

WHATEVER HAPPENED TO INDEPENDENT INVENTORS?

Their decline is America's loss,
but new innovation centers may help them return

The United States is slowly losing the competitive edge it has long held, compared to other countries, in producing new inventions. The result is likely to be a relative lowering of productivity and ability to sell goods abroad, just at a time when the country is being forced to spend more for the fuel and raw materials it imports. Part of the cause is a growing conservatism among corporations, which are reluctant to invest in speculative new technologies. But an even more disturbing element is a slackening of the flood of new ideas that have traditionally flowed from private inventors.

Leaving patriotic sentiment aside for the moment, what has become commonly known as the "American Way of Life" is largely an expression of traditionally high worker productivity (output per employee or per man-hour) and dynamic innovation (introduction of new products to the market). In 1960, the average American worker produced nearly twice the value of goods than a worker in other advanced nations produced. In the late 1950s, according to one survey, nearly 80 percent of the major technological innovations made in the leading industrial countries came from the United States. The U.S. "patent balance" (foreign patents to U.S. nationals minus U.S. patents to foreign nationals) showed a surplus of 36,000 per year, as recently as 1966.

Now, however, according to the National Science Foundation's Science Indicators, the U.S. lead in each of these areas is diminishing significantly. Productivity per worker in France and West Germany in 1974 was only 20 to 25 percent less than in the United States and productivity per man-hour was increasing faster in Japan (where it has jumped nearly 380 percent), France, West Germany and Great Britain. The patent balance has fallen 30 percent since 1966, leading the NSF investigators to conclude that "the number of patentable ideas of international merit has been growing at a greater rate in other countries than in the United States." And over roughly a decade, NSF found, the proportion of U.S. innovations classified as "radical breakthroughs" had declined nearly 50 percent.

A report to the Congress by the General Accounting Office reached similar conclusions, stated even more bluntly: "Looking to the future, it appears that foreign competitors have an advantage of being able to exploit, develop and diffuse

At SCIENCE NEWS we receive numerous requests to publicize new inventions or to advise inventors where they should go for help. We also hear numerous complaints about the trouble independent inventors are having these days. No magazine can afford to uncritically acclaim unproven new technologies—it's not our business. Nor are we equipped to act as a referral service. But we have tried to find out where serious independent inventors can go to get help and a fair evaluation of their work, and include a list of specific addresses (see box). In the course of trying to present this service for our readers, we also uncovered a sobering story of the increasing problems facing the private innovator, which may seriously affect the progress of American technology.

BY JOHN H. DOUGLAS

manufacturing technology faster than the United States." The GAO recommended a national policy for improving productivity as a "top priority effort."

Such an effort will require improving the climate for innovation, both for industrial laboratories and for private inventors. Both face the problems of rising costs of research and the increased complexity of the technologies involved. Even such a simple idea as Pringle's New-fangled Potato Chips—a modification of an old product for an established market—reportedly cost Procter and Gamble \$70 million to bring to market. A product involving substantial innovation, like the new Polaroid cameras, may cost more than a quarter of a billion dollars to develop. Yet only one out of every five products emerging from R&D to the market ever become commercial successes. Little wonder that BUSINESS WEEK (Feb. 16 and June 28) reports a decreased willingness to gamble on new technologies.

But the problems for independent inventors are even worse. Not only are they less able to afford the increasing costs and are, in general, less equipped to face the complex technology, but they are also less aware of market forces—a crucially important element during times of cutbacks. Worst of all, however, is the growing scandal over so-called "invention brokers," to whom the independents turn when they fail elsewhere.

Some 250 such brokers were operating in the country last year, dealing with roughly 100,000 inventors and doing an

estimated \$100 million of business. According to an investigator for the Federal Trade Commission, the average customer of such brokers paid \$1,000 to \$1,500 for generally useless services, and received almost nothing in return. When a California law recently required such brokers to disclose their records of success, one of the largest revealed that of 30,000 inventors it had had contracts with, only three had earned a profit.

The squeezing of independent inventors out of the market is reflected in patent statistics: The percentage of patents issued to independent inventors has fallen from 44 percent in 1954 to 25 percent in 1974. During the same time, the percentage issued to foreign corporations has risen steadily from 5 percent to 20 percent. Four countries now issue more patents per capita than the United States (which is on a par with the Soviet Union). One important probable reason for this discrepancy is that most other advanced countries have launched incentive programs for independent inventors, ranging from cash awards to small business loans and tax breaks. Such programs are only now being discussed in the United States.

The decline of private inventors has led some to conclude that their days of making valuable contributions have ended. John Kenneth Galbraith (writing 20 years ago) lamented their demise and summarized a widely held sentiment when he declared: "Most of the cheap and simple inventions . . . have been made. . . . Because development is costly, it follows that it can be carried on only by a firm that has the resources which are associated with considerable size."

Others, however, strongly and even vehemently disagree. Certainly the failure rate for inventions by independents is greater than those produced in industrial laboratories. Certainly small companies and individuals have trouble attracting the talent and affording the equipment industrial giants can procure. But a growing body of evidence indicates that individuals and small companies still account for a disproportionately large number of the most important inventions and the most original discoveries. Over the last 20 years, small firms have produced more innovations per unit of sales volume than large firms, which have increasingly tended to put their money into improving existing products. When one expert, Jacob Rabinow, prepared a list of the 50 greatest

inventions of the last 40-odd years (excluding chemical formulas) for discussion in congressional testimony, he concluded that only two had been produced by major corporations. The largest contributors were scientists in universities, government laboratories, small businesses or those working independently.

One can thus offer the following alternative hypothesis to that of Galbraith: Independent inventors, or those in small businesses or universities, still represent a vital reservoir of creativity, whose freedom of expression is not as limited by the economic and policy constraints found in big business. But the problem of separating the gems of originality from the dross of impractical schemes has grown.

A striking illustration of this problem can be seen in the experience of the National Inventors Council (NIC), created to evaluate citizen's ideas for national defense during the Second World War. In less than six years time, more than 200,000 ideas were submitted, of which 8,600 were regarded as useful and examined further. Only 106 of these (about one-twentieth of one percent) ever went into production, but some—like the mercury dry cell battery—were so successful that each alone could have paid for the expensive effort of evaluating the others.

As a first step toward trying to reestablish the place of the independent inventor in the mainstream of American technology, two government agencies have started evaluation programs similar to the old NIC. At the National Bureau of Standards, which took over NIC functions after the war, a new Office of Energy-Related Inventions (OERI) has been established. With an evaluation team headed by Jacob Rabinow (who holds more than 200 patents), OERI is sifting through citizen's ideas on how to save energy and referring the best to the Energy Research and Development Administration (ERDA) for support. Such assistance may take the form of a grant or loan for testing, prototype development or marketing. Rights to the invention remain with the inventor.

A second, more comprehensive approach is being pursued by NSF, through an experiment setting up three university-based "innovation centers." Though their functions overlap somewhat, each has its own speciality: The University of Oregon center concentrates on the invention evaluation process, the MIT center tries to stimulate students at the university to be more creative, and Carnegie-Mellon has a masters degree program in how to successfully start a small business to exploit a new technology.

Robert M. Colton, NSF project manager, told SCIENCE NEWS that the experimental centers aim at reducing the risk involved in trying to commercialize new ideas. "I think most people are creative in the first place," he says, and the centers seek to aid this creativity by speeding evaluation of new ideas, by teaching stu-

What to Do With Your Invention

If you have an idea for an invention, you may apply for a patent, which essentially gives you the exclusive manufacturing rights to it for a period of 17 years. The procedure for obtaining a patent has become increasingly complex and involves making a search to see whether someone else has already staked a claim on the idea (or one very close to it), preparing a formal and carefully prescribed statement of specification and drawing, and shepherding the application through the arcane technicalities of the Patent Office examination. The process usually requires the services of a lawyer or agent licensed to practice before the Patent Office. The office publishes a list of those registered, but it would probably be simpler to just look in the Yellow Pages (under "Patent Attorney") or consult your local bar association.

The Patent Office publishes a booklet called *General Information Concerning Patents*, which lists everything from where to send for more information to the type of paper and ink required for the technical drawings. Prospective applicants can receive one free copy by writing to:

Commissioner of Patents
Washington, D.C. 20231

For multiple copies, send 75¢ per copy (check or money order only) to:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

Two words of caution should immediately be added. A device that, for more than a year, has been offered for sale, or has been in public use or has been described in a printed publication, can no longer be patented. So if you decide to market your invention first to see if it sells, you may lose your exclusive right. Second, *all* attorneys and agents actually registered at the Patent Office and licensed to practice before it are *forbidden* to advertise. Thus, most of the so-called "invention brokers" will be limited in the help they can give you in this important area. The Federal Trade Commission warns that before signing a contract with such a broker (who usually demands payment in advance), you should check with your state's attorney general or the Consumer Affairs Division of your regional office of the commission.

If you want to have your invention evaluated before trying to patent it, and if it is energy-related, you may use the free service of the OERI. Write for general information and Evaluation Request Form (NBS-1019) to:

Office of Energy-Related Inventions
National Bureau of Standards
Washington, D.C. 20234

If you wish an evaluation on any invention and are willing to pay the \$25 fee for a detailed report, write for information to:

Experimental Center for the Advancement of Invention and Innovation
College of Business Administration
University of Oregon
Eugene, Ore. 97401

Finally, when it comes time to approach a manufacturer in order to sell the rights to your idea, certain formalities should be observed. First, the invention should already be patented. This tells the manufacturers that at least they are not wasting their time on a technically impossible, wild scheme (the Patent Office will see to that), and the legal rights of both parties are better protected. (Some manufacturers are quite gun-shy about talking to inventors before a patent has been secured, for fear of lawsuits over "stolen" ideas.) For other hints, request the booklet *Submitting an Idea to a Manufacturer*, by sending 25¢ in coin to:

Circulation Department
American Bar Association
1155 E. 60th St.
Chicago, Ill. 60637

—J.H.D.

dents how to develop their ideas into practical inventions and by finally helping train the small entrepreneur to compete in an increasingly hostile marketplace—a subject long neglected in traditional business schools.

The five-year project has now reached its half-way mark and has already produced some clear indications of success. A Carnegie-Mellon student invented an

instrument that can measure oxygen levels in the blood without the necessity of sticking a needle into the patient. A currently popular electronic game using one's home television set is being marketed by students from the MIT program. And the Oregon center helped the inventor of a gold ore analyzer develop the product. Some 600 students are participating in the increasingly popular programs at the three

Venus, the only planet you'll have much chance of seeing in the evening sky until the end of August, is low in the west just after sunset. Although it's brighter than any other planet, or any star in the night sky, even it will be difficult to locate. That's because it sets within an hour of the sun, while the sky is still quite bright. However, if you look near the western horizon soon after sundown, and the sky is clear in that direction, you may be able to find it.

But by the end of August, late in the evening, Jupiter will appear in the east with more than a quarter the brilliance of Venus. At the beginning of August, Jupiter, in Taurus, rises about 1 a.m., but by the month's end it will appear above the eastern horizon about 11 p.m., local DST. Later in the night, as it climbs higher, it will be conspicuous in the southeastern sky, remaining visible until dawn.

The most prominent star is Vega, in Lyra, which is overhead in mid-evening. Arcturus, well below it in the west, is slightly brighter but dimmed because of its lower altitude.

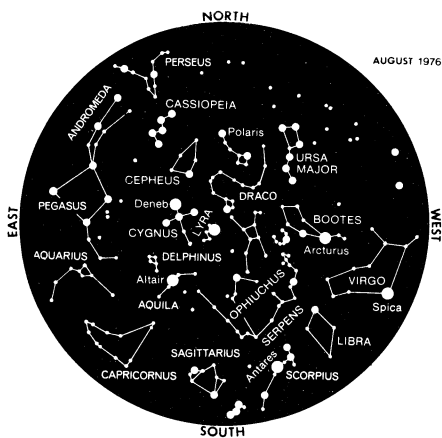
Directly east of Vega flies the swan, Cygnus. Deneb, the brightest star, is toward the north, at the top of the group of six stars that form the "Northern Cross." As a swan, Deneb marks the tail, the crosspiece, the wings and the lower part of the outstretched neck.

Another bird, an eagle, is south of Cygnus, represented by Aquila. Altair is the brightest star. Vega, Deneb and Altair form the summer triangle, so-called because it's prominent overhead at this time of year.

Low in the southwest you'll see the

AUGUST STARS

BY JAMES STOKLEY



Aug. 2	6:07 pm EDT	Moon in first quarter
9	7:44 pm	Full Moon
11-12		Perseid meteors
16	2:00 am	Moon farthest, distance 251,300 miles
17	8:13 pm	Moon in last quarter
18	5:00 am	Moon passes south of Jupiter
25	7:01 am	New Moon
26	6:00 am	Mercury farthest east of sun
	8:00 pm	Moon passes south of Venus
27	11:00 am	Moon passes south of Mars
	10:00 pm	Moon nearest, distance 226,500 miles
31	11:35 pm	Moon in first quarter

familiar summertime figure of Scorpius with ruddy Antares. To its left is Sagittarius, supposedly representing an archer. However, it looks more like a little teapot, the spout toward the right and the handle to the left.

Even though it contains no first-magnitude star, Hercules is prominent west of Lyra. Just north of this group you'll see Draco, a long, snake-like constellation which winds toward the northern horizon around Ursa Minor (where Polaris, the polestar, is located) and ends near the Big Dipper, part of Ursa Major.

Low in the northeast is Cassiopeia, shaped like a W. Cepheus is just above and close to Draco. Andromeda is to the right of Cassiopeia and Pegasus to the right of that.

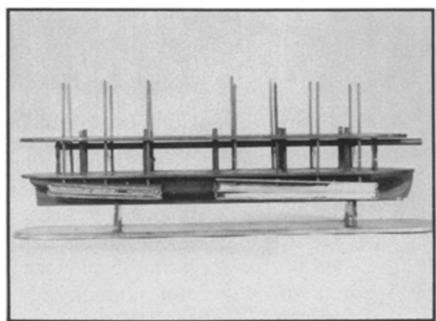
Frequently, around August 12, you can see a number of shooting stars or meteors, which seem to radiate from Perseus, in the northeast. Sometimes, especially in the early morning, you can see an average of one-per-minute. However, 1976 is unfavorable for this Perseid shower of meteors, since the moon is just past full. Its glare will drown out all but the brightest.

Extending overhead from horizon to horizon, the Milky Way is in a good position on evenings of late summer and early autumn. This is a vast swarm of faint stars, not visible separately with the naked eye. You'll hardly be able to see it in competition with bright city lights, but on a clear, moonless night it is conspicuous from a country location. It runs from Scorpius and Sagittarius, in the south, through Ophiuchus, Aquila, Cepheus and Cygnus to Cassiopeia and Perseus in the northeast. □

... Inventors

centers and Colton estimates that if one counts the tax return from inventions already marketed because of the program, the federal government has reaped a 10 to 1 return for its funds invested in the centers through NSF.

Of immediate concern to independent inventors nationwide are the services offered by the innovation center at the University of Oregon. Center director, Gerald G. Udell, described to SCIENCE NEWS the importance of their evaluation program as being able "to say 'no' with feedback." For a \$25 registration fee an inventor can send an idea to the center for evaluation and receive a detailed, computerized chart showing the strengths and weaknesses of his gadget. Evaluation points include checking on the invention's technical feasibility, potential profitability, further research needed, possible safety hazards, prospects for protection through patent, and probable environmental impact. If the idea passes with flying colors (so far only about two percent have done so), the center will help refer the inventor to someone who might help the commercialization process.



Lincoln's hand-carved patent model of a device to float riverboats off of shoals.

Evaluations at the Oregon center are carried out by faculty, students in the program and outside consultants. An important result of this experience has been new knowledge gleaned about the innovation process, including profiles of the steps required to bring an idea to market and when the breakeven point is likely to be reached. Udell estimates, for example, that from 100 initial ideas, 15 may survive technical screening, eight may seem commercially feasible, five might then be developed, but probably only one would survive testing and commercialization to

become a successful product. However, that one may pay for the whole effort.

The spirit of invention is one of the greatest American traditions. Though the basement tinkerer may have been a somewhat over-romanticized hero, the willingness of people from all walks of life to spend some time to put their insight to practical use is a venerable practice, and one worth perpetuating. A glance at the history of American patents produces an impressive, and somewhat surprising list of distinguished people who helped carry on the tradition: Ex-riverboatman Abraham Lincoln invented a device for buoying vessels over shoals; though writer Mark Twain lost considerable money investing in the inventions of others, his own three patents brought him considerable profit; magician Harry Houdini patented a safer diving suit; and Albert Einstein, once a patent-office clerk, received a patent of his own for inventing a better refrigerator.

To say that independent inventors must change with the times is probably more accurate than saying their time is past. What is needed is a new system of incentives, opportunities and guidance. □