kind of generalship blunted by short tenure, misdirected effort and triviality. Tomorrow's generals will, like their predecessors, live by fear and lead by fear. And because they are sacred cows, they will be content.

But we should not be. The Army is a remarkable institution and, for now at least, will survive in spite of its generals. But it will not survive indefinitely. Nor will the other services, which choose and employ their top leaders in much the same way.

The first step is to deprive generals of this sacred-cow status and examine them, their selection, their performance with a fresh and critical eye. This calls for external pressure, which will not come unless the public reverses its deepening post-Vietnam indifference to military affairs. More important, citizens must realize that *Seven Days in May* generals are fictions, but weak and ineffectual generals are only too real. A nation that deludes itself into thinking it can buy a strong defense while ignoring the custodians of that awesome machinery is in a situation that should make us all afraid. □

GETTING CANCER ON THE JOB

LARRY AGRAN

In April 1973, Joseph Fitman's doctor told him he had lung cancer. A few days later, he underwent a radical left pneumonectomy—the removal of his left lung. Recovery from the surgery was very slow, difficult and imperfect. At 63, after more than four decades of industrial labor, Joe Fitman was finished as a productive worker.

Now, two years after his cancer operation, Fitman is alive but not well. He sees his life in narrowly measured terms:

> I can't do too much. Mostly I just watch TV or walk to the patio and sit down. I tried to work, but I just can't, 'cause I'm fightin' so many things. If I do too much, I wind up goin' to the hospital, an emergency. I get the feelin' like if you ran around the block, stopped, sat down—you'd be takin' deep breaths. Well that's my problem. I get spells where my air was bein' shut off and I feel I'm not gettin' oxygen, and I found myself struglin' for some air.

Statistically, Joe Fitman's case is one of more than 600,000 new cancer cases in the United States in 1973. But upon analysis, it becomes evident that his cancer was not an inexplicable, unpredictable occurrence. His work history suggests a classic case of job-caused cancer. Fitman toiled for a quarter-century as a hot metalworker, first in a Pennsylvania tin mill and after that as a blacksmith in a steel mill. Long-time metalworkers who are exposed to iron oxides and a host of metallic dusts and fumes develop lung cancer at rates significantly higher than the general population. Later on, in 1958, Fitman went to work for Douglas Aircraft in Long Beach, Calif. His job was to operate a bench saw, cutting fiberglass. While he wore goggles to shield his eyes, he did not wear a respirator; unwittingly, he was inhaling millions of tiny fiberglass particles, now suspected to be a cancer-causing agent. After he was laid off at Douglas in 1961, Fitman took a job, his last one, with a Southern California plastics firm. There, daily for twelve years he handled and breathed a variety of recognized carcinogens, including asbestos, carbon black and vinyl chloride. It is impossible to say which of these agents was chiefly responsible for his malignancy, but it is reasonable to conclude that it originated with one or more of them.*

In 1973, more than 353,000 Americans died from cancer, up by almost 7,000 from the 1972 death toll. More than a decade ago, a World Health Organization committee of cancer experts concluded that a majority of human cancers could well be attributed to known environmental carcinogens. Since then, U.S. and international authorities have estimated that 80 per cent of human cancers, perhaps even 90 per cent, are environmentally induced: that is, they result from exposures to certain cancer-causing substances in the air, water and soil—at work, in the community, or in the home. To those who study such things, it is apparent that the vast majority of these environmentally induced cancers derive from direct and indirect exposure to industrial carcinogens.

In 1942, Dr. Wilhelm C. Hueper, then a research pathologist, wrote a monumental text, *Occupational Tumors and Allied Diseases*. Drawing upon studies of selected worker populations both here and abroad, Hueper convincingly established the relationship between occupational contact with certain chemicals, metals and minerals and a subsequent high incidence of cancer. In the book, he urged adoption of comprehensive preventive measures to minimize the cancer hazards faced by the industrial workforce. His words had little effect.

From the late 1940s through the 1950s, evidence mounted to support Hueper's theory. Still, despite the persuasive body of evidence, public health authorities remained, for the most part, unmoved. By this time, Hueper had become chief of the National Cancer Institute's Environmental Cancer Section and an embattled pioneer in the field of occupational cancer. In 1964, at the age of 70, he was co-author of a second massive text, *Chemical Carcinogenesis and Cancers*. There, Hueper wrote ominously of an impending "epidemic in slow motion." He noted that human cancer ordinarily does not appear until ten, twenty, or even thirty years after exposure to a carcinogen. With this long latent period in mind, he warned that the unbridled proliferation of cancer-causing substances which accompanied the frenetic industrialization after 1940 would, in time, produce a terrible cancer epidemic

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* Joe Fitman died on March 30.

in the United States. It now appears that a continuing policy of national neglect is, with the passage of time, proving Hueper right.

¶Rubber workers, routinely exposed to multiple cancer-causing substances, are dying of cancer of the stomach, cancer of the prostate and of leukemia and other cancers of the blood-and-lymph-forming tissues at rates ranging from 50 to 300 per cent greater than in the general population.

¶Steelworkers, particularly the thousands who handle coal as it is transferred to coke ovens for combustion and distillation, fall victim to lung cancer at excessive rates. Those who labor atop the hot coke ovens are most vulnerable to the carcinogenic coal-tar emissions and experience a lung cancer rate seven times as great as would normally be expected.

¶Asbestos workers, including those who mill the mineral and those who must use it regularly in construction work and elsewhere, die from lung cancer at a rate more than seven times that of comparable control groups. Mesothelioma, a fatal malignancy which attacks the lining of the lungs and abdominal organs, used to be an extremely rare form of cancer. But it has become relatively commonplace among asbestos workers, even those with short-term occupational exposures.

¶Workers who produce dyestuffs, using benzidine and other so-called aromatic amines, have evidenced notoriously high rates of bladder cancer.

¶Miners of uranium, iron ore, nickel, chromium and other industrial metals succumb to a wide range of occupationally related cancers. In the case of uranium miners, the lung cancer rate is extraordinary, accounting for upward of 50 per cent of all deaths among these workers.

¶An estimated 2 million workers, among them dry cleaners, painters, printers and rubber and petroleum workers, are exposed to the solvent benzene, a known leukemia-producing agent.

¶Another 1.5 million laborers, among them insecticide workers, farm workers and copper and lead smelter workers, are exposed to inorganic arsenic, a carcinogen which causes high rates of lung cancer and lymphatic cancer.

¶Machinists, chemical workers, woodworkers, roofers—and many more—join an ever expanding list of workers who hold jobs posing special cancer risks of one kind or another.

These developments, and others, indicate that we are in the grip of an emerging national epidemic of blue-collar cancer. Yet for decades, federal and state health agencies have treated occupational cancer as a relatively inconsequential issue. A partial explanation for this neglect might be attributed to the widely held but thoroughly misguided expectation of a universal cancer "cure," a dramatic breakthrough which would obviate the need for expensive preventive policies. But a more probable explanation is the tendency of key public health officials, frequently acting with industry spokesmen, to play down the question of occupational cancer, lest it "frighten" workers and possibly impair production.

Even today, federal policy in the area of occupational cancer is only a notch or two above the do-nothing policies of the 1940s, 1950s and 1960s. In 1970, hope rose temporarily among health-conscious reformers when Congress passed the Occupational Safety and Health Act, an ambitious measure establishing a federal framework for the adoption and enforcement of nationwide occupational health standards to assure that "no employee will suffer diminished health, functional capacity, or life expectancy as a result of his work experience." Sponsors of the legislation had reason to believe that the Department of Labor's Occupational Safety and Health Administration (OSHA), an agency created to administer the act, would give top priority to setting the toughest possible standards for protection against job-caused cancer.

No such luck. Throughout 1971, OSHA adopted no new federal standards. This was no ordinary case of bureaucratic sloth. As we now know, in June of 1972 George C. Guenther, then head of OSHA, sent a confidential memo to higher-ups in the Department of Labor, assuring these administration loyalists that, prior to Election Day, "no highly controversial standards will be proposed by OSHA." Eager to enlist the agency in the Nixon re-election drive, he stressed the attractiveness of a management-oriented OSHA as a "sales point for fund raising."

True to his word, Guenther did not offend management when OSHA finally adopted its first cancer-related work standard, a standard for asbestos exposure. Studies dating back to the 1930s had established airborne asbestos fibers to be a dangerous carcinogen, but the recent work of Dr. Irving Selikoff at the Mount Sinai Medical Center in New York brought out the shocking extent of the damage. About 18 per cent of Americans die of cancer; among asbestos insulation workers, Selikoff found, the toll approaches 50 per cent. Twenty per cent of all long-term asbestos workers die of lung cancer. Another 5 per cent die from the previously rare cancer, mesothelioma. Stomach and colon cancer account for still more of the excess cancer deaths.

Armed with this data, Selikoff and labor officials urged upon OSHA the only prudent course when dealing with a carcinogen of such demonstrated potency: adoption of a standard which allows "no detectable level" of exposure. For its part, the industry proposed a standard which would permit the prevailing death-dealing asbestos exposure levels to continue. In the end, OSHA adopted a standard which fell between the two proposals, cutting maximum exposure levels in half. OSHA thus ignored a fundamental principle of cancer prevention policy: there is no "safe level" for exposure to a cancer-causing agent. While lowering the level of exposure can ordinarily be expected to lower the incidence, anything short of a "zero tolerance level" carries the strong likelihood of excessive cancer deaths.

Quite obviously OSHA officials were attempting to balance competing interests by striking a compromise with their new asbestos standard, but the compromise is so weak in content that it will have only marginal effect on cancer rates among asbestos workers. Accordingly, it will certainly lead to still thousands more of needless cancer deaths among the several hundred thousand asbestos workers in the United States.

In early 1974, the Occupational Safety and Health Administration passed up an extraordinary opportunity to

get a firm hold on the entire problem of workplace carcinogens. The Oil, Chemical, and Atomic Workers Union and the Washington-based Health Research Group filed a petition with OSHA requesting that exposure levels for ten recognized workplace carcinogens be set at "zero tolerance." Even more important, the petition included a request that OSHA adopt a precedent-setting permit system whereby carcinogens would be barred in industrial processes unless a firm had sought and received a government-issued use permit. In that way, a manufacturer could not legally use specified carcinogens until OSHA had surveyed the work environment and certified it to be exposure-proof.

OSHA did adopt fairly rigorous standards for the ten cancer-causing substances, and for another four substances. But it rejected the all-important permit proposal, on the dubious ground that initiation of such a system was beyond the scope of its statutory authority. For the first time, an industry producing or using certain carcinogens would have been required to make a convincing showing that: (*1*) the substance was essential to its operations; (*2*) there were no appropriate substitutes of lesser danger; and (*3*) all necessary steps were being taken to safeguard employees against any exposure whatever. OSHA determined this was too much to ask.

Without a permit system, OSHA will need a veritable army to enforce even the limited number of carcinogen standards adopted to date. No such army exists. There are at present 800 federal occupational health and safety compliance officers. And, of these, fewer than 100 are technically qualified industrial hygienists. Charged with monitoring all of the abuses of the workplace—among them, noise, heat and the use of toxic but non-carcinogenic chemicals—this staff cannot pretend to police effectively the country's plants and factories.

Joe Fitman was a helpless victim of this kind of lax enforcement effort, particularly during his last twelve years as a worker when he was employed by a Southern California plastics outfit. It was with some bitterness that he described the squalid conditions of his labor:

> In a way I knew the materials I was workin' with was dangerous, but when you're up in age like me—your age is against you. You've got a house payment. You've got five kids around the table.
>
> I feel sorry for the fellas that are tryin' to hold their jobs in that place because only I know, due to my experience, how dangerous that place is to work. From my point of view, that place is filthy up there. And I just wonder, throughout this country, if the rest of the places are like that.

The Occupational Safety and Health Act took effect on April 28, 1971. But Joe Fitman couldn't remember any inspections ever taking place, either before or after that date.

A second federal agency intimately involved with the occupational cancer issue is the National Institute for Occupational Safety and Health (NIOSH). It is the research agency responsible for conducting studies and recommending workplace standards to OSHA. But while OSHA is part of the Department of Labor, NIOSH is within the Department of Health, Education, and Welfare. It was set up as a worker-oriented health protection agency and the caliber of its work has been in keeping with that purpose. Thanks to a staff of aggressive young technicians, there has never been any real problem with the quality of NIOSH's work, but there has always been a problem with the quantity. The institute is starved for funds and for personnel. Its entire 1974-75 budget for occupational cancer was a puny $1.8 million. To conduct a single study on the effects that a suspect carcinogen has had on the death rates of a defined population of workers costs $250,000 and occupies six people for at least a year. Since the equivalent of only twenty-eight full-time staff positions are devoted to these occupational cancer studies, it is obvious that only a handful of studies can be completed each year. As a result, the backlog of both recognized and suspect carcinogens not yet studied by NIOSH grows ever larger: commercial talc, mineral wool, antimony, wood dust, phosphoric acid, benzidine—there are scores of urgent studies left undone for lack of resources.

Though a relatively small proportion of chemicals induce cancers, nevertheless hundreds of commercially important compounds are known to be cancer-causing, or at least are highly suspect. And the industrial process feeds hundreds of new substances into industrial and commercial channels each year. Only the foolhardy would assume them all to be non-carcinogenic.

In years past, the cancer-causing properties of new compounds were generally not discovered until at least two or three decades after their adoption by industry. The method of discovery was a crude kind of human experimentation: counting the number of cancer victims among the dead workers to see if any abnormal trends could be detected. That was how vinyl chloride was spotted.

Vinyl chloride was first produced commercially in this country in 1939. It is an organic chemical, a gas at normal air temperature and pressure. Chemical plants convert this gas into a hard granular resin, called polyvinyl chloride, which has become the base for a cornucopia of solid and flexible plastics: food wrappings, bottles, vinyl tiles, phonograph records, water pipes, toys, car upholstery, tubing and thousands of other commonly used plastic products. The country now produces more than 7 *billion* pounds of polyvinyl chloride a year. Some 300,000 workers are involved in the chain of production—from the synthesis of the gas to the manufacture of the resin to the fabrication of the plastics. They work with vinyl chloride in its principal cancer-causing forms, and they have borne the brunt of this latest occupational peril.

Raymond P. Gettelfinger, Jr. began to work with vinyl chloride in 1954, when at the age of 22 he hired on at the B.F. Goodrich plant in Louisville. His job included operating the giant vat-like reactors used to transform the gas into resin. Gettelfinger recalls that the sweet smell of vinyl chloride was always thick in the air, but that it was worst when he and his colleagues had to climb down into the reactors and spend as many as four hours at a time cleaning and scraping the residue of the resin off the walls.

> You have a residue build-up on the wall of your reactor and in some cases you have a water residue in the bottom. When I went to work there, that was the job of the helper—to get in and take the residue off the wall, which we done with scrapers. And if there was any left

on the bottom . . . you'd pick it out with your hands—bare hands or leather gloves and your hands were wet. . . . When I began we wore nothing for protection. All we done was took an exhaust hose and stuck it in there and sucked the vinyl chloride out and we got in. . . .

Now, vinyl chloride has a characteristic that if there should be a mixture near the bottom of the vessel or reactor you were in, your feet would start feeling cold if there was much in there. Then you would know it was time to get out and see what is wrong. That, in the early years when I worked there, that was your first warning sign. . . . We didn't even—it wasn't in the safety regulations when I began working there to keep your exhaust hose in the reactor with you all the time.

It was in the mid-1960s, more than ten years after Gettelfinger joined Goodrich, that some of the workers there began to worry about the effect of vinyl chloride on their health. According to Gettelfinger:

We just got to noticing that there was just a few too many of us young men—the men working in the company, we were young men—they were losing too many guys. As we sat and ate and had our breaks, we just got to thinking that maybe there might be a little too much—too many of us guys just getting out of this world too young.

It wasn't until January 1974, that the company publicly acknowledged similar fears. Dr. John L. Creech, a Louisville surgeon who is also the plant physician at Goodrich, was alert enough to notice that three Goodrich workers had died of angiosarcoma of the liver, an extremely rare form of cancer that attacks the blood vessels of the liver. Some months earlier, industry representatives had received in secret the results of animal studies commissioned by European plastics manufacturers. They showed that rats breathing air with vinyl chloride concentrations as low as 250 ppm—250 parts per million—developed a variety of cancers, including angiosarcomas of the liver. Then, in June 1974, it was found that angiosarcomas could be induced in rats with exposures of only 50 ppm. Yet for years workers had been breathing air with vinyl chloride concentrations ranging as high as 8,000 ppm.

After what was apparently an industry attempt to withhold the animal cancer findings from NIOSH during the last six months of 1973, in January 1974, Goodrich announced the cause of the three deaths that Dr. Creech had noticed. Once the story was out, the body count began in earnest. From the beginning, interest centered primarily on victims of angiosarcoma. This type of liver tumor had previously been so rare that there were thought to be fewer than thirty cases a year in the United States. Yet, so far, at the Louisville plant alone nine workers are reported to have the disease. In other U.S. plants, another dozen victims have been found, with new cases turning up almost monthly. All but two are now dead. One of the victims was Raymond Gettelfinger; age 43, the father of six. He died on March 11.

Since a latent period of ten to thirty years is typical for this and other human cancers, it is apparent that we are now seeing just the onset of this particular outbreak of occupational cancer. Reduced exposure levels were adopted last fall by OSHA (exposures as high as 25 ppm are still permitted), but the malignant cells are already loose in the bodies of countless vinyl chloride workers, and it seems likely that during the next twenty years the liver cancer toll will climb into the hundreds. Moreover, while the victims of angiosarcoma have received the major share of public concern, the even more tragic fact is that vinyl chloride also produces less exotic cancers at alarmingly excessive rates: cancers of the lung and respiratory system at more than one and one-half times the normal expectancy, lymphoma and leukemia at nearly twice normal and brain cancer at five and one-half times normal.

Of course the industry could have done more than it did to prevent this suffering. But more important, public policy should have required more. The animal studies on vinyl chloride which were completed in Europe in 1973 should have been done in 1939, before plastics became a multibillion-dollar industry in which workers are the unwitting subjects of a vast on-the-job experiment in human carcinogenesis.

In response to the vinyl chloride disaster, and to similar but less publicized cancer episodes over the years, the new Congress will almost certainly adopt a proposed Toxic Substances Control Act. This legislation would establish machinery to require the animal testing of specified chemical compounds for their toxic and carcinogenic properties. But which compounds would be subject to testing is not all that clear. Apparently, the Congress intends to vest enormous discretionary authority with the director of the Environmental Protection Agency. Under pending proposals, the director could require the testing of any substance which he or she "has reason to believe may pose an unreasonable threat to human health or the environment."

If the Toxic Substances Control Act had been in effect ten years ago, would the government have ordered testing of vinyl chloride? Maybe yes, maybe no; at the time the evidence did not necessarily compel such a course. That is why it would be preferable if the Congress adopted a Toxic Substances Control Act which required—perhaps over a ten-year span—that *all* industrially and commercially significant substances be tested for their carcinogenicity and other destructive effects. It would be an enormous undertaking, but one more than matched by the need to gain firm control over the industrial environment. Are there other vinyl chlorides lurking out there? Certainly. Perhaps less dramatic in impact, but certainly. The tens of thousands of substances now in use make it certain that in the years ahead more workplace disasters will be uncovered.

There is yet another dimension to the menace of job-caused cancer: occupational carcinogens frequently do not remain within the factory gates. Certain of them, such as asbestos fibers, pose a distinct take-home risk. Family members are inadvertently exposed when work clothes covered with millions of tiny fibers are brought home to be hung or washed. This kind of incidental exposure has already produced a number of documented cases of the ever fatal mesothelioma. And X-rays of the families of asbestos workers have revealed excessive rates of the lung abnormalities common to the workers themselves.

Nor are the relatives of workers the only members of the community who face such hazards. Many plants pro-

during or using carcinogens pose exceptional risks to those who live nearby. In the case of asbestos, both South African and U.S. studies have related a high incidence of "neighborhood cases" of mesothelioma to exposure to fibers airborne from nearby production sites. In the case of vinyl chloride, even at this early point victims of angiosarcoma of the liver have been reported among citizens who have never worked with the substance but who have lived for some time near a vinyl chloride plant. The neighborhood victims of vinyl chloride-induced lung cancer can never be identified with any measure of certainty. Statistically, they are lost in a national swamp of 80,000 annual lung cancer deaths. Last year, plastics producers discharged more than 200 million pounds of vinyl chloride into the air. Nevertheless, according to Environmental Protection Agency officials—the EPA monitors emissions beyond the factory gates—it will be another year before the agency adopts standards to limit community exposures to vinyl chloride.

Vinyl chloride and asbestos are only tiny aspects of the community cancer question. A study of Los Angeles County cancer rates recently reported a markedly higher incidence of lung cancer among residents in the heavily industrialized south-central area. The study attributed the excess lung cancers to particularly high levels of benzo(a)pyrene, a carcinogen that is probably formed of effluents from the petroleum and chemical industries concentrated in the area. Years earlier, a similar study on Staten Island, New York disclosed that unusually high lung cancer rates in certain areas were related to wind conditions and the resultant exposure to airborne industrial carcinogens.

The indirect effect of occupational carcinogens was brought home again recently when elevated cancer rates in New Orleans and several other cities were attributed to water supplies contaminated with industrial carcinogens. Biostatisticians are only now beginning to consider the question of miscarriages among the wives of male workers exposed to carcinogens. The phenomenon was first noted among the wives of anesthesiologists who were regularly exposed to the gases present in an operating room. Now, among the wives of vinyl chloride workers, early evidence indicates a striking increase in the rates of both miscarriages and stillbirths.

In a related and highly disturbing development, two Canadian investigators surveyed the records of several hundred children who died of malignant diseases. Upon checking the occupations of their fathers at their time of birth, the investigators found that a disproportionately high number held jobs that exposed them to recognized cancer-causing agents: for example, service-station attendants, painters, dyers and cleaners working with solvents. The possibility of take-home exposure in this study looms large, since the developing cells of the fetus are known to be particularly vulnerable to carcinogens that cross the placental barrier. A second possibility, more frightening still, is that the workplace carcinogens have damaged the father's sperm cells, initiating a "carcinogenetic defect" which is then transmitted at conception, producing a child who subsequently develops cancer as a youngster.

If this society is to come to terms with the multiple horrors of occupational cancer, it must begin by discarding the distracting notion of a universal and imminent cancer "cure." Despite the more than $500 million per year spent on cancer research, there is no reason to believe that a major breakthrough is at hand. There will be no quick fix for occupational cancers, or for any other environmentally induced cancers. It is equally important that we discard the fatalistic notion that "everything causes cancer." While many widely used industrial and commercial substances are carcinogenic, the vast majority—both at the workplace and elsewhere—are in this respect harmless. The real task is to identify the agents that are carcinogens and then enforce the strictest measures to prevent human exposure to them.

If this Congress were to adopt a tough Toxic Substances Control Act, requiring the prior testing of all commercially and industrially significant substances, it would be taking an important step toward isolating workplace carcinogens much earlier than is now the case. But, if it is to be more than a gesture, the Congress must back that kind of legislation with major appropriations to the Environmental Protection Agency which will administer its provisions. Furthermore, the Congress should see to it that the chemical testing program within the National Cancer Institute is accelerated with significantly larger appropriations. Currently, the Chemical Carcinogenesis Program receives only 6 per cent of the National Cancer Institute's funds, despite the evidence that cancers are largely the result of chemical exposures.

Beyond the animal testing programs, there is the question of on-site worker studies carried out by NIOSH. Its present $1.8 million budget for occupational cancer studies is disgracefully inadequate. Just to keep from being overwhelmed by a backlog of undone studies, NIOSH needs another $10 million earmarked for occupational cancer.

The situation is perhaps most discouraging with respect to the Occupational Safety and Health Administration, the Department of Labor's standards-setting and enforcement agency. In the area of occupational carcinogens, and in other areas as well, OSHA has been a bitter disappointment during its four-year history. Perhaps by way of Congressional mandate, the agency can be compelled to adopt a use-permit system to assure the most stringent and effective controls over occupational carcinogens. Its snail-paced operations indicate that OSHA lacks the money, manpower and single-minded determination to carry out its mission on behalf of American workers. Congress can remedy the first two problems; the third will probably have to await a new administration.

When he wrote *Occupational Tumors and Allied Diseases* in 1942, Dr. Hueper began with a chapter dealing with what he called "the new artificial environment." He observed that the great medical advances of the late 19th century and the first half of the 20th century came with an understanding of the biologically destructive effects of bacteria, viruses and other microorganisms. Similarly, he argued, the great challenge for the second half of the 20th century was to recognize the cancer-causing effects of many chemicals and other substances which have been introduced at the workplace in burgeoning numbers as part of the industrial age. It was a vital message, one that has been largely ignored for thirty-three years. □