henry should beat the steam drill? Why is John Henry happy when the steam drill doesn't measure up to expectations?

4) What is the significance of John Henry's collapse after outperforming the steam drill?

5) What significance has the ballad as a protest song? In other words, what does the ballad say about man and machine in the 1880's?

b. "Tractoring Off"

1) Why are both the tractor and the driver referred to as "monsters"?

2) "The man sitting in the iron seat did not look like a man" What is the significance of this statement?

3) Why is the tractor a symbol of power? How are all machines symbols to their drivers?

4) Do you think that the attitudes about machines reflected in statements made by authors living in the nineteenth century are valid today? (Whitman and Thoreau for example)

c. "A Bad Day For Sales"

1) Is Robie a hero or a villain in this story? Explain.

2) Why doesn't Robie understand human suffering? What qualities, characteristics, or feelings does Robie lack?

3) Does Robie ever get tired of his work? Does he ever get frustrated with his work or the results of his work? Does he enjoy his work?

4) In what ways are Robie and the machine which caused the destruction in the city alike?

5) Why would the child feel that Robie didn't look like a robot? What should a robot's appearance be like?

6) From judging the "futuristic" details of the story, in what time do you think it was laid? Does the story describe the present?

7) Does Robie's environment leave you with a negative feeling? a positive feeling? Explain.

B. Part II, Automation: Life With A Black Box

1. Discussion questions to check basic understanding of the narratives:

   a. "An Extension of Man"

      1) Why must man create likenesses of himself or need charms or effigies in an advanced civilization?

      2) In what other ways can we describe the machine or mechanical devices as the "extension of man"?

      3) Is it important at this point to find a way in which to humanize the machine?

      4) What sets the computer apart and above all other kinds of machines or how is the computer an "advance" over the music-box mechanism?

      5) How dependent will man be on the computer? In terms of a world which requires "yes" and "no" answers, how does man remain master of the machine?

   b. "The Portable Phonograph"

      1) Note the choice of books and articles saved from the bombing. What choice would you have made?

      2) The record is referred to as "the sacred disk." Why does the author use this symbolism?

      3) Is there impending doom for the men gathered around the fire?

2. If an historical conflict between man and the machine is developed with this unit, ask students to select additional readings from the past, from the resource list. The play, R. U. R., although not American, may be useful to establish the technical use of the word robot, derived from "working with one's hands," as well as to pose certain questions concerning the survival of the human race.

3. It is suggested that the films listed in the resource section on automation be used in order to clarify some of the technical points made in the

narrative. These films may also serve to stimulate discussion on the philosophical problems of man's survival, the responses of the brain to problem solving, and the solutions to both mechanical and human failures.

4. With the use of artificial limbs and artificial organs, etc., the human body becomes increasingly likened to a machine or artificially controlled mechanism. Articles describing the mechanical nature of the human body are numerous: 1969 issues of Life, Popular Mechanics, Technology Review, and others. Students should be encouraged to think about the scientific (medical) attitudes concerning the human body. More recent articles, describing the heart transplants (the heart as a pump and the use of dacron and other synthetics) should be used. One classic description entitled "What is Man?" comes from R. Buckminster Fuller in his book, Nine Chains to the Moon, written in 1938. It may serve as a beginning for discussion:

A self-balancing, 28 jointed adapter-base biped; an electrochemical reduction plant, integral with segregated stowages of special energy extracts in storage batteries for subsequent actuation of thousands of hydraulic and pneumatic pumps with motors attached; 62,000 miles of capillaries.

Millions of warning signal, railroad and conveyor systems; crushers and cranes (of which the arms are magnificent 23 jointed affairs with self-surfacing and lubricating systems) and a universally distributed telephone system needing no service for 70 years, if well managed.

The whole extraordinary complex mechanism guided with exquisite precision from a turret in which are located telescopic and microscopic self-registering and recording range finders, a spectroscope, etc.; the turret control being closely allied with an airconditioning intake-and-exhaust, and a main fuel intake.

Within the few cubic inches housing the turret mechanisms, there is room also for two sound-wave and sound-direction-finder recording diaphragms, a filing and instant reference system, and an expertly devised analytical laboratory large enough not only to contain minute records of every last and continual event of up to 70 years' experience, or more, but to extend, by computation and abstract fabrication, this experience with relative accuracy into all corners of the observed universe.

"A man," indeed! Dismissed with the name, "Mr. Jones"!

C. Part III, The Culture of Machine Living

1. Discussion questions to check basic understanding of the narratives:

a. "Work: The Assembly Line Machine"

1) How does the worker feel about his assembly-line job? Is the fully mechanized assembly line an improvement over the one described by the worker?

2) If you were to describe the assembly line with the word monotonous, what is it that makes it so?

b. "Work: The Myth That Became a Monster"

1) Compare the concepts of work with the themes in the "Ballad of John Henry."

2) Do you agree or disagree with the statement that work is necessary for man to keep his self-respect? Explain.

3) How are you going to cope with the "work monster"?

c. "Cultural Standardization"

1) Do you agree with Professor Lerner that all life in these United States is standardized to the extent that he describes?

2) The current rash of student rebellions has been attributed to a revolt against "the establishment." Is this another way of saying that people are rebelling against standardization?

d. "Mobility or Telemobility"

1) Do you agree or disagree with the idea that the car and television are in competition with each other? If you had to live the rest of your life with only one, either the car or television, which one would you choose to keep? Why?

2) Can you think of other reasons why a man might prefer driving to work by himself rather than in a car pool?

e. "The Medium is the Message"

1) Do you feel that you are living in a global village and are part now of tribal man? Explain and illustrate from the experiences of your own environment.

2) Can you follow through on other examples of "hot" and "cool," according to Mr. McLuhan's definition, or is this theory all a put-on to stimulate discussion?

3) How do you assess the influence of TV on your life so far, especially in view of the estimate by technicians that you will spend a total of nine years of your whole life in looking at television?

2. Ask the students to create in detail a "Fun Lab" in which man can have a foretaste of all the pleasures of 1984. Since the Fun Lab is a foretaste, they will have to be particularly imaginative in being able to fulfill everyone's needs in music, the dance, sports, etc. The emphasis for the Fun Lab should involve the proper use of leisure time in pleasurable pursuits.

3. Ask the students to create their own "situations" in which they can also foresee certain valuable or not so valuable effects which technology will have in the future. The situations may involve a form of depersonalization, a separation of man and what he is producing, a collapse of time, or a minimum need for human skills in work. Or let them write their own short stories in which they try to prophesy what the year 2000 wil not be like. They may discover that trends are found in most prohecies and futuristic predictions.

4. Ask the students to find evidence which will back up the attitude of the scientists who make this kind of statement: "The human brain as a highly specialized organ may have reached its level of efficiency and is now declining and may lead to extinction."

5. The section entitled "The Culture of Machine Living" should involve the students in their own preparation for a life-style over the next 30 years. Any discussion of a life-style will involve certain trends noticeable in our culture. They are:

   a. An increasingly sensate, pragmatic, utilitarian, hedonistic culture

   b. increasing affluence and leisure

c. Population growth

d. Growth of megalopolises

e. An increased need for education

f. Increased capacity for mass destruction

As culminating activity and as time may allow, the students in a given class could prepare for the school paper a survey in which they present the attitudes or future life-style wishes (promises) of the students and faculty for the next 30 years. It is important in making such a survey to discover, among other things, what kind of people will be using all the marvels of technology at the end of another 30 years.

The following considerations for future life-styles may be useful in the preparation of survey questions:

a. Genetic manipulation and the ability to control the formation of new beings, or "human prescriptions to develop desired types of man"

b. Practical nuclear power to provide the future energy needs of the world

c. Laser technology and its probable use with instant interplanetary television

d. Increased life span

e. Extrasensory perception (brain waves) and sending and receiving messages (signals) through distances

f. Communication with life existing on other planets

g. Human robots that will assume everyday chores

h. Man-machine symbiosis; that is, humanizing machines and mechanizing humans and direct man-machine communication

i. Time-travel and space-travel theories wherein space-travel time stands still for man's lifetime while thousands of years pass on earth

j. Synthetic foods

k. Computerized medicine

l. Regeneration of body parts that have been damaged or removed

6. The narratives and stories suggest cetain human propensities and feelings with which the machine cannot be endowed, such as seeking companionship, feeling loneliness, escaping danger, and so forth. Using the following guide, ask the students to think about how the culture of machine living might modify human activities. Could the machine also modify human propensities? Discuss

PROPENSITY	ACTIVITIES IT COULD MOTIVATE
Seeking Companionship	
Wanting to be with people, especially those one feels at ease with	Going where the crowds are Wanting congenial fellow workers "Lonesome pay" for isolated jobs Marriage and home life Telephone talks with friends Teenage gangs, adult clubs
Protectiveness	
Wanting to protect one's children, the helpless	Coddling children, pampering pets Aiding the sick, poor, charities Providing opportunities for children Do-gooding for neighbors
Seeking Information	
Wanting to explore and satisfy one's curiosity	Finding out how things work Wanting to know what is going on Visiting new places Watching construction work Reading magazines, newspapers, gossip columns Higher education

Escaping Danger

Wanting to be secure	Taking vitamin pills Buying insurance of various sorts Seeking job security Locking the house Avoiding crowded traffic Working to prevent wars Wanting better police

Seeking Self-Assertion

Wanting to be master of one's own fate and to stand out among people	Being one's own boss Striving to come up in the world Inclination to argue Trying to look attractive Seeking acquaintance of the famous Rivalry for promotions Daringness and high spending, showing off Browbeating wife, employees, others

Seeking Comfort

Wanting creature comforts and sensory pleasures	Music at work, tasty foods, air conditioning, automobiles

7. Marshall McLuhan has stated:

'Drug taking is a means of expressing rejection of the obsolescent mechanical world and values. And drugs often stimulate a fresh interest in artistic expression, which is primarily of the audile-tactile world. The hallucinogenic drugs, as chemical simulations of our electric environment, thus revive senses long atrophied by the overwhelmingly visual orientation of the mechanical culture. LSD and related hallucinogenic drugs, furthermore, breed a highly tribal and communally oriented subculture, so it's understandable why the retribalized young take to drugs.

Ask the students to comment on some aspects of their "electric" environment. In what respects do they represent or not represent "the retribalized young"?

8. To initiate a discussion of the students' "work ethic," or in other terms, the students' preoccupation with "doing his thing," ask them to choose one of the following judgments:

> Given a man wallpapering a room. A box of chocolates sits on a table, next to the brush, roller, etc. At what point should he permit himself to eat his first chocolate?
>
> a. He should not touch a single chocolate until he has not only completed his job but cleaned up afterwards. The judgment: A man must earn his chocolates.
>
> b. He may eat one, or two, or any number after he has finished half the job. The judgment: A man must deserve his chocolates.
>
> c. He may eat chocolates from the very beginning, secure in the knowledge that he is going to earn and deserve them. The judgment: His intentions are good and, therefore, he is entitled to his chocolates.
>
> d. He should refuse, as a point of pride, to make any connection between work and reward. He should eat as many chocolates as he wants, immediately. The judgment: The man has a good appetite.

IV

Vocabulary

The words below appear frequently in works on technology, and many of them occur in the narratives:

acoustic

analog

apologia

automaton

computer, computations

cybernation, cybernetics

digital computer

electronic computer

feedback

input

microfiche

microminiaturization

output

phosphors

prototype

readout

reference silhouettes

ricochetted

scanned, to scan

simulation, to simulate

solid state

V

Resources

1. Films

   a. "The Living Machine" (1961), in two parts, takes the viewer into an IBM experimental office where a checkers game is being played between a computer and a checkers champion. Other parts include an explanation of how the computer operates and how it can be used for weather forecasting. A scientist discusses the possibilities of the machine's taking over the human world. A small intoduction to the beginnings of science fiction is made, also. The second part begins with a probe into the complexities of the human mind which contributed to the technology in putting up the first astronaut. Available through Sterling Educational Films. 29 minutes for part 1 and 30 minutes for part 2

   b. "Automation - The Next Revolution"(1965) deals with the problems of unemployment brought about by increased technology and mechanization. Union leaders discuss the need for a shorter workday and more leisure time. Secretary of Labor Wirtz mentions the problems of social dislocation when Whites and Blacks both apply for jobs, etc. Available from McGraw-Hill Textfilms. 28 minutes

   c. "Computers And Human Behavior - Computers and Human Mental Process" (1963) (from the Focus on Behavior Series, Prod. NET) deals with various experiments with depth perception which are then applied to the working of the computer in its "yes" and "no" responses. Available from Indiana University, Audio-Visual Center. 29 minutes

   d. "The Control Revolution" (1962) (from The Computer and the Mind of Man Series, Prod. NET) emphasizes industrial dynamics and the use of the computer to solve production problems as well as for keeping records. Many cechnical explanations are handled by the use of diagram and animated cartoon. Available from Indiana University, Audio Visual Center. 30 minutes

   e. "Of Men and Machines - Engineering Psychology" (1963) (from the Focus on Behavior Series, Prod. NET) deals with the social purpose of technology and the engineering psychology involved in correcting human

errors made with machinery. Examples are taken from the problems of air traffic control. Available from Indiana University, Audio Visual Center. 29 minutes

f. "Engine At The Door" (1962) (from the Computer and the Mind of Man Series, Prod. NET) deals with the kinds of increased responsibility which technology has brought about. The film is more a discussion of problems than an illustration of them. Available from Indiana University, Audio Visual Center. 29 minutes

g. "America And The Americans" (1967), in two parts, is an evaluation of some of the problems facing the nation, including issues of air pollution and population. It is narrated by Henry Fonda. Available from McGraw-Hill Textfilms. 51 minutes

h. "This Is Marshall McLuhan: The Medium Is The Message" (1967) (NBC-TV) in two parts includes an interview with Marshall McLuhan on his views of the television media. Available from McGraw-Hill Textfilms. 54 minutes

i. Other films in the series Focus on the Human Mind are "Logic by Machine," "Universal Machine," and "Machine by Numbers" (1962). Available from Indiana University, Audio Visual Center. 29 minutes each

j. Films involving the automation of plant and assembly lines are available from several companies: IBM, Hershey, Eastman Kodak, General Motors, or Ford Motor Car Company.

k. Recommended feature film for futuristic discussion: Stanley Kubrick's "2001: Space Odyssey."

2. Recommended Related Reading

a. Play

Capek, Karel, R.U.R. (Rossum's Universal Robots), in Arthur O. Lewis, Jr., Of Men and Machines. New York: E.P. Dutton & Company, Inc., 1963

b. Books

Hersey, John, Hiroshima. New York: Bantam Books, 1967

Huxley, Aldous, Brave New World Revisited. New York: Harper & Brothers, 1958

de Kruif, Paul, The Microbe Hunters. New York: Harcourt, Brace & Company, 1926

Orwell, George, 1984. New York: Signet Books, 1950

Shelley, Mary, Frankenstein. New York: E. P. Dutton & Company, Inc., 1951

Silverberg, Robert (ed.), Men and Machines. New York: Meredith Press, 1968

Vonnegut, Kurt, Jr., Player Piano. New York: Charles Scribner's Sons, 1952

c. Selected Short Stories

Asimov, Isaac, "Robbie" (1950)

Bennett, Margot, "The Long Way Back" (1954)

Clark, Van Tilburg, Walter, "The Portable Phonograph" (1942) is included in Arthur O. Lewis, Jr., Of Men and Machines, op. cit.

d. Selected Poetry with Machine Theme

Auden, W. H., "The Unknown Citizen" (1940)

Benet, Stephen, Vincent, "Nightmare Number Three" (1935) is also included in Lewis, Of Men and Machines, op cit.

Cummings, E. E., "pity this busy monster, manunkind" (1954

Dickinson, Emily, "I Like to See It Lap The Miles" (1862)

Sandburg, Carl, "Prayers of Steel" (1918)

3. Record on "The Golden Age of Radio" to stimulate discussion on comparative environments in the forms of radio communication and television

VI

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B. The following references may be valuable for further study on related areas of technology:

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_____, Eden Was No Garden, New York: Holt, Rinehart & Winston, Inc., 1967

de Grazia, Sebastian, Of Time, Work and Leisure. New York: Doubleday & Company, Inc., 1964

Diebold, John, Beyond Automation. New York: McGraw-Hill Book Company, Inc., 1964

Drucker, Peter F., The Age of Discontinuity. New York: Harper & Row, Publishers, 1969

Fromm, Erich, The Revolution of Hope: Toward a Humanized Technology. New York: Harper & Row, Publishers, 1968

Helmer, Olaf, and Gordon, Ted, Social Technology. New York: Basic Books, 1967

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Potter, David M., People of Plenty. Chicago Illinois: Phoenix Books, 1958

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TECHNOLOGY: THE CULTURE OF MACHINE LIVING

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THE MACHINE: FRIEND OR FOE?

"I believe the narrowest hinge in my hand
puts to scorn all machinery."

--Walt Whitman, Leaves of Grass

"I would rather sit on a pumpkin and have
it all to myself than to be crowded on a
velvet cushion. I would rather ride on
earth in an ox cart, than go to heaven in
the fancy car of an excursion train. But
lo! Men have become the tools of their
tools."

--Henry David Thoreau, Walden

Ballad of John Henry

John Henry was a little baby, uh-huh,
Sittin' on his mama's knee, oh, yeah,
Said: "The Big Bend Tunnel on the C. & O. road,
Gonna cause the death of me,
Lord, Lord, gonna cause the death of me."

John Henry told his captain
That a man was a natural man,
And before he'd let that steam drill run him down,
He'd fall dead with a hammer in his hand,
He'd fall dead with a hammer in his hand.

Captain says to John Henry,
"Gonna bring me a steam drill 'round,
Gonna take that steam drill out on the job,
Gonna whop that steel on down,
Lord, Lord, gonna whop that steel on down."

John Henry told his captain,
Lightenin' was in his eye:
"Captain, bet your last red cent on me,
For I'll beat it to the bottom or I'll die,
Lord, Lord, I'll beat it to the bottom or I'll die."

Sun shine hot and burnin',
Weren't no breeze at all,
Sweat ran down like water down a hill,
That day John Henry let his hammer fall,
Lord, Lord, that day John Henry let his hammer fall.

John Henry went to the tunnel,
And they put him in the lead to drive,
The rock so tall and John Henry so small,
That he laid down his hammer and he cried,
Lord, Lord, that he laid down his hammer and he cried.

John Henry started on the right hand,
The steam drill started on the left,
"Before I'd let this steam drill beat me down,

I'll hammer my fool self to death,
Lord, Lord, I'd hammer my fool self to death."

White man told John Henry,
"Nigger, damn your soul,
You might beat this steam and drill of mine,
When the rocks in this mountain turn to gold,
Lord, Lord, when the rocks in this mountain turn to gold."

John Henry said to his shaker, *
"Nigger, ** why, don't you sing?
I'm throwin' twelve pounds from my hips on down,
Just listen to the cold steel ring,
Lord, Lord, just listen to the cold steel ring."

Oh, the captain said to John Henry,
"I believe this mountain's sinkin' in."
John Henry said to the captain, oh my!
"Ain't nothin' but my hammer drivin' wind,
Lord, Lord, ain't nothin' but my hammer drivin' wind."

John Henry told his shaker,
"Shaker, you better pray,
For, if I miss this six-foot steel,
Tomorrow'll be your burying day,
Lord, Lord, tomorrow'll be your burying day."

John Henry told his captain,
"Looka yonder what I see--
Your drill's done broke and your hole's done choke,
And you can't drive steel like me,
Lord, Lord, and you can't drive steel like me."

The man that invented the steam drill,
Thought he was mighty fine.
John Henry drive his fifteen feet,
And the steam drill only made nine,
Lord, Lord, and the steam drill only made nine.

---

*Shaker, a dredging machine, hammer
**In this version of the ballad, John Henry is addressing himself.

The hammer that John Henry swung,
It weighed over nine pound;
He broke a rib in his left-hand side,
And his entrails fell on the ground,
Lord, Lord, and his entrails fell on the ground.

John Henry was hammerin' on the mountain,
And his hammer was strikin' fire,
He drove so hard till he broke his pore heart,
And he laid down his hammer and he died,
Lord, Lord, he laid down his hammer and he died.

They took John Henry to the graveyard,
And they buried him in the sand,
And every locomotive came roarin' by,
Said, "There lays a steel-drivin' man,
Lord, Lord, there lays a steel-drivin' man."

"Tractoring Off"*

The tractors came over the roads and into the fields, great crawlers moving like insects, having the incredible strength of insects. They crawled over the ground, laying the track and rolling on it and picking it up. Diesel tractors, puttering while they stood idle; they thundered when they moved, and then settled down to a droning roar. Snub-nosed monsters, raising the dust and sticking their snouts into it, straight down the country, across the country, through fences, through dooryards, in and out of gullies in straight lines. They did not run on the ground, but on their own roadbeds. They ignored hills and gulches, water courses, fences, houses.

The man sitting in the iron seat did not look like a man; gloved, goggled, rubber dust mask over nose and mouth, he was part of the monster, a robot in the seat. The thunder of the cylinders sounded through the country, became one with the air and the earth, so that earth and air muttered in sympathetic vibration. The driver could not control it--straight across country it went, cutting through a dozen farms and straight back. A twitch at the controls could swerve the cat', but the driver's hands could not twitch because the monster that built the tractor, the monster that sent the tractor out, had somehow got into the driver's hands, into his brain and muscle, had goggled him and muzzled him--goggled his mind, muzzled his speech, goggled his perception, muzzled his protest. He could not see the land as it was, he could not smell the land as it smelled; his feet did not stamp the clods or feel the warmth and power of the earth. He sat in an iron seat and stepped on iron pedals. He did not know or own the land. If a seed dropped did not germinate, it was nothing.

He loved the land no more than the bank loved the land. He could admire the tractor--its machined surfaces, its surge of power, the roar of its detonating cylinders; but it was not his tractor. Behind the tractor rolled the shining disks, cutting the earth with blades--not plowing but surgery, pushing the cut earth to the right where the second row of disks cut it and pushed it to the left; slicing blades shining, polished by the cut earth. The driver sat in his iron seat and he was proud of the straight lines he did not will, proud of the tractor he did not own or love, proud of the power he could not control. And when that crop grew, and was harvested, no man had crumbled a hot clod in his fingers. No man had touched the seed. Men ate what they had not raised, had no connection with the bread.

"A Bad Day For Sales"*

The big bright doors of the office building parted with a pneumatic whoosh and Robie glided into Times Square. The crowd that had been watching the fifty-foot-tall girl on the clothing billboard get dressed, or reading the latest news about the Hot Truce scrawl itself in yard-high script, hurried to look.

Robie was still a novelty. Robie was fun. For a little while yet, he could steal the show. But the attention did not make Robie proud. He had no more emotions than the pink plastic giantess, who dressed and undressed endlessly whether there was a crowd or the street was empty, and who never once blinked her blue mechanical eyes. But she merely drew business, while Robie went out after it.

For Robie was the logical conclusion of the development of vending machines. All the earlier ones stood in one place, on a floor or hanging on a wall, and blankly delivered merchandise in return for coins, whereas Robie searched for customers. He was the demonstration model of a line of sales robots to be manufactured by Shuler Vending Machines, provided the public invested enough in stocks to give the company capital to go into mass production.

The publicity Robie drew stimulated investments handsomely. It was amusing to see the TV and newspaper coverage of Robie selling, but not a fraction as much fun as being approached personally by him. Those who usually bought, bought anywhere from one to five hundred shares, if they had any money and foresight enough to see that sales robots would eventually be on every street and highway in the country.

Robie radared the crowd, found that it surrounded him solidly, and stopped. With a carefully built-in sense of timing, he waited for the tension and expectation to mount before he began talking.

"Say, Ma, he doesn't look like a robot at all," a child said. "He looks like a turtle."

Which was not completely accurate. The lower part of Robie's body was a metal hemisphere hemmed with a sponge rubber and not quite touching the sidewalk. The upper was a metal box with black holes in it. The box could swivel and duck. A chromium-bright hoopskirt with a turret on top.

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*A short story by Fritz Leiber ©1952. Reprinted by permission of Robert P. Mills, Ltd., literary agent for Fritz Leiber.

"Reminds me too much of the Little Joe Paratanks," a legless veteran of the Persian War muttered, and rapidly rolled himself away on wheels rather like Robie's.

His departure made it easier for some of those who knew about Robie to open a path in the crowd. Robie headed straight for the gap. The crowd whooped.

Robie glided very slowly down the path, deftly jogging aside whenever he got too close to ankles in skylon or sockassins. The rubber buffer on his hoop-skirt was merely an added safeguard.

The boy who had called Robie a turtle jumped in the middle of the path and stood his ground, grinning foxily.

Robie stopped two feet short of him. The turret ducked. The crowd got quiet.

"Hello, youngster," Robie said in a voice that was smooth as that of a TV star, and was, in fact, a recording of one.

The boy stopped smiling. "Hello," he whispered.

"How old are you?" Robie asked.

"Nine. No, eight."

"That's nice," Robie observed. A metal arm shot down from his neck, stopped just short of the boy.

The boy jerked back.

"For you," Robie said.

The boy gingerly took the red polly-lop from the neatly fashioned blunt metal claws, and began to unwrap it.

"Nothing to say?" asked Robie.

"Uh--thank you."

After a suitable pause, Robie continued, "And how about a nice refreshing drink of Poppy Pop to go with your polly-lop?" The boy lifted his eyes, but didn't stop licking the candy. Robie waggled his claws slightly. "Just give me a quarter and within five seconds--"

A little girl wriggled out of the forest of legs. "Give me a polly-lop, too, Robie," she demanded.

"Rita, come back here!" a woman in the third rank of the crowd called angrily.

Robie scanned the newcomer gravely. His reference silhouettes were not good enough to let him distinguish the sex of children, so he merely repeated, "Hello, youngster."

"Rita!"

"Give me a polly-lop!"

Disregarding both remarks, for a good salesman is singleminded and does not waste bait, Robie said winningly, "I'll bet you read Junior Space Killers. Now I have here--"

"Uh-uh, I'm a girl. He got a polly-lop."

At the word "girl," Robie broke off. Rather ponderously, he said, "I'll bet you read Gee-Gee Jones, Space Stripper. Now I have here the latest issue of the thrilling comic, not yet in the stationary vending machines. Just give me fifty cents and within five--"

"Please let me through. I'm her mother."

A young woman in the front rank drawled over her powder-sprayed shoulder, "I'll get her for you," and slithered out on six-inch platform shoes. "Run away, children," she said nonchalantly. Lifting her arms behind her head, she pirouetted slowly before Robie to show how much she did for her bolero half-jacket and her form-fitting slacks that melted into skylon just above the knees. The little girl glared at her. She ended the pirouette in profile.

At this age-level, Robie's reference silhouettes permitted him to distinguish sex, though with occasional amusing and embarrassing miscalls. He whistled admiringly. The crowd cheered.

Someone remarked critically to a friend, "It would go over better if he was built more like a real robot. You know, like a man."

The friend shook his head. "This way it's subtler."

No one in the crowd was watching the newscript overhead as it scribbled, "Ice Pack for Hot Truce? Vanadin hints Russ may yield on Pakistan."

Robie was saying, " ...in the savage new glamor-tint we have christened Mars Blood, complete with spray applicator and fit-all fingerstalls that mask each finger completely except for the nail. Just give me five dollars--uncrumbled bills may be fed into the revolving rollers you see beside my arm--and within five seconds -"

"No, thanks, Robie," the young woman yawned.

"Remember, " Robie persisted, "for three more weeks, seductivizing Mars Blood will be unobtainable from any other robot or human vendor."

"No,thanks."

Robie scanned the crowd resourcefully. "Is there any gentleman here..." he began just as a woman elbowed her way through the front rank.

"I told you to come back!" she snapped at the little girl.

"But I didn't get my polly-lop!"

"... who would care to..."

"Rita!"

"Robie cheated. Ow!"

Meanwhile, the young woman in the half-bolero had scanned the nearby gentlemen on her own. Deciding that there was less than a fifty percent chance of any of them accepting the proposition Robie seemed about to make, she took advantage of the scuffle to slither gracefully back into the ranks. Once again the path was clear before Robie.

He paused, however, for a brief recapitulation of the more magical properties of Mars Blood, including a telling phrase about "the passionate claws of a Martian sunrise."

But no one bought. It wasn't quite time. Soon enough silver coins would be clinking, bills going through the rollers faster than laundry, and five hundred people struggling for the privilege of having their money taken away from them by America's first mobile robot.

But there were still some tricks that Robie had to do free, and one certainly should enjoy those before starting the more expensive fun.

So Robie moved on until he reached the curb. The variation in level was instantly sensed by his under-scanners. He stopped. His head began to swivel. The crowd watched in eager silence. This was Robie's best trick.

Robie's head stopped swiveling. His scanners had found the traffic light. It was green. Robie edged forward. But then the light turned red. Robie stopped again, still on the curb. The crowd softly ahhed its delight.

It was wonderful to be alive and watching Robie on such an exciting day. Alive and amused in the fresh, weather-controlled air between the line of bright skyscrapers with their winking windows and under a sky so blue you could almost call it dark.

(But 'way, way up, where the crowd could not see, the sky was darker still. Purple-dark, with stars showing. And in that purple-dark, a silver green something, the color of a bud, plunged down at better than three miles a second. The silver-green was a newly developed paint that foiled radar.)

Robie was saying, "While we wait for the light, there's time for you youngsters to enjoy a nice refreshing Poppy Pop. Or for you adults--only those over five feet tall are eligible to buy--to enjoy an exciting Poppy Pop fizz. Just give me a quarter or--in the case of adults, one dollar and a quarter; I'm licensed to dispense intoxicating liquors--and within five seconds..."

But that was not cutting it quite fine enough. Just three seconds later, the silver-green bud bloomed above Manhattan into a globular orange flower. The skyscrapers grew brighter and brighter still, the brightness of the inside of the sun. The windows winked blossoming white fire-flowers.

The crowd around Robie bloomed, too. Their clothes puffed into petals of flame. Their heads of hair were torches.

The orange flower grew, stem and blossom. The blast came. The winking windows shattered tier by tier, became black holes. The walls bent, rocked, cracked. A stony dandruff flaked from their cornices. The flaming flowers on the sidewalk were all leveled at once. Robie was shoved ten feet. His metal hoopskirt dimpled, regained its shape.

The blast ended. The orange flower, grown vast, vanished overhead on its huge magic beanstalk. It grew dark and very still. The cornice-dandruff

pattered down. A few small fragments rebounded from the metal hoopskirt.

Robie made some small, uncertain movements, as if feeling for broken bones. He was hunting for the traffic light, but it no longer shone either red or green.

He slowly scanned a full circle. There was nothing anywhere to interest his reference silhouettes. Yet whenever he tried to move, his under-scanners warned him of low obstructions. It was very puzzling.

The silence was disturbed by moans and a crackling sound, as faint at first as the scampering of distant rats.

A seared man, his charred clothes fuming where the blast had blown out the fire, rose from the curb. Robie scanned him.

"Good day, sir," Robie said. "Would you care for a smoke? A truly cool smoke? Now I have here a yet-unmarketed brand..."

But the customer had run away, screaming, and Robie never ran after customers, though he could follow them at a medium brisk roll. He worked his way along the curb where the man had sprawled, carefully keeping his distance from the low obstructions, some of which writhed now and then, forcing him to jog. Shortly he reached a fire hydrant. He scanned it. His electronic vision, though it still worked, had been somewhat blurred by the blast.

"Hello, youngster," Robie said. Then after a long pause, "Cat got your tongue? Well, I have a little present for you. A nice lovely polly-lop.

"Take it, youngster," he said after another pause. "It's for you. Don't be afraid."

His attention was directed by other customers, who began to rise up oddly here and there, twisting forms that confused his reference silhouettes and would not stay to be scanned properly. One cried, "Water," but no quarter clinked in Robie's claws when he caught the word and suggested, "How about a nice refreshing drink of Poppy Pop?"

The rat-crackling of the flames had become a jungle muttering. The blind windows began to wink fire again.

A little girl marched, stepping neatly over arms and legs she did not look at. A white dress and the once taller bodies around her had shielded her from

the brilliance and the blast. Her eyes were fixed on Robie. In them was the same imperious confidence, though none of the delight, with which she had watched him earlier.

"Help me, Robie," she said. "I want my mother."

"Hello, youngster," Robie said. "What would you like? Comics? Candy?"

"Where is she, Robie? Take me to her."

"Balloons? Would you like to watch me blow up a balloon?"

The little girl began to cry. The sound triggered off another of Robie's novelty circuits, a service feature that had brought in a lot of favorable publicity.

"Is something wrong?" he asked. "Are you in trouble? Are you lost?"

"Yes, Robie. Take me to my mother."

"Stay right here," Robie said reassuringly, "and don't be frightened. I will call a policeman." He whistled shrilly, twice.

Time passed. Robie whistled again. The windows flared and roared. The little girl begged. "Take me away, Robie," and jumped onto a little step in his hoopskirt.

"Give me a dime," Robie said.

The little girl found one in her pocket and put it in his claws.

"Your weight," Robie said, "is fifty-four and one-half pounds."

"Have you seen my daughter, have you seen her?" a woman was crying somewhere. "I left her watching that thing while I stepped inside--Rita!"

"Robie helped me," the little girl began babbling to her. "I knew I was lost. He even called the police, but they didn't come. He weighed me, too. Didn't you, Robie?"

But Robie had gone off to peddle Poppy Pop to the members of a rescue squad which had just come around the corner, more robotlike in their asbestos suits than he in his metal skin.

Automation: Life With A Black Box

"I don't know enough," replied the Scarecrow cheerfully. "My head is stuffed with straw, you know, and that is why I am going to Oz to ask him for some brains."

"Oh, I see," said the Tin Woodman. "But, after all, brains are not the best things in the world."

"Have you any?" inquired the Scarecrow. "No, my head is quite empty," answered the Woodman, "but once I had brains, and a heart also; so, having tried them both, I should much rather have a heart."

--L. Frank Baum, The Wizard of Oz

"An Extension of Man"*

It may be only because we are so lonely--so awfully lonely. We scan the sky with radar and radio telescope; we probe the planets with rocket-borne instruments that simulate men. We listen and we hope. And no voice answers.

In despair, we make effigies of ourselves: something that simulates life and can share with us the extraordinary experience of being alive.

The idea of producing a simulation of a living organism has always intrigued civilizations. In old Jewish legend we have the Golem, an automaton-like servant made of clay and given life by means of a charm. In the time of Newton, the automaton becomes a music box with mechanical figures on its top. In the nineteenth century, the automaton was a glorified heat engine burning some combustible fuel instead of the glycogen of the human muscles. The present automaton opens doors by means of photocells. Today the effigies with which we play are the little darts of light that dance across the plexiglass screen, deep in a mountain in Colorado Springs, where the North American Air Defense Command scans the world for signs of mechanical monsters on the move.

The genie in the magic bottle of our times, whom we summon forth to do our "thinking" by a mere push of the button, differs from all the other effigies in our history in one important respect: we know why it works. All the other dolls of our past and present were shaped from such materials as were at hand,

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*From "The Dynamics of Change," Kaiser Aluminum and Chemical Corporation,

and if they happened to be put together right, they worked. Not so with today's computers: their construction and their use is built on information theory, on mathematics, on logic. We can construct as many automatons as we want or that technology allows.

"Let us consider the activity of the little figures which dance on top of a music box," suggests Norbert Wiener, the foremost spokesman for the cybernetic world.

They move in accordance with a pattern, but it is a pattern which is set in advance, and in which the past activity of the figures has practically nothing to do with the pattern of their future activities. There is a message, indeed, but it goes from the machinery of the music box to the figures, and stops there. The figures themselves have no trace of communication with the outer world, except this one-way stage of communication with the pre-established mechanism of the music box. They are blind, deaf, and dumb, and cannot vary their activity in the least from the conventional pattern.

And this is a perfect description of what is meant by mechanization--a robot world that repeats its past mindlessly into the future. Recently a new dimension has been added--machines that are capable of learning from their past and thus can create new patterns of response in their futures. CYBERNATION is not the mere extension of mechanization and automation; it is a new way of thinking about ourselves and about machines. Cybernation is then the complete adaptation of computer-like equipment to industrial, economic, and social activity. It represents an extension of man.

When a person works or engages in any of the activities of living, he uses the marvelous mechanism which is his body and brain in three specific ways. The first is the exercise of physical strength and manual dexterity, called skill. The second is the functioning of the five perceptive senses and the personal control that is exercised therefrom. The third is the use of the brain, both in its decision-making capacity and in the information storage system we call memory.

The new industrial technology being called automation is an extension and, in many ways, a replacement of these three human performances: (1) highly engineered mechanization extends and replaces physical dexterity and strength; (2) instrumentation and automatic control extend and replace the perceptive senses and personal control; (3) the electronic computer replaces the simple repetitive decision-making functions of the brain and has a memory. It is these three processes together which constitute automation.

Here we have spoken of automation and cybernation as the non-biological replacement of human nerves and brains in the affairs of men. We are not dolls, nor do we dance atop a music box. And our computers don't either. They are a new race that shares this planet with us--for good or for ill.

You may not think of it that way, but the device you are wearing on your wrist is a combination digital computer and analog computer. It counts each catch and release of the teeth on the escapement gear, and translates the number of counts in a circular motion between gear and gear, until, in the end, the hands

of the watch stand at an angle that represents how many clicks have occurred since the machine began to operate.

The angle of the hands is an analog "readout" and the "input" is a digital click, click. We put such store by this little device that we run our personal, social, and business lives by it.

There are many analog devices in our machine world. The pilot who flies your jet liner does so by watching an array of analog readouts; they transform discrete numbers (gallons of fuel in the tanks, pressure per square inch in the hydraulic system, number of feet above sea level as units of barometric pressure) into continuous measurements (the angle of hands on a dial).

In an analog machine, each number is represented by a suitable physical quantity, whose value, measured in some pre-assigned unit, is equal to the number in question. This quantity may be the angle by which a certain disk has rotated, or the strength of a current, or the amount of a certain voltage.

An easy way to distinguish between analog and digital processes is this. The analog machines represent number by some analogous quantity, such as length or size. A child might learn to add assembling blocks of various sizes; a block of a given size would be the analog of 1; a block twice the size would be the analog of two and so on. To put it briefly, an analog device measures, while a digital computer counts.

Now, analog devices are important to our general idea, which is that we can and do build machines that simulate, if not duplicate, human reasoning

processes. One of these processes is analogous. It is characteristic of analog processes that they are only approximate; they indicate high probability but not exact accuracy. They say, "it's about like this." A fairly familiar analog device is the slide rule, which can give approximate answers to numerical questions that are accurate within two to four decimal places. It translates numbers into positions. For greater accuracy, we go to the desk digital calculator.

The next time you turn your head to watch a pretty girl go by, you have transformed certain digital inputs into an analog that is expressed by turning your head. We can design machines to do the same, but, one assumes, the experience would be different for the machine.

Imagine, if you will, that there is an infinite telegraph office. At the base of its service, you are allowed to send one or two messages--"YES" or "NO." The probability that you will send either "yes" or "no" is equal. In sending either one, you assume a high degree of risk. If either fails to get through, there is no statistical pattern from which the receiver can reconstruct what you sent.

The physical world appears to be a "yes" or "no" universe; it can only be reconstructed through a large sampling of yes's and no's. Our experience of it thus becomes a simple process of addition.

Let us imagine that at the same telegraph office you also can send 26 messages, but only one at a time. Now the chances that you will send any particular one, at a particular time, are 1 in 26; in short, the English alphabet. The probabilities that a particular message will follow another message can be computed

statistically, if you are sending in the English language, and if you want the receiver to be able to understand what you have said.

A message, then, is a structure made up of a sequence of yes-or-no choices. It can be the dot-dash of the telegraph key; the on-off of a light globe; the puff-no puff of an Indian smoke signal; the hole-no hole in a punch card; the turn black-don't turn black of a molecule in a photographic film emulsion. It most particularly, for our purposes, can be the "pass" or "don't pass" of an impulse moving along a mechanical system.

What is important here as regards "mechanical brains" is that they can reduce the infinite telegraph office to a whistle-stop "yes" or "no" office. But with this difference--computers can make "yes" or "no" choices so rapidly, in billionths of a second, that they can build a high statistical probability into low probability sequences.

Man can do this, too, but he would have to spend a million years in a telegraph office.

In the language of these machines, there are only two statements, "yes" and "no," and in their arithmetic only two numbers, 1 and 0. They surpass human capacity in their great speed of action and in their ability to perform many interdependent computations at the same time.

For example, the player piano roll was the direct descendant of the escapement wheel on a clock. Both are "go" and "no-go" systems. The teeth on the clock wheel said "hold me on" or "let me go." The player piano roll said to

the wind that fingered its face, "Pass" or "Don't Pass." And the compressed air that moved searchingly over the surface of the roll would find an opening, flow through that, and activate a diaphragm for a hammer, which would strike a note on the strings. The punch card is the descendant of the player piano. It said, "Charge" or "No charge" to the electrical brushes that passed across its otherwise impassive face. Thus it is with all digital systems--the electronic computer, the desk calculator, and most impressively, photographic film, where each molecule in the film emulsion can say, "Black" or "No Black."

As we look at men, animals, or automatic machines as information-processing devices, we find:

an input--the selection of a particular incoming message at a given moment in time

a process--the addition of this message to all the previous messages that have been selected and stored

an output--a sequential selection of "yes" or "no" that is highly improbable and statistically determined.

Computers can simulate the mathematical and logical processes of the human mind with incredible speed and accuracy. Thus the computer becomes the extension of the human brain just as surely as the telescope and microscope become extensions of the eye, the telephone becomes the extension of the mouth, and the steam shovel becomes the extension of the hands and arms.

We have described two processes that appear to apply equally to organisms moving in an environment and to machines--that numbers can be translated into measurements (as in the analog process) and that experience is a function of addition

(the digital system). There is one more process we need to understand computers--it has been called "feedback."

Think about picking up a glass of water. You have willed the action, and your arm and hand respond to the will. You determine how close you are to your goal by subtracting the motions you already have made toward it. In the end, the result is zero; no more impulses are needed, because you have reached the glass.

This self-correcting process is what is meant by feedback. We can simulate any action of an organism in its environment. We have decided to call the entire field of control and communication, whether in the machine or animal, by the name mentioned before, CYBERNETICS, which is formed from the Greek word for 'steersman.' The steering engines of a ship are one of the earliest and best-developed forms of feedback mechanisms.

Speed, high accuracy, and virtually unlimited memory are characteristics of such machine brains as we have today. With the application of microminiaturization and solid state technology, the size of machine brains has been steadily shrinking; the power requirement has been steadily lowered, and with it the heat dissipation problem. As this process continues, the advantages the human system has over machine systems will be reduced.

What happens when the little black box on your bedside table is smarter than you?

Now, man and automobile share life and death together; each becomes the expression of experience for the other. Some day people will "ride" their personal

computers with the same excitement they feel when they storm down the road.

Today there are 30,000 or more than $11 billion dollars worth of computers; and by 1976 the machine population may reach 100,000.

A decade ago, our machines were capable of 12 billion computations per hour; today they can do more than 20 trillion. By 1976 they may do about two billion computations per hour for every man, woman, and child. We have crossed the threshold of the computer age and discover ourselves in an enormous room peopled with strange creatures. The creature machines understand us, but do we understand them?

Here are some of the voices in that enormous room.

An Internal Revenue Department investigator might wish to have immediate[1] access to the tax returns of a man who is being audited.

A doctor may wish to trace the entire medical history of a patient to provide better input into a diagnostic computer.

The Veteran's Administration may wish to examine a man's complete military history.

A lawyer for the defense of a man will wish to search for jail and arrest records, and credit records of witnesses.

The military in filling extremely sensitive positions may even wish a record

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[1]Saturday Review, July, 1967, "The Cybernetic Age: An Optimist's View" by Glenn T. Seaborg.

of all books borrowed by an applicant to insure that his interests are wholesome and that he has the proper political background.

Consider a computer programmed to decide who should get a security clearance from the government, or who should get an education loan, or whether someone's driver's license should be suspended, or who should get a passport or be accepted for the Job Corps.

Consider that students can share a digital computer that adapts lessons to their individual needs.

As well as storing names and records of persons for instant checking by policemen, computers are helping to solve crimes.

All forms of information, oral, written or photo or drawing, whether on film, radio, or TV can now be translated into identical electronic impulses which can be processed and either stored or transmitted anywhere in the world in less than one-seventh of a second.

Consider a situation. You have flown out of town on a business trip and at your destination have a few hours to spend visiting a friend. At the airport you rent a car. You place your ID containing your bank account number and a micro-fiche of your fingerprints in a slot, and the fingers of your free hand over a flat looking plate. Within minutes your credit has been checked. The keys to your rented car are released to you. Driving through town you encounter a minimum of delay at the busiest hour because the traffic lights are controlled by computers.

But you step up your speed once outside of town and without realizing it, you exceed the speed limit. When you return home you receive a notice of this violation which calls for a fine. You also learn that the fine has been charged to your bank account.

Consider this situation. You are a key man in a company which produces products for the home. Market surveys analyzed by computers tell the company of the need of a new product. You sit at a desk containing a large flourescent screen and with an electronic "lightpen" draw your conception of the new product. As you design the product you "tell" the computerized screen what materials you want the product to be made of. The system coordinates the information from the lightpen with your other instructions. As you work, it guides you in your design by making recommendations, by showing you the stress and strain in your design, by correcting your errors, by recommending alternatives and improvements. When you and the system are both satisfied with the design, you release the design for manufacture. The system has tested the product, so no test model is necessary. It turns the design over to another department, which calculates and orders the materials necessary to produce it, sets up the required manufacturing equipment, and prepares the production schedule. You never see the product, but you know it has been turned out the way you thought.

How long will it be before the computer will make it without you?

The Portable Phonograph*

The Red Sunset, with narrow, black cloud strips like threats across it, lay on the curved horizon of the prairie. The air was still and cold, and in it settled the mute darkness and greater cold of night. High in the air there was wind, for through the veil of the dusk the clouds could be seen gliding rapidly south and changing shapes. A queer sensation of torment, of two-sided, unpredictable nature, arose from the stillness of the earth air beneath the violence of the upper air. Out of the sunset, through the dead, matted grass and isolated weed stalks of the prairie, crept the narrow and deeply rutted remains of a road. In the road, in places, there were crusts of shallow, brittle ice. There were little islands of an old oiled pavement in the road, too, but most of it was mud, now frozen rigid. The frozen mud still bore the toothed impress of great tanks, and a wanderer on the neighboring undulations might have stumbled, in this light, into large, partially filled in and weed-grown cavities, their banks channeled and beginning to spread into badlands. These pits were such as might have been made by falling meteors, but they were not. They were the scars of gigantic bombs, their rawness already made a little natural by rain, seed, and time. Along the road, there were rakish remnants of fence. There was also, just visible, one portion of tangled and multiple barbed wire still erect, behind which was a shelving ditch with small caves, now very quiet and empty, at intervals in its back wall. Otherwise there was no structure or remnant of a structure visible over the dome of the darkling earth, but only, in sheltered hollows, the darker shadows of young trees trying again.

Under the withering arch of the high wind a V of wild geese fled south. The rush of their pinions sounded briefly, and the faint, plaintive notes of their expeditionary talk. Then they left a still greater vacancy. There were the smell and expectation of snow, as there is likely to be when the wild geese fly south. From the remote distance, towards the red sky, came faintly the protracted howl and quick yap-yap of a prairie wolf.

North of the road, perhaps a hundred yards, lay the parallel and deeply intrenched course of a small creek, lined with leafless alders and willows. The

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*A short story by Walter Van Tilburg Clark, © 1941. Reprinted by permission of Ashley Famous Agency, Inc.

creek was already silent under ice. Into the bank above it was dug a sort of cell, with a single opening, like the mouth of a mine tunnel. Within the cell there was a little red of fire, which showed dully through the opening, like a reflection or a deception of the imagination. The light came from the chary burning of four blocks of poorly aged peat, which gave off a petty warmth and much acrid smoke. But the precious remnants of wood, old fence posts and timbers from the long-deserted dugouts, had to be saved for the real cold, for the time when a man's breath blew white, the moisture in his nostrils stiffened at once when he stepped out, and the expansive blizzards paraded for days over the vast open, swirling and settling and thickening, till the dawn of the cleared day when the sky was thin blue-green and the terrible cold, in which a man could not live for three hours unwarmed, lay over the uniformly drifted swell of the plain.

Around the smoldering peat, four men were seated cross-legged. Behind them, traversed by their shadows, was the earth bench, with two old and dirty army blankets, where the owner of the cell slept. In a niche in the opposite wall were a few tin utensils which caught the glint of the coals. The host was rewrapping in a piece of daubed burlap four fine leather-bound books. He worked slowly and very carefully, and at last tied the bundle securely with a piece of grass-woven cord. The other three looked intently upon the process, as if a great significance lay in it. As the host tied the cord, he spoke. He was an old man, his long, matted beard and hair gray to nearly white. The shadows made his brows and cheekbones appear gnarled, his eyes and cheeks deeply sunken. His big hands, rough with frost and swollen by rheumatism, were awkward but gentle at their task. He was like a prehistoric priest performing a fateful ceremonial rite. Also, his voice had in it a suitable quality of deep, reverent despair, yet perhaps at the moment, a sharpness of selfish satisfaction.

"When I perceived what was happening," he said, "I told myself, 'It is the end. I cannot take much; I will take these.'

"Perhaps I was impractical," he continued. "But for myself, I do not regret, and what do we know of those who will come after us? We are the doddering remnant of a race of mechanical fools. I have saved what I love; the soul of what was good in us is here; perhaps the new ones will make a strong enough beginning not to fall behind when they become clever."

He rose with slow pain and placed the wrapped volumes in the niche with his utensils. The others watched him with the same ritualistic gaze.

"Shakespeare, the Bible, Moby Dick, The Divine Comedy," one of them said softly. "You might have done worse, much worse."

"You will have a little soul left until you die," said another harshly. "That is more than is true of us. My brain becomes thick, like my hands." He held the big, battered hands, with their black nails, in the glow to be seen.

"I want paper to write on," he said, "And there is none."

The fourth man said nothing. He sat in the shadow farthest from the fire, and sometimes his body jerked in its rags from the cold. Although he was still young, he was sick, and coughed often. Writing implied a greater future than he now felt able to consider.

The old man seated himself laboriously, and reached out, groaning at the movement, to put another block of peat on the fire. With bowed heads and averted eyes, his three guests acknowledged his magnanimity.

"We thank you, Doctor Jenkins, for the reading," said the man who had named the books.

They seemed then to be waiting for something. Doctor Jenkins understood, but was loath to comply. In an ordinary moment he would have said nothing. But the words of "The Tempest," which he had been reading, and the religious attention of the three made this an unusual occasion.

"You wish to hear the phonograph," he said grudgingly.

The two middle-aged men stared into the fire, unable to formulate and expose the enormity of their desire.

The young man, however, said anxiously, between suppressed coughs, "Oh, please," like an excited child.

The old man rose again in his difficult way, and went to the back of the cell. He returned and placed tenderly upon the packed floor, where the fire-light might fall upon it, an old portable phonograph in a black case. He smoothed the top with his hand, and then opened it. The lovely green-felt-covered disk became visible.

"I have been using thorns as needles," he said. "But tonight because we have a musician among us"--he bent his head to the young man, almost invisible in the shadow--"I will use a steel needle. There are only three left."

The two middle-aged men stared at him in speechless adoration. The one with the big hands, who wanted to write, moved his lips, but the whisper was not audible.

"Oh, don't!" cried the young man, as if he were hurt, "The thorns will do beautifully."

"No," the old man said. "I have become accustomed to the thorns, but they are not really good. For you, my young friend, we will have good music tonight."

"After all," he added generously, and beginning to wind the phonograph, which creaked, "they can't last forever."

"No, nor we," the man who needed to write said harshly. "The needle, by all means."

"Oh, thanks," said the young man. "Thanks," he said again in a low, excited voice, and then stifled his coughing with a bowed head.

"The records, though," said the old man when he had finished winding, "are a different matter. Already they are very worn. I do not play them more than once a week. One, once a week, that is what I allow myself.

"More than a week I cannot stand it; not to hear them," he apologized.

"No, how could you?" cried the young man. "And with them here like this."

"A man can stand anything," said the man who wanted to write, in his harsh, antagonistic voice.

"Please, the music," said the young man.

"Only the one," said the old man. "In the long run, we will remember more that way."

He had a dozen records with luxuriant gold and red seals. Even in that light the others could see that the threads of the records were becoming worn. Slowly he read out the titles and the tremendous dead names of the composers and the artists and the orchestras. The three worked upon the names in their minds, carefully. It was difficult to select from such a wealth what they would at once most like to remember. Finally, the man who wanted to write named Gershwin's "New York."

"Oh, no," cried the sick young man, and then could say nothing more because

he had to cough. The others understood him, and the harsh man withdrew his selection and waited for the musician to choose.

The musician begged Doctor Jenkins to read the titles again, very slowly, so that he could remember the sounds. While they were read, he lay back against the wall, his eyes closed, his thin, horny hand pulling at his light beard, and listened to the voices and the orchestras and the single instruments in his mind.

When the reading was done he spoke despairingly. "I have forgotten," he complained; "I cannot hear them clearly.

"There are things missing," he explained.

"I know," said Doctor Jenkins. "I thought that I knew all of Shelley by heart. I should have brought Shelley."

"That's more soul than we can use," said the harsh man. Moby Dick is better.

"By God, we can understand that," he emphasized.

The Doctor nodded.

"Still," said the man who had admired the books, "we need the absolute if we are to keep a grasp on anything.

"Anything but these sticks and peat clods and rabbit snares," he said bitterly.

"Shelley desired an ultimate absolute," said the harsh man. "It's too much," he said. "It's no good; no earthly good."

The musician selected a Debussy nocturne. The others considered and approved. They rose to their knees to watch the Doctor prepare for the playing, so that they appeared to be actually in an attitude of worship. The peat glow showed the thinness of their bearded faces, and the deep lines in them, and revealed the condition of their garments. The other two continued to kneel as the old man carefully lowered the needle onto the spinning disk, but the musician suddenly drew against the wall again, with his knees up, and buried his face in his hands.

At the first notes of the piano the listeners were startled. They stared at each other. Even the musician lifted his head in amazement, but then quickly

bowed it again, strainingly, as if he were suffering from a pain he might not be able to endure. They were all listening deeply, without movement. The wet, blue-green notes tinkled forth from the old machine, and were individual, delectable presences in the cell. The individual, delectable presence swept into a sudden tide of unbearable beautiful dissonance, and then continued fully the swelling and ebbing of that tide, the dissonant inpourings, and the resolutions, and the diminishments, and the little, quiet wavelets of interlude lapping between. Every sound was piercing and singularly sweet. In all the men except the musician, there occurred rapid sequences of tragically heightened recollection. He heard nothing but what was there. At the final, whispering disappearance, but moving quietly so that the others would not hear him and look at him, he let his head fall back in agony, as if it were drawn there by the hair, and clenched the fingers of one hand over his teeth. He sat that way while the others were silent, and until they began to breathe again normally. His drawn-up legs were trembling violently.

Quickly Doctor Jenkins lifted the needle off, to save it and not to spoil the recollection with scraping. When he had stopped the whirling of the sacred disk, he courteously left the phonograph open and by the fire, in sight.

The others, however, understood. The musician rose last, but then abruptly, and went quickly out at the door without saying anything. The others stopped at the door and gave their thanks in low voices. The Doctor nodded magnificently.

"Come again," he invited, " in a week. We will have the 'New York.'"

When the two had gone together, out toward the rimed road, he stood in the entrance, peering and listening. At first, there was only the resonant boom of the wind overhead, and then far over the dome of the dead, dark plain, the wolf cry lamenting. In the rifts of clouds the Doctor saw four stars flying. It impressed the Doctor that one of them had just been obscured by the beginning of a flying cloud at the very moment he heard what he had been listening for, a sound of suppressed coughing. It was not nearby, however. He believed that down against the pale alders he could see the moving shadow.

With nervous hands he lowered the piece of canvas which served as his door, and pegged it at the bottom. Then quickly and quietly, looking at the piece of canvas frequently, he slipped the records into the case, snapped the lid shut, and carried the phonograph to his couch. There, pausing often to stare at the canvas and listen, he dug earth from the wall and disclosed a piece of board. Behind this there was a deep hole in the wall, into which he put the phonograph. After a moment's consideration, he went over and reached down his bundle of books and inserted it also. Then guardedly, he once more sealed up the hole with board and

the earth. He also changed his blankets, and the grass-suffed sack which served as a pillow, so that he could lie facing the entrance. After carefully placing two more blocks of peat upon the fire, he stood for a long time watching the stretched canvas, but it seemed to billow naturally with the first gusts of a lowering wind. At last he prayed, and got in under his blankets, and closed his smoke-smarting eyes. On the inside of the bed, next to the wall, he could feel with his hands the comfortable piece of lead pipe.

THE CULTURE OF MACHINE LIVING

Quo Vadis?*

Here he comes, stumbling down
his ten thousand technological
years--the fragmented man;
a thing of bits and pieces
cast upon the mudflats of the
20th century by wayward
tides and waves too high.
This is a mosaic that walks,
wearing all his yesterdays like tatoos.
Little, or nothing,
in all his ancient heritage fits him for
this moment.
There is always something coming ashore,
and he is doing so now. He strides into
the spectrum as once the lonely
horseman rode into the sunset
of another time and place.
And no one knows what new
adventures await him now.

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*From "The Dynamics of Change," Kaiser Aluminum & Chemical Corporation, ©1967.

Work: The Assembly Line Machine

I heard that they were hiring people for the assembly plant. And the idea of making automobiles sounded like something. Lucky for me, I got a job and was made a spot welder on the front cowling. There wasn't much to the job itself. Picked it up in about a week.

My job was to weld the cowl to the metal underbody. The jig is all made up and the welds are made in set places along the metal. Exactly twenty-five spots. The line runs according to schedule. Takes me one minute and fifty-two seconds for each job. I walk along the line as it moves. Then I snap the jig off, walk back down the line, throw it on the bench, grab another just in time to start on the next car. The cars differ, but it's practically the same thing. Finish one--then have another one staring me in the face.

I don't like to work on the line--no man likes to work on a moving line. You can't beat the machine. Sure, maybe I can keep it up for an hour, but it's rugged doing it eight hours a day, every day in the week all year long.

During each day I get a chance for a breather, ten minutes in the morning, then a half hour for lunch, then a few minutes in the afternoon. When I'm working, there isn't much chance to get a breather. Sometimes the line breaks down. When it does we all yell "Whooppee!" As long as the line keeps moving, I've got to keep up with it. On a few jobs I know, some fellows can work like crazy up the line, then coast. Most jobs you can't do that. If I get ahead maybe ten seconds, the next

model has more welds to it, so it takes ten seconds extra. You hardly break even. You're always behind. When you get too far behind, you get in a hole--that's what we call it. Everything breaks loose. I get in the next guy's way. The foreman gets sore, and they have to rush in a relief man to bail you out.

It's easy for time-study fellows to come with a stop watch and figure out just how much you can do in a minute and fifty-two seconds. There are some things they can see and record with a stop watch. But they can't clock how a man feels from one day to the next. Those fellows ought to work on the line for a few weeks and maybe they'll feel some things they never pick up on the stop watch.

I like a job where you feel you're accomplishing something and doing it right. When everything's laid out for you and the parts are all alike, there's not much you feel you accomplish. The big thing is that steady push of the conveyor--a gigantic machine which I can't control.

You know, it's hard to feel that you're doing a good quality job. There is that constant push at high speed. You may improve after you've done a thing over and over again, but you never reach a point where you can stand back and say, "Boy, I did that one good. That's one car that got built right."

My job is all engineered out. The jigs and fixtures are all designed and set out according to specifications. There are a lot of little things you could tell

them, but they never ask you. They have a suggestion system, but the fellows don't use it too much because they're scared that a new way to do it may do some one out of a job.

There's only three guys close by--me and my partner and a couple of fellows up the line. I talk to my partner quite a lot. We gripe about the job 90 percent of the time. You don't have time for any real conversation. The guys get along o'k--you know the old saying, "Misery loves company."

I think the foreman is an all-right guy, but in the shop he can't be. He has to push you all the time to get production out. But you can't fight the line. The line pushes you. We kid about it and say we don't need a foreman. That line is the foreman.

Work: The Myth That Became A Monster*

When it comes to considering the meaning of work in our society, we are much like the patriotic gentleman: we are quite willing to die for the right of other people to work, but we don't really know just what it is that we mean when we talk about work.

Somewhere along the line, in our society at least, we have confused work and income, so that the two became somehow related in our minds. When people say, "We want work," they usually mean they want income. The two are seldom related in any proportional sense, yet when we think they are, we try to build a social structure that assumes work will somehow solve our problems, when what we really mean is that income will solve our problems, or at least some of them.

When did we begin to feel that work as a human activity was valuable? Almost any culture you may study does not like work. The Golden Ages of our ancient pasts were places where one did not have to work. And most concepts of heavens have as their chief characteristic the fact that one does not have to work in them.

It is doubtful that ancient man had any concept of "work" at all, and such primitive societies as still exist frequently have no vocabulary that distinguishes between "work" and "free time."

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*From "The Dynamics of Change," Kaiser Aluminum & Chemical Corporation,

In many "low energy" societies, the concepts of work time and free time hardly exist. A man in such a culture may feel as constrained by necessity to do one as the other. It is only when we classify his time into categories meaningful to us that work becomes defined. But if we say that he is working only when he is gaining sustenance, then many "primitive" men had far more work-free time than we have. When Aristotle, the Greek assigner of categories, took a look at work, he could assign it no very high value, except as a way to achieve leisure, or to not work. "Nature," he wrote, "requires that we should be able, not only to work well, but to use leisure well. Leisure is the first principle of all action and so leisure is better than work and is its end. As play, and with it rest, are for the sake of work, so work, in turn, is for the sake of leisure."

The idea then that work, to be called work, must be something that we do not want to do, or that is at least unpleasant, was imprinted quite early in western culture. That work is painful, that it is a penalty, belongs to western culture. But in the Christian view, also, labor also contributes to such happiness as man can enjoy on earth. But in all the conceptions of a better life, the implication seems to be that labor is a drudgery, a burden. The pains of toil do not belong to human life by any necessity of human labor, but rather through the accident of external circumstances.

The contrary view would maintain that work is not a curse but a blessing, filling man's hours usefully, turning to service energies which would otherwise be wasted. It is suggested that useful occupations save men from a boredom they

fear more than the pain of labor, as evidenced by the variety of amusements and diversions they invent or frantically pursue to occupy themselves when work is finished. Not merely to keep alive, but to keep his self-respect, man is obliged to work.

In western thought, work as such became important. Later, we were to confuse the two -- that is, idleness and labor--so that "putting in the time" became more important than the work. Thus WORK WAS GOOD FOR THE SOUL. This was the myth that became a monster in our times; it drives the rich to maintain the illusion that they are working, and those who do not work into an incessant apologia for being alive.

"Today, the American without a job is a misfit," comments Sebastian de Grazia, author of Of Time, Work, and Leisure. "To hold a job means to have status, to belong in the way of life. Between the ages of twenty-five and fifty-five, after school age and before retirement age, nearly 95 percent of all males work and about 35 percent of all females. Various studies have portrayed the unemployed man as confused, panicky, prone to suicide and revolt. Totalitarian regimes seem to know what unemployment can mean; they never permit it."

The "work" monster gained a certain substance from the idea that the progress of a society or a culture is something like the natural progress of the life of a man; as he grows older and works harder, he accumulates more wisdom and more material things.

It is probably no accident that the idea of social progress and the goodness

of work as a means to achieve it grew into a now virtually unexamined principle at the same time that the Industrial Revolution began to need more "workers." This kind of work was not like the work that had gone on before; it was oriented in space (in the factory or foundry) and structured in time (the necessity for the worker to be in a certain place, at a certain time, performing certain work).

Niall Brennan, in The Making of a Moron, explains what is "wrong" with "work." "The unpleasantness of a job has nothing to do with whether it is repetitive or not. It depends solely on how many of the parts of man are used and how well they are being used. Acting is monotonous in this sense of the word; but no other occupation uses the man so intensely. If only a part of man is being used, the salvation of his sanity depends on what he himself does with the unwanted parts."

The idea that one should show up at a certain place at a certain time and perform some activity for a certain number of hours, remains today what we usually think of as work. We have constructed a society in which participation in this activity almost becomes the goal of life itself.

There are, however, two kinds of work: object-oriented work is activity directed toward transforming some natural resource into some useful object for man's use or needs. For example, petroleum into gasoline. It is the object-oriented work that is being replaced by mechanization, automation, and cybernation.

People-oriented work is directed toward service to others: entertainment, government service, teaching. This kind of work is as repetitive as object-oriented

work, but it involves much more of the person who is doing it.

It is natural for a society to "progress," and at the base of "progress" is the use of human energy in the form of work. Therefore the more people in our society who work, the more will we progress. People who do not contribute to progress by working should not share in its fruits with those who do work.

Will this idea have to change as the exploding technology and exploding population collide in the next decade?

Cultural Standardization[1]

Most American babies are born in standardized hospitals, with a standardized tag put around them to keep them from getting confused with other standardized products of the hospital. Many of them grow up either in uniform rows of tenements or of small town or suburban houses. They are wheeled about in standard carriages, fed from standardized bottles with standardized nipples according to standardized formulas, and tied with standardized diapers. In childhood they are fed standardized breakfast foods out of standardized boxes with pictures of standardized heroes on them. They are sent to monotonously similar school houses, where almost uniformly standardized teachers ladle out to them standardized information out of standardized textbooks. They pick up the routine wisdom of the streets in standard slang and learn the routine terms which constrict the range of their language within narrow limits. They wear out standardized shoes playing standardized games, or as passive observers they follow though standardized newspaper accounts or standardized radio or TV programs the highly ritualized antics of grown-up professionals playing the same games. They devour in millions of uniform pulp comic books the prowess of standardized supermen.

As they grow older they dance to canned music from canned juke boxes, millions of them putting standard coins into standard slots to get standardized

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[1]Max Lerner, America as a Civilization (Vol. 1), New York, Simon and Schuster, p. 262.

tunes sung by voices with standardized inflections of emotion. They date with standardized girls in standardized cars. They see automatons thrown on millions of the same movie and TV screens, watching stereotyped love scenes adapted from made-to-order stories in standardized magazines.

They take time out in factory, office, and shop for standardized "coffee breaks" and later a quick standardized lunch, come home at night to eat processed and canned food, and read syndicated columns. Dressed in standardized clothes, they attend standardized club meetings, church socials. They are drafted into standardized armies, and if they escape the death of mechanized warfare, they die of highly uniform diseases; and to the accompaniment of routine platitudes they are buried in standardized graves and celebrated by standardized obituary notices.

Mobility or Telemobility*

Man has always had the choice between two kinds of mobility, but he has for the most part concentrated on means for moving the body to the experience. In doing so, he became enchanted with the vehicle -- the horse, the chariot, the raft, train, automobile, airplane--each in its time the magic carpet that transported his neutral network to the scene of its desire. So enraptured did he become with the vehicle that he began to confuse the means of mobility with the meaning of mobility.

In the end he overlooked, and ultimately almost forgot, the essential purpose of human movement, which is to confront the sensory system with a new array of stimuli. As a sight and sound experience, there is nothing to choose between sending a man to New York, or sending New York to him.

Already the car in the garage and the television set in the living room--both of them tools for communication--are in direct competition for man's energy, and this is the beginning of the beginning. As he moves more deeply into the electromagnetic world, more and more "making the scene" will mean not stepping on the starter, but switching channels.

The daily press is full of talk about supersonic transports traveling three times the speed of sound; of 150 mile-an-hour automobiles; of trains traveling at

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*From "The Dynamics of Change," Kaiser Aluminum & Chemical Corporation,

300 miles per hour; of transports that carry 600 people and their baggage at sonic speed; of a rocket liner that can carry 170 passengers at 17,000 miles per hour, connecting any point on the globe with any other in 45 minutes.

Our infatuation with the vehicle has led us to neglect to create the environment in which it can function most efficiently. Passengers sometimes meet at places called terminals which are not really "terminals" at all, but staging areas where the traveler tries to figure out how to get to the next system's terminal so that he can continue. This is not a system; it is a random dispersion of accidental meetings. What holds the system together is the automobile; it draws the little lines from terminal point to terminal point.

The main reason a man drives his car all alone to work is that it gives him the only times during the day when he can be free from the social, emotional, and psychological pressures of family, neighbors, and business associates. In all his active working years, he usually has but two refuges for privacy: driving his car alone or locking himself in the bathroom. Perhaps it might be possible to design bathrooms that offer the visual experience of a car moving along the highway.

We do not, as yet, have a true "traffic science." We still, contrary to all reason and experience, design roadways on which drivers going in opposite directions can approach each other at high speed. It is also a common experience to sit in a car at an absolutely empty intersection, waiting for the red light to change. The programming of these signals was frozen into a timing pattern based on a previous traffic flow. The freeway and other high speed sections must be provided

with a means of positive traffic control. This will be done by guidance systems in the vehicle. There will be television surveillance of every mile of highway so that a dispatcher can anticipate problems and correct them before congestion builds up.

The driver's position in relation to other vehicles within one mile of him, together with his position on the roadway with respect to all points of conflict, will be shown continuously on a small television viewer, available to him with the flick of a switch. While he's watching TV, who is watching the road?

"No other single phenomenon in American life has ever met with such acclaim as television," says Desmond Smith, writing in Electronic Age. "It took 80 years for the telephone to be installed in 34 million homes. It took 62 years for electric wiring, 49 years for the automobile, and 47 years for the electric washer to reach the same number of homes. Television made the giant stride in 10 years."

The trek toward the phosphors is not an American phenomenon, it is a turning of the human species away from the personal biological confrontation of experience to the introspective experience of electronic waves. If ever there was an avenue of approach to the "one-world" concept, this appears to be it. The world is becoming a village.

From some central transmitter, television broadcasting balloons out over an area of approximately 50 miles, or is ricochetted from microwave tower to microwave tower, pours through the walls of our houses, streams through our

bodies, and a part of it is picked up by antenna and becomes a pattern of dots on a screen moving so fast they appear, to us, to be a picture.

The other forms of television may transform our lives more than the monster in the living room. Still growing, closed-circuit TV is an energizing medium on the new frontier of communications.

Here, in the "unseen world of TV" is a person-to-person, firm-to-firm medium that annihilates space and time, makes the corporation president as close to his regional manager, 3000 miles away, as if they were in the same room; brings the economic and business life of our country into full, instantaneous sight and sound communication. Already, the memo is a paper dodo. There seems to be no real doubt that current and immediately foreseeable technology can provide us with a global system for instantaneous communication.

The Medium is the Message

One of the most critical commentators on the effect of television on our culture is Marshall McLuhan. Thus far his writings have been concerned with communication in the three Ages of Man which he describes as the Pre-Literate or Tribal, the Individual, and the present Electric. Each age is shaped by the form of the information available.

One of McLuhan's central ideas is that changes are going on all about us of which we are not fully aware. The rise of television has very subtly altered the way people THINK. "This has nothing to do with the quality of the programs. Those who are against the 'boob tube' are really missing the whole point," McLuhan says. Even if TV programs consisted entirely of literary classics and first-rate news commentaries, TV would still make us think differently.

The present electronic revolution is the third major historical change that has made a profound impact on the way man thinks. The two previous were the alphabet and printing.

McLuhan sees each medium--alphabet, printing, television--as an extension and modifier of man; just as the caveman's ax is an extension of the hand, so the book is an extension of the eye, and so electric circuitry--the telegraph, telephone, and television--is an extension of the central nervous system. Each such extension changes the balance among the five senses, making one sense dominant and altering the way man feels, thinks, and acts toward information. As a result, a new environment is created. New medium to new sensory balance to new environ-

ment. This is why the effect is important, why the fact that the TV image is composed of phosphor dots is more important than whether the dots are carrying the Smothers Brothers or UNCLE.

Radio was a "tribal drum" that stepped up man's sense of hearing and added a person-to-person dimension to world affairs. Man no longer just read about important speeches and events; he listened to them. Like illiterate men in the primitive tribes, modern man could get a feeling of direct contact with all of his fellow tribesmen in a "global village." McLuhan says that radio also introduced the "all-at-once" atmosphere of modern man, seen in the popular student practice of studying with the radio or phonograph on.

In the pre-alphabet age, the ear was dominant; "hearing was believing." Man lived in acoustic space--a world of tribes, emotion, mystery. The new medium of the phonetic alphabet forced the magic world of the ear to yield to a new sensory balance centered on the neutral world of the eye. Later, Gutenberg's invention of movable type forced man to understand in a linear (line), uniform, connected, continuous fashion. A whole new environment emerged. The portable book! For the first time man could read and think in isolation. Individualism was born, and it became possible to separate thought from action. Politically, this newly discovered privacy of the reader made a point of view possible; economically, linear thought produced the assembly line and industrial society; in physics, it led to the views of the universe as a mechanism in which it is possible to locate a physical event in space and time.

Then in the nineteenth century, man entered the Electric Age with the

invention of a new medium, the telegraph. The Gutenberg printing explosion that had shattered the old tribal unity of the ancients gave way to a huge explosion; electrical circuitry bound up the world and brought all the fragmented pieces together again. The old, linear, visual connections were cut. With Telstar, an "all-at-once" environment had taken place. Tribal man had returned, and the world turned into a global village in which everyone is involved with everyone else--Negroes and whites, haves and have-nots.

Television added sight to sound and brought the world closer. It tore man away from his detached, noninvolved attitude. TV INVOLVED men. A TV screen reveals just a pulsing sequence of light and dark dots that must be pieced together in a man's mind before taking on meaning, thus the glossy-eyed man in front of the TV is no passive blob absorbing sight and sound. That man is actively involved in creating for himself a visual image to go with the sound that reaches his ears.

Thus, to McLuhan, the key word in the new Electronic Age is involvement. Television involves all the senses. This is why he says that some media are "hot" and some "cool." Print, McLuhan says, is a hot medium: the printed page projects plenty of information. By contrast, TV is cool; that is, it provides a minimum of information--but involves the senses all at once.

To the man who has stared for hours on end at the little black box, this simply doesn't make sense. TV to him seems visual. McLuhan says that this is eye thinking. With television, you are the screen; the TV image is not a still

photo but constant projecting of dots onto you, the screen, at the rate of 3 million pulses a minute. You have to fill in all the dots. You have to be "with it."

Television brings not only the voting booth into the living room but also the civil rights march along Alabama's U. S. 80, and the bulldozing of a village in Vietnam involves the audience. Moreover, a "hot war like Vietnam over a cool medium like TV is doomed. The young opposed the war because of their pain of involvement."

Among the first victims of television that McLuhan counts are his own views emphasizing the changing nature of advertising. There is less of the visual. "That's why discotheques are loud and dark. It is why a girl is sexier in cool media like dark glasses and fishnet stockings: these things invite involvement."

The shift away from the visual is signaled by boys and girls who dress alike and cut their hair alike--gender differentiation now comes with touch.

Baseball, McLuhan says, is linear and individual. The pitcher stands on the mound, and the batter waits. By contrast, football is like TV. Action occurs all-at-once, with the entire team involved and scattering all over the screen.

Since TV, McLuhan declares, the assembly line has disappeared and staff and line structures have gone in management. In fact, all lines are disappearing: stag lines, receiving lines, and pencil lines from the backs of nylons. McLuhan would assume that Detroit is making custom cars, that is, like the basic Mustang which comes with all the options. Why, then, don't we all realize this? The trouble,

he says, is that people are still looking through their rear-view mirror.

"We are witnessing a clash between two technologies: the print culture is fighting a rearguard action, striving to absorb the electronic culture." But the press itself will change. "We can't stop TV from changing people. Prepare by education: it can serve as civil defense against 'media fallout,'" McLuhan sums up.

Do you agree?