

DIAGNOSIS AND A CURE

CALIFORNIA'S comparative prosperity during recent years has been largely due to the profitable manufacture of various products for use in war. A writer, J. S. Taub, in the June 1987 *California Journal*, describes its extent, through "the aerospace, semi-conductor and electronics industries of Los Angeles, San Diego, Orange and Santa Clara counties."

By fiscal 1985, California commandeered over \$30 billion in Department of Defense (DoD) prime contract awards—nearly three times the amount awarded to Texas, the closest competitor, according to a 1986 report by the Commission in State Finance. An estimated 30 per cent of the state's employment growth since 1981 is attributed to President Ronald Reagan's unprecedented peacetime military spend-up.

Today, however, this military spending is winding down and some of the politicians in the state are wondering how to handle future plant closures, job dislocations and layoffs. While agencies for job retraining exist, Taub says, "California politicians and the non-military business community are increasingly embracing the concept of economic conversion as an alternative to the state's economic dependence on the military."

Economic conversion is a planning process to develop alternative uses of a military plant's workforce and facilities, converting them to commercial and civilian production before a shut down or layoff. Ideally, conversion takes place at the local plant level with input from management, workers, local and state officials and consultants from government, industry and academia.

Conversion involves examining plant, equipment and technical processes, workforce skills, and management, engineering and marketing experiences to identify new, profitable and socially necessary products. Observers cite the need for transit systems, schools, housing, health care, infrastructure construction, renewable energy and toxic-waste treatment as appropriate applications for high-tech engineering talent that would otherwise be

slotted into military research and development programs.

"There has been a dramatic leveling off in military spending right now and the day when there's a dramatic shift is when the idea of economic conversion will take hold," said Greenbrae's Democratic Congresswoman Barbara Boxer, who sits on both the House Budget and Armed Services committees.

Evidently, the people in the federal agencies concerned with such matters do not regard the idea of plant conversion with particular favor. Its connection with peace activists does not appeal to them, and many of the workers seem satisfied to hope that military production will go on and on. The Office of Economic Adjustment, an arm of the Pentagon, Taub says, points to major failures in conversions by such large companies as Boeing-Vertol and McDonnell Douglas. The OEA speaks of Boeing's inability to produce and sell transit vehicles as "typical," while McDonnell Douglas Aircraft Company's foray into the energy business was unsuccessful. A McDonnell Douglas spokesman said: "You have to be able to both manufacture and sell. You can find things for your engineers to do but you can't sell it." Yet the OEA recommends diversification, pointing to a Connecticut corporation "which managed to diversify from military helicopters to a line of guitars." Interestingly, Taub reports:

Conversion advocates say some failures occurred not only because military contractors did not adapt to the cost-conscious realities of commercial production, but did not take their commercial efforts seriously enough. . . . observers further suggest that the DoD wasn't the best place to gain an objective view of economic conversion.

According to James L. Quillan, executive secretary of the California Machinists, a union which strongly supports economic conversion, "There has never been a rational approach to

economic conversion by the Defense Department, and there's been no philosophical commitment to the need to retrain or replace workers when projects get cancelled. It's all window dressing. These guys are on their way when they get laid off." Taub says:

Conversion is also encountering stiff resistance by defense contractors who echo the Pentagon's position, but with a vengeance. A comment from one, who spoke only on condition that he not be identified, underscores the ideological incompatibility between conversionists and the so-called "merchants of death," a left-over World War II epithet over which this contractor still smarts. "Economic conversion is an attempt to return to isolationism and passivism, and it is totally wrong. Their argument is that America can be disarmed and stand alone. That is madness. This is no real movement, just a group of individuals and people from the peace movement. There is no world affairs foundation stone for all this stuff." . . .

Gene Miles, analyst at Dataquest, the Silicon Valley research firm, is contemptuous of job-retraining efforts in aerospace. "Layoffs? The very suggestion scares the hell out of military contractors. No company wants to talk about it. That's because they don't know what they will do about them, and they don't want to find out. They are just giving lip service to retraining."

There are of course other views, sensible, constructive views, but whether or not they are influential enough to govern policy remains open to question.

Jay Stowsky, a research fellow at the Berkeley Roundtable on the International Economy, is troubled by these figures [of military spending]. "The massive defense spending (does) great harm to the economy—particularly in key technology centers—by creating bottlenecks in production, encouraging cost-inefficiency, and diverting human and capital resources away from commercial priorities toward high-cost, low-volume, over-sophisticated military applications," he says.

Stowsky further argues that military spending is defeating the purpose of a strong national defense by weakening the economy and inhibiting U.S. ability to compete globally.

Regis McKenna, president of the Silicon Valley high-tech public relations firm bearing his name,

says, "America is bankrupting its commercial industries, hence its ability to compete, by spending disproportionate amounts of capital and human resources on the development and production of weapons systems." He avers that while exotic, high-tech weapons systems create jobs, they produce no new wealth to cycle back into the economy. . . .

Democratic Congresswoman Barbara Boxer of Greenbrae argues, "It is immoral to keep the arms race going so that people stay employed. I've always felt it was immoral to vote for a weapons system because it meant jobs for my district," she says.

Her Democratic colleague, Norman Mineta of San Jose, agrees. "I don't say that just any job is okay. You can't become so dependent on a single microcosm of the economy." Mineta, whose district is the heartbeat of the Silicon Valley, compares military spending to addiction. "It puts the economy on a dependency scheme like giving more drugs to an addict. It's economic methadone."

All of the foregoing may serve as introduction to an account in a book that came in for review recently from England, *People and Planet*, edited by Tom Woodhouse (published by Green Books at £6.50), consisting of the Alternative Nobel Prize Speeches, responses to awards provided by the Right Livelihood Foundation. This foundation was established in 1979 by Jakob von Uexkull who in that year asked the Nobel Foundation "to consider the creation of a new award for work aimed specifically at meeting the needs of the Third World and of our planet." When this suggestion was not accepted, Uexkull, a well-known Swedish journalist, established, with the help of friends, the Right Livelihood Foundation to carry out his idea. He said in explanation:

The Alternative Nobel Prize is an attempt to get a value debate going. We need to show a different value system. Our choice of people given awards will clearly show that. Although this award has become known as the Alternative Nobel Prize, its official name is the Right Livelihood Award. Right Livelihood of course is an old concept, it means taking responsibility even in the way we choose our livelihood. Living lightly on the earth, not taking more than our share of the earth's resources. This Award is presented in Stockholm, the day before the Nobel Prize Awards, which is why the media have named it the Alternative Nobel Prize.

Uexkull remarks that "Award winners cover a wide spectrum, both geographically and as regards their work. The award serves to create coalitions and networks between groups who had hitherto often been unaware of each other."

These new coalitions give hope. We cannot separate the search for peace in the world, for peace with nature and for peace within ourselves. Together with our allies in the Third World, who are not susceptible to the illusions of the throw-away society, we must save this planet from war, destruction and delusion. We must not expect answers from politicians who have chosen to remain in the concrete towers of their obsolete thinking and are afraid of our attempts to free them from their ideological prisons.

Whether we succeed, whether we can promote our solutions widely and effectively enough in the short time left to change course, remains an open question. But as long as it does remain open we must do our best and be prepared to risk everything, for it is indeed a question of all or nothing, of the survival of mankind and the living earth.

The above is quoted from the Foreword to *People and Planet*. Among the recipients of the Right Livelihood Award, whose acceptance speeches are in this book, are Petra Kelly of the German Green Party, Amory and Huriter Lovins of the Rocky Mountain Institute in the U.S., High Chief Ibedul Gibbons of the island country Palau, which is struggling to maintain an effective nuclear free constitution, Wangari Maathi, of the tree-planting Green Belt Movement in Kenya, and Leopold Kohr, the Austrian economist and friend of E.F. Schumacher. Others include Bill Mollison of the Permaculture movement, and Hassan Fathy, the Egyptian author of *Architecture for the Poor*. There are several more among the speakers but here we want to focus on the address of Mike Cooley, who represents the Lucas Aerospace Combine Shop Stewards Committee, which has been working from within one of the largest multinational corporations in the world.

This requires explanation. The editor of the book, Tom Woodhouse, says:

Lucas Aerospace is part of Lucas Industries and was by the early 1970s the largest single

manufacturer of aircraft systems and equipment in the United Kingdom. About 50% of its work was directly concerned with the manufacture of military aircraft. The Lucas Combine Committee was formed in 1969, to unite and represent the various groups of rank and file workers from the ten major trade unions in the seventeen Lucas factories throughout the United Kingdom. In the course of their activities during the mid-1970s, the Lucas workers developed an approach so new within the labor movement that it has continued to have an inspirational effect, not only in the UK, but throughout the world. In 1976 the workers produced a statement of their objectives in the form of a Corporate Plan:

"The objective of the plan is twofold. First, to protect our members' right to work by proposing a range of alternative products on which they could become engaged in the event of further cutbacks in the aerospace industry. Second, to ensure that amongst the alternative products are a number which will be socially useful to the community."... While the Lucas workers did not succeed in persuading the management of Lucas to implement their ideas, the concept of popular planning and workers' plans has become part of the currency of debate among trade unions and others seeking to extend the idea and practice of social control and design of new technologies.

What is most striking and interesting in Mike Cooley's address is the underlying maturity and spirit of what he says. These qualities, with an exception or two, are in marked contrast with the hard-headed pragmatism of the Americans in considering such problems. Only a few of the Americans would sympathize and agree with Cooley. He says:

The science and technology of the military industrial complex, in which I've worked for twenty years, can now produce guidance systems so incredibly sophisticated that we can aim a missile system on to an entirely different continent with a degree of accuracy of a few millimetres, but the blind and lame in our society still stumble across roads in rather the same way as they did in medieval times. We have got recognition systems which can identify an enemy missile thousands of miles away, but we are incapable of recognizing the real enemies in our midst: the squalor, the disease and the filth which results in something like six hundred million people throughout the planet starving. . . .

It is a measure of the depravity of the whole value system of our society that in countries like Britain fifty per cent of our scientists and technologists spend their lifetime working on weapon systems, which they know in their heart of hearts would, if they were ever used, probably mean the end of humanity as we know it.

Even when we get the so-called spin-offs from the military industrial complex, we end up with something as sophisticated as Concorde. Yet that very same society allows old pensioners to die of hypothermia, because they cannot get a simple, effective heating system. The spin-off from the guidance systems and the communication networks for the missiles have meant that we can send messages around the world in fractions of a second, but it now takes longer to send an ordinary letter from Washington to New York than it did in the days of the stagecoach. By using some of the most advanced interactive graphic techniques from the aerodynamic side of the armaments industry, we can optimize car bodies so that they are aerodynamically stable at about 180 km.p.h. when the average speed of a car through the center of New York is now 11 km.p.h. It was 16 km.p.h. at the turn of the century when they were horse-drawn. It was in an attempt to reverse this sad history that the Lucas workers drew up the corporate plan.

These realizations were part of the perspective of the Lucas Combine Shop Stewards Committee, which "links together the highest level technologists in the company with the people on the shop floor." The organization was in some sense unique: "Thus you have in one organization the analytical power of the scientist and the technologist linked together with what in my experience is more important: the common sense of people who work on the shop floor." They began with a practical program of trying to save plants destined to be closed, but utterly failed in this. As Cooley says:

So we were totally defeated. I think it is important when you've been defeated either in your private life or in your community or in whichever group you belong to, that you look realistically at that defeat, and you analyze it and see how you can handle it more creatively next time around. In the discussion arising out of that disaster, one worker asked an elegantly simple question. He said, "Why can we not use the skills and abilities that we've got to meet the

interests of the community as a whole? Why can we not produce socially useful products which will help human beings rather than maim them?"

This idea became the program of the planners and experimenters of the Shop Stewards Committee. After they had wasted some time asking the advice of various "experts," they sought the counsel of their own work force as to what "they thought they could and should be doing." This was through a questionnaire which they prepared without following the suggestions of sociologists who told them to be sure "that the consciousness of the person filling it in is not changed."

We sought to do precisely the opposite. We deliberately structured the questionnaire so that those filling it in were caused to have their consciousness turned right on its head. We asked them to think of themselves in their dual role in society, both as producers and as consumers, so that we transcended that ridiculous division which suggests that there is one nation that works in factories, offices and schools; and an entirely different nation that lives in houses and communities. We said that what you do during the day should be relevant to the way that you and your family would hope to live for the rest of your life.

Within six weeks, we had an incredible outpouring of creativity.

They developed 150 product proposals which fell into six product ranges. Mike Cooley describes several of these products, one of which is a "hybrid power-pack for cars, coaches, or trains," which combines an electric motor with a gas engine that is much smaller than usual. The electric motor has great power for starting, but much less power is needed for running the vehicle. They used bolt construction, enabling owners to do their own repairs. Such cars would run for twenty years with repairs by the owner, the machine using 50% less energy and reducing toxic emissions by 80%.

The problems of the world, in short, are in no sense technological. They lie in attitudes of mind.

REVIEW

A MYSTERIOUS GENIUS

THE story of Srinivasa Ramanujan, one of the greatest mathematicians of all time, was told in *Science* for June 19, 1987, by Gina Kolata, in the news section of that magazine. A meeting was held last June to celebrate the centenary of Ramanujan's birth in 1887, attended by a number of eminent mathematicians, scholars who are trying to place his work in the context of modern mathematics. Why is this Indian who died at the age of thirty-two so highly regarded? Because, as someone has said, he was more than an "ordinary" genius. He was a "magical genius," meaning that few or no one has been able to grasp how his mind worked and where he got his ideas. Gina Kolata relates:

Ramanujan was born in 1887 in the town of Erode, in southern India, and grew up in the nearby town of Kumbakonam, where his father was an accountant for a cloth merchant. Although his family was of the middle class, he was actually very poor. Ramanujan, his brother, and his parents lived in a one-room adobe home. His entire mathematical education seems to have been gleaned from only two books, and these were books that mathematicians would not even give today because they are not particularly good. . . .

When he was 12, Ramanujan borrowed the first of these math books, S. L. Linney's *Plane Trigonometry*, from an older student and read straight through. The book, according to Ramanujan scholar and mathematician Bruce Berndt of the University of Illinois at Champaign, contained more advanced math than its title would indicate. It included, for example, logarithms of complex numbers, infinite products, and infinite series.

At age 15, Ramanujan went to a government library and borrowed the second book—one by G. S. Carr called *Synopsis of Elementary Results in Pure Mathematics*. It was an unusual book and one that gave Ramanujan his unorthodox idea of how to present mathematical results. Carr was a tutor at Cambridge University in England, and his book was essentially a list of results that he went through with his students. As many as 6000 mathematical theorems were stated, but almost never proved. Carr did give an extensive list of references but these "would have been useless to Ramanujan because he had no access to a library that contained them," says Richard Askey of the University of Wisconsin in Madison. The lack of proof apparently did not bother Ramanujan. He simply worked through the book, presumably supplying the proofs on his own.

Ramanujan completed high school and tried twice to obtain a college education. But he failed both times because he was so obsessed by mathematics that he simply could not bring himself to spend any time on other subjects. In 1909, when he was 22, he married 9-year-old Srimathi Janka and took a clerical position in the Madras Port Trust Office to support her and his mother, who lived with the young couple. While he worked as a clerk, Ramanujan continued to pour out math results, using excess wrapping paper from the office to scribble down his formulas. He was so obsessed with his mathematics, in fact, that he did not want to stop to eat. His wife, who is still alive, told Berndt that she and Ramanujan's mother used to feed Ramanujan at mealtimes so that he would be free to continue writing while he ate.

This fascinating tale of the brief life of a genius goes on. Fortunately, the two men he worked under at the office were engineers who recognized his extraordinary mathematical talent. One of these men was an Englishman, the other an Indian educated in England. Both encouraged Ramanujan to send some of his work to English mathematicians. This he did, with at first no response. Then he wrote to G.H. Hardy of Cambridge University.

This changed both his life and Hardy's. The story continues:

Hardy opened Ramanujan's letter, read it, and put it aside, not certain what to make of it. It was crammed with as many as 60 mathematical theorems and formulas, stated without any proofs. That evening, Hardy went with his colleague John E. Littlewood to the chess room at Trinity College of Cambridge University. Hardy showed Littlewood the strange letter he had received from Ramanujan and said he could not decide whether Ramanujan was a crank or a genius. Hardy declared that Ramanujan's results must be true, because "if they were not true, no one would have had the imagination to invent them."

So Hardy wrote to Ramanujan and invited him to come to England to study with him. Ramanujan accepted and arrived at Trinity College in April of 1914. For the next 3 years he "pitted his brains against the accumulated wisdom of Europe," Hardy said. And Ramanujan was successful. At Cambridge, he derived outstanding results in number theory in particular. Littlewood, in describing Ramanujan's work, wrote, "There is hardly a field of formulae, except that of classical number theory, that he has not enriched, and in which he has not revealed unsuspected possibilities. The beauty and singularity of his results is entirely uncanny."

But unfortunately, working in England, his wife in India, Ramanujan had no one to watch over his eating and to care for him. It is said that he would work long hours—24 or 36—and then collapse and sleep for 12 or more hours. He cared much more for mathematics than for either eating or sleeping. Moreover, he was a vegetarian and found it difficult in those days to find food that suited him. Finally, he had rice sent to him from India. Then, in May, 1917, he came down with a "mysterious illness" which some supposed to be a vitamin B-12 deficiency caused by his diet in England. He returned to India in 1919 and died there a year later.

It would be interesting if we could somehow explain the importance of Ramanujan's work, but we have only the language used for this purpose by the mathematicians, which is jargon for the ordinary reader. Early in her account Gina Kolata remarks that his work is meaningful for the mathematicians of the present, since he "touched on some very fundamental problems in number theory and analysis." Then she adds:

But it was somewhat unexpected that his results are so relevant to problems he could have known nothing about—string theory in physics, for example, and fast algorithms in computer science. It also was surprising to see how many people were touched throughout their professional lives by Ramanujan—everyone from theoretical physicist Freeman Dyson of the Institute for Advanced Study in Princeton to number theorist Paul Erdos of the Hungarian Academy of Sciences.

Ramanujan, wrote mathematician G. H. Hardy of Cambridge University, was "a man whose career seems full of paradoxes and contradictions, who defies almost all the canons by which we are accustomed to judge one another, and about whom all of us will probably agree in one judgment only, that he was in some sense a very great mathematician."

Speaking of his own career, G. H. Hardy describes his student years at Cambridge, saying that there he found out what it meant to be a "real mathematician." He then says:

I wrote a great deal during the next ten years, but very little of any importance; there are not more than four or five papers which I can still remember with some satisfaction. The real crises of my career came ten or twelve years later, in 1911, when I began my long collaboration with Littlewood, and in 1913, when I discovered Ramanujan. All my best work since then has

been bound up with theirs, and it is obvious that my association with them was the decisive event of my life.

This is quoted from Hardy's book, *A Mathematician's Apology*, published by the Cambridge University Press in 1941.

Ramanujan was incredibly prolific. Even during the last sickly year of his life back in India, according to his widow, he filled a trunk with papers on which he had scribbled his results. During his funeral, a University of Madras mathematics teacher came to his home and took all of his papers. Berndt suspected that these papers might be piled somewhere in the Madras University library, but the librarian says they are not there. Berndt, the mathematician and Ramanujan scholar at the University of Illinois at Champaign, says that for the past ten years, he has as a labor of love been attempting to provide the proofs of Ramanujan's theorems.

He [Berndt] feels, he says, somewhat the way mathematician George Polya did in 1925 when he came to England to visit Hardy. Polya asked Hardy if he could see Ramanujan's first notebook, and Hardy loaned it to him. "A day or so later, Polya returned the notebook in a state of panic," Berndt says. "He said that as long as he held on to the notebook, he would continue to try to prove the formulas in it. The notebooks were so fascinating that Polya was afraid that if he kept them, he would never again prove any result of his own."

Speaking of the conference last June at the University of Illinois, Gina Kolata writes:

More and more often, said the conference participants, mathematicians are finding that their clever new ideas were discovered first by Ramanujan. In fact, William Gosper of Symbolics, Inc., in Palo Alto, California, called his talk "Ramanujan as Nemesis." "How can we all love this man if he is forever reaching out from the grave and snatching our neatest results?" Gosper asked. Gosper recently devised a new computer algorithm to calculate the number pi to 17.5 million digits. But over and over again, he found that his best ideas were already discovered by Ramanujan.

Where does such a man get his ideas? If he brought them with him, what does this suggest to us concerning his life before he was born?

COMMENTARY

LESS AND LESS WATER

FOR years, now, we have been reading and quoting passages about the Ogallala Aquifer, which waters a large part of the United States, but have never known much about its resources and its limits. It was pleasant, therefore, to come across an article entirely devoted to this subject in *Wilderness* for the Fall of 1987. The story, by Charles E. Little, begins with an editor's note which says that the Ogallala Aquifer "is being poisoned to one degree or another, though here the source of the contaminants is more likely to be agricultural practices rather than toxic waste dumps." Little writes:

At first they thought it might be a great underground river. Later it was called a lake—and sometimes still is, the "Sixth" Great Lake, with as much water as Huron or Erie, a quadrillion gallons. Only it isn't a lake either. It is an aquifer, or more exactly, a formation of water-saturated sand, gravel, clay, and caliche [a crust of calcium carbonate], the bottom of it a thousand feet deep in some places, only twenty feet in others. This is the Ogallala, named for an Indian tribe that once roamed the High Plains that lie above it.

The Ogallala underlies New Mexico, Colorado, Kansas, the Sand Hills of Nebraska and the Panhandles of Texas and Oklahoma. In these areas the water is being mined by center pivot irrigation rigs which suck up water at a thousand gallons a minute. In this way, Little says, you "see" the Ogallala, "in giant circles, stretching to the horizon." Pivot irrigation has "converted millions of acres of former High Plains shortgrass prairie into lush, low-row agriculture, pushing the corn Belt westward into the heart of the Great American Desert."

The first of these center pivot devices was patented in 1952. Today there are 150,000 deep irrigation wells tapping the Ogallala, most of them operating center pivot rigs.

In 1935, Woody Guthrie, then twenty-three, mourned the disaster of the terrible dust storms which swept up thousands of tons of dust from as far away as the Dakotas and spread it over the southern states. All across the Panhandle, Little says, "animals died of asphyxiation, as did babies and small children whose mouths and noses became

clogged with dust—somebody's topsoil." Guthrie wrote "Dusty Old Dust," later known as "So Long It's Been Good to Know You." Little writes:

What happened next was the deep-well turbine pump, the center-pivot irrigation system, and the energy to run them that was supplied courtesy of the Rural Electrification Administration and the new natural gas pipelines. In the short span of fifty years, thanks to this remarkable technology, agriculture in the High Plains tapped the riches of the Ogallala and went from dusty disaster to astonishing wealth.

And now it is on its way back to disaster again, or at least so some believe. In recent years, the Ogallala's waters have been pumped out so fast that some farmers have had to redrill their wells every year. Many of them just go broke. In a sizeable area, the Ogallala's "overdraft" has reached 95 per cent, which is to say for every gallon of water pumped out, only a teacupful is restored by the natural processes of aquifer recharge.

How long did it take to accumulate the water in the Ogallala? Mr. Little answers this question:

The whole process—to build the mantle of water-saturated geological debris that is the Ogallala, and then to overlay it with hundreds of feet more of soil from "the perishing rivers," as historian Prescott Webb put it—took about ten million years to complete. Now it would seem that in parts of the High Plains the Ogallala's water may be all used up in less than one hundred. . . .

When a Texas farmer pumps water from a deep well, the deficit is permanent. In Colorado and Kansas the problem is almost as bad, with water tables dropping routinely two or three feet a year, sometimes as much as ten in some places in a dry season. The rule of thumb is this: for every acre of land irrigated to an aggregate depth of 12 inches in a year, the water table will drop five to six feet.

Are there any solutions? Little names some. Farmers who can afford it are installing "drip-irrigation" that uses only a fraction of the water once required. Other farmers are planting less thirsty crops, such as milo and sunflowers instead of corn and beans. Little thinks we might well begin to take the advice offered on arid range management by John Wesley Powell a century ago, and an Oklahoma man has proposed to let the land go back to the grassland it was originally—"a prairie equivalent of the national forests." There seems general agreement that we should have the land become what nature intended it to be—a desert or semi-desert, resistant to agriculture.

CHILDREN ... and Ourselves

A GROWING MOVEMENT

UNDER California law, no distinction is made between teaching children at home and private schooling, so that parents have no great difficulty in teaching their own children if they declare their homes to be private schools and file a lengthy affidavit once a year. The parents need not have teaching credentials. But they are expected to conform to the curriculum of the public schools and keep comparable records. In the *Santa Barbara News-Press* for June 30, Marcia Heller contributed a long article about home schoolers in Santa Barbara county, describing the views and practices of a number of mothers and fathers who are home schoolers. While officials estimate that statewide there are some 1800 families that home-school, they believe that there are 28 families in Santa Barbara which are home-schooling. Frank Schultz, superintendent of the Goleta Union School District, adjoining Santa Barbara, has said that the district "has no problem with home schools as long as they register properly with the state as private institutions."

School officials vary in opinion. Some say that parents are unable to provide children with the opportunities afforded by the public schools, while Schultz, for one, is quoted as saying: "We don't want to become missionaries for public education, if parents feel they would rather teach their children." Marcia Heller observes that Jerry Crow, a Ventura attorney who has successfully defended two home schoolers in Santa Maria County, maintains that "more districts in Southern California are becoming more flexible," while "the more dogmatic and authoritarian the districts, the less home schoolers will cooperate."

Suzanne Swanson, a Goleta home-schooler, teaches her six-year-old daughter, Annie, at home. Annie, Marcia Heller says, "is one of a growing number of Santa Barbara County children who are being schooled at home. The parents even have

their own support group—Homesteaders—and publish their own newsletter." She goes on:

Parents choose to be their children's school teachers for a variety of reasons, but imparting moral values that are compatible with their own seems the most important.

Parents are worried about outside influences and pressures on children in public schools. Many parents—even without benefit of a teaching certificate—believe they can give their youngsters a better education than public or parochial schools.

"Everything I believe in my heart is home schooling," said Suzanne Swanson, who last year taught Annie at home. In the fall, she will be home-schooling her second eldest child, Emily, as well. (She and her husband also have two younger children, Amanda and Kate.)

"It's not just home school. It's life learning," Suzanne Swanson said.

While Mrs. Swanson and other parents like her, according to Marcia Heller, "are steadfast in their commitment to home schooling, they have been teaching in an atmosphere of secrecy for fear their work may be met with a court challenge from local school officials."

Some parents, such as a Carpinteria mother who asked that her name not be used, say they want to cooperate, but they are unsure of what is required. She has been teaching her two teen-age daughters for two years.

"I feel strongly about my rights and about doing things correctly, but it's still a little scary not knowing what would happen," she said. She has filed the proper affidavit but is worried her record-keeping of the girls' studies is not as precise as it should be. "Everything I teach them I try to put down as school work so we have enough courses," she said. "I look at what the public schools are doing but I want to use my own curriculum."

The Swansons have recently subscribed to a \$100-a-year insurance plan offered by the Home School Legal Defense Association, a Washington, D.C.-based group. The coverage affords them legal representation in the event of a challenge.

The *News-Press* writer gives the attitude of some of the parents:

"My theory is you facilitate learning when it happens," says Swanson, who has a bachelor's degree in psychology and master's in counseling education. "One day they'll want to write their names. But then it will be a really natural thing because they are interested. Some kids just aren't interested until they're seven.

"Some kids need to work out being kids."

All the families do have a structured schedule for their children, including a summer break. The schedule is less stringent than that of public schools. Many see themselves continuing their children's educations at home through their high school years; however, they do envision their children attending colleges.

Marcia Heller reports on another mother:

Kathy Battson, of Goleta, who has home-schooled her daughter, Ciara, 7, for three years, also subscribed to the idea of holding off the three R's until a child is 7 or older. At age 5, Ciara's curriculum included Bible study, gardening, kitchen skills, cooking—which incorporates counting and measuring—and combined science and nature studies, said her mother, who has a bachelor's degree in elementary and handicapped education and psychology. "There were no academics unless Ciara asked," she said.

Battson cites several reasons for putting off formalized book studies, from lack of emotional maturity and reasoning power to the inability of young eyes to adapt to the close focusing needed for bookwork.

"I was a little reluctant to postpone the academics," admitted Ciara's father, Art Battson, who serves on the board of his church school. "I wanted her to speed up but I remember she exhibited a lot of reluctance at my attempts to coax her into reading at age 6."

Kathy Battson said the research she has found shows a child who starts reading later tends to catch up and surpass the earlier reader. "The only real testing I've done is in spelling and Ciara's at fourth grade level," Mrs. Battson said.

Concerning the issue of testing, Mrs. Battson said that national standardized tests are available for children at home. However, the more informal way that parents measure their children's progress is by the grade-level textbooks the students are using.

Annie Swanson is reading at fifth or sixth grade level, her mother said.

On the matter of costs, the *News-Press* writer says:

Home schools often operate on a shoestring. The Battsons figure they spend about \$150 a year on texts and curriculum guides. Swanson finds the Santa Barbara area's abundant garage sales a good source for books and local libraries are invaluable.

As to social life and contacts, Mrs. Swanson says she gets together with friends on a regular basis. "If you have five good friends it's better than having 50 friends," she said. She also thinks there is too much emphasis on children being with other children.

The Carpinteria mother said her girls have more self-esteem since they left public school and, consequently, more friends. Her 13½-year-old daughter said she misses her friends at school but finds them somewhat envious of her. "They think I'm lucky because I get to stay at home but mom is harder (than public school teachers). I have a lot more homework and when I'm not doing that, she makes me clean my room."

On the other hand, she said, "If I had a question about schoolwork, it was easy to ask because she was my mom and she explains things more."

"Each home-school family varies (in the way it runs its program)," said Mrs. Swanson, "but what could be more ideal than to have everybody in the family interested in the child's education."

Among people with such qualities and interests, the home-schooling movement is really growing.

FRONTIERS A Growing Menace

IN 1962, in *Silent Spring*, Rachel Carson wrote:

The contamination of our world is not alone a matter of mass spraying, indeed, for most of us this is of no less importance than the innumerable small-scale exposures to which we are subjected day by day, year after year. Like the constant dripping of water that in turn wears away the hardest stone, this birth-to-death contact with dangerous chemicals may in the end prove disastrous. . . . Probably no person is immune to contact with this spreading contamination unless he lives in the most isolated situation imaginable. Lulled by the soft sell and the hidden persuader, the average citizen is seldom aware of the deadly materials with which he is surrounding himself; indeed he may not realize he is using them at all.

This passage from *Silent Spring* is quoted by Samuel Epstein, M.D. and Shirley Briggs in the June *Environmental Reporter*, in an article which proposes what Rachel Carson would say if she were writing today.

The objects of her landmark book were to draw attention to the global dissemination of new synthetic chemicals and to express concern as to their potential adverse effects. Like Darwin and other pathfinders, Rachel Carson had to gather a vast amount of information and synthesize it into a coherent concept of the natural world, using popular imagery and language. She is properly credited with making ecology a household word, explaining the intricate complexities of our natural world, and warning of its fragile susceptibility to mindless human intervention. This helped produce the broad public understanding that sustained the environmental movement.

Rachel Carson would have seen her premonitions more than vindicated if she were alive today. In general, such vindication is reflected by the overdue realization that the chemical industry is a runaway technology. More specific vindication is reflected by the exponential increase in production and use of synthetic organic chemicals since the dawn of the petrochemical era; increasing cancer rates and other evidence of exposure to toxic and carcinogen petrochemicals; the irresponsibility and intransigence of the chemical industry to regulation; the unresponsiveness of government; and the indifference or tacit acquiescence of the scientific community to

the new era of microchemical pollutants. The developments that Rachel Carson would so gladly have welcomed have been the evolution of the public interest movement and the growth of grass roots activism.

The four pages of this article are given to listing the multiplication of petrochemicals, many of them still untested for "long-term toxic, carcinogenic, mutagenic, and teratogenic effects, let alone for ecological effects." The production of pesticides rose from 124 million pounds in 1947 to 638 million pounds in 1960, while the Environmental Protection Agency (EPA) now reports that "1.4 billion pounds were produced in 1985."

Petrochemicals are now ubiquitous and embrace a very wide range of products including drugs, pesticides, and solvents. Gradually, a pervasive mindset has developed in the public that the use of highly toxic materials is somehow required for our current lifestyle. . . . The petrochemical products have replaced products that were previously manufactured from natural materials such as wood, glass, and fiber. The natural products were gradually priced out of the market on the basis of purchase price. The market price of the petrochemical products, however, does not include externalized costs, which are discounted and not reflected in the annual budget of any industry but are passed on to society. When externalized costs such as increasing cancer rates and contaminated ground water are factored in, then synthetics are no longer cheaper than natural products.

The attempts of the EPA to regulate pesticides and other contaminants are often ineffectual by reason of the "stalling strategies by the chemical industry, through lawsuits and political pressure, and by the Reagan Administration's drastic reduction in already inadequate agency funds."

If a pesticide intended to kill insects or fungi happens also to kill plants, this may be discovered only by accident, not by prewarning tests. EPA was established with the understanding that we are all basically dependent on the health of our whole environment, as Rachel Carson demonstrated. The point needs to be made again.

We turn without further comment from this paper to a pamphlet issued earlier this year by the

Gandhi Peace Foundation, *A Gandhian Approach to Technological Wonders for the 21st Century*, by T. S. Ananthu. The writer, Ananthu, is working toward the possibility of the emergence of "a new kind of science which would be compatible with spirituality." He shows in his discussion that already there are a few eminent scientists who are already working in this direction, enabling him to ask:

Could it be that technologies which are based on a posture in which man attempts to confront and conquer nature will have to give way to technologies in which man humbles himself before nature, cooperates with it and gives it the status of a life-giving, life-preserving Mother? . . . If so, how will we go about the task of reshaping our technological scenario along lines that Gandhi would have approved? Would such a step amount to "going backwards," or to abandoning the scientific outlook? . . .

Gandhi minced no words in condemning "present-day civilization," and termed his *Hind Swaraj* (a small book that contains the quintessence of his ideas) "a severe indictment of modern civilization." However, to term Gandhi's approach a *Limits to Growth* one, carries with it the danger of a gross misunderstanding. True, he was against the kind of materialistic acquisition that has become the norm of life these days. Equally true, he himself practiced simplicity and austerity to such an extent that we can visualize him only as one clad in a loin cloth, living in a hut and leading a frugal life. But he chose this life-style because he was the representative of a people whose poor could afford no more, and not because he expected everyone to convert to this style of living.

A careful reading of this pamphlet may nevertheless bring the reader to see that there is indeed scientific insight behind Gandhi's ideas, that the moral factor in action has in its own way the weight of both natural and moral law, although working on a different time-scale. Ananthu presents a mode of thinking that is now required of the industrialists whose activities have the effect of poisoning the world.