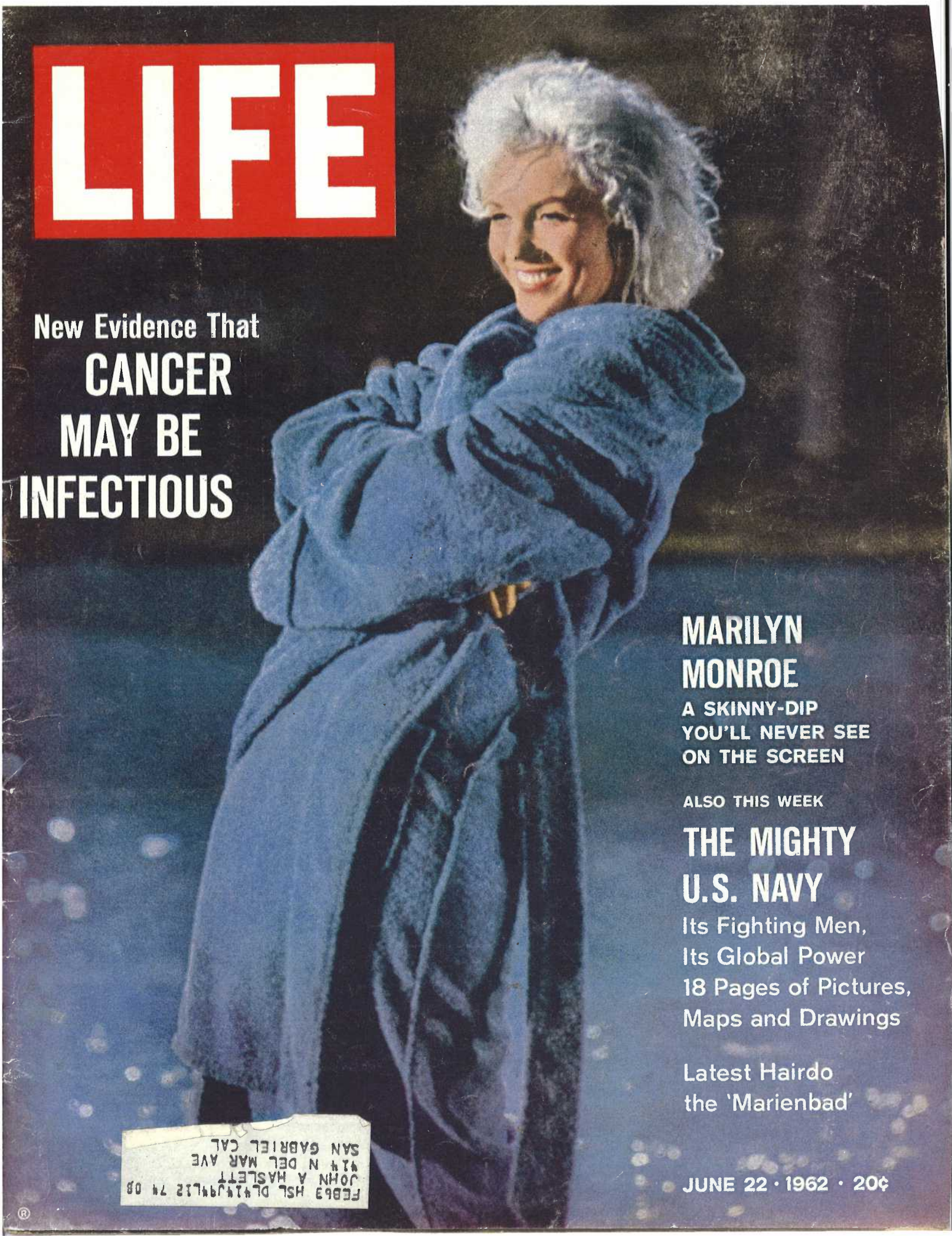


Viceroy's got the taste that's right!

Some filter cigarettes taste too strong–just like the unfiltered kind. Some taste too light–and they're no fun at all. But Viceroy tastes the way you'd like a filter cigarette to taste.

Smoke all seven of the leading filter brands, and you'll agree: some taste too strong . . . some taste too light . . . but Viceroy's got the taste that's right. That's right! That's right!

This is tobacco too mild to filter. This is pleasure too good to miss. This is CHESTERFIELD KING

21 GREAT TOBACCOS make 20 WONDERFUL SMOKES

Should a gentleman offer a Tiparillo to a lady?

What is the story of this remarkable new smoke by Robt. Burns?

If she enjoys smoking a cigarette, why not? The Tiparillo* is slim, neat, mild as mild can be. Go ahead, offer her one.

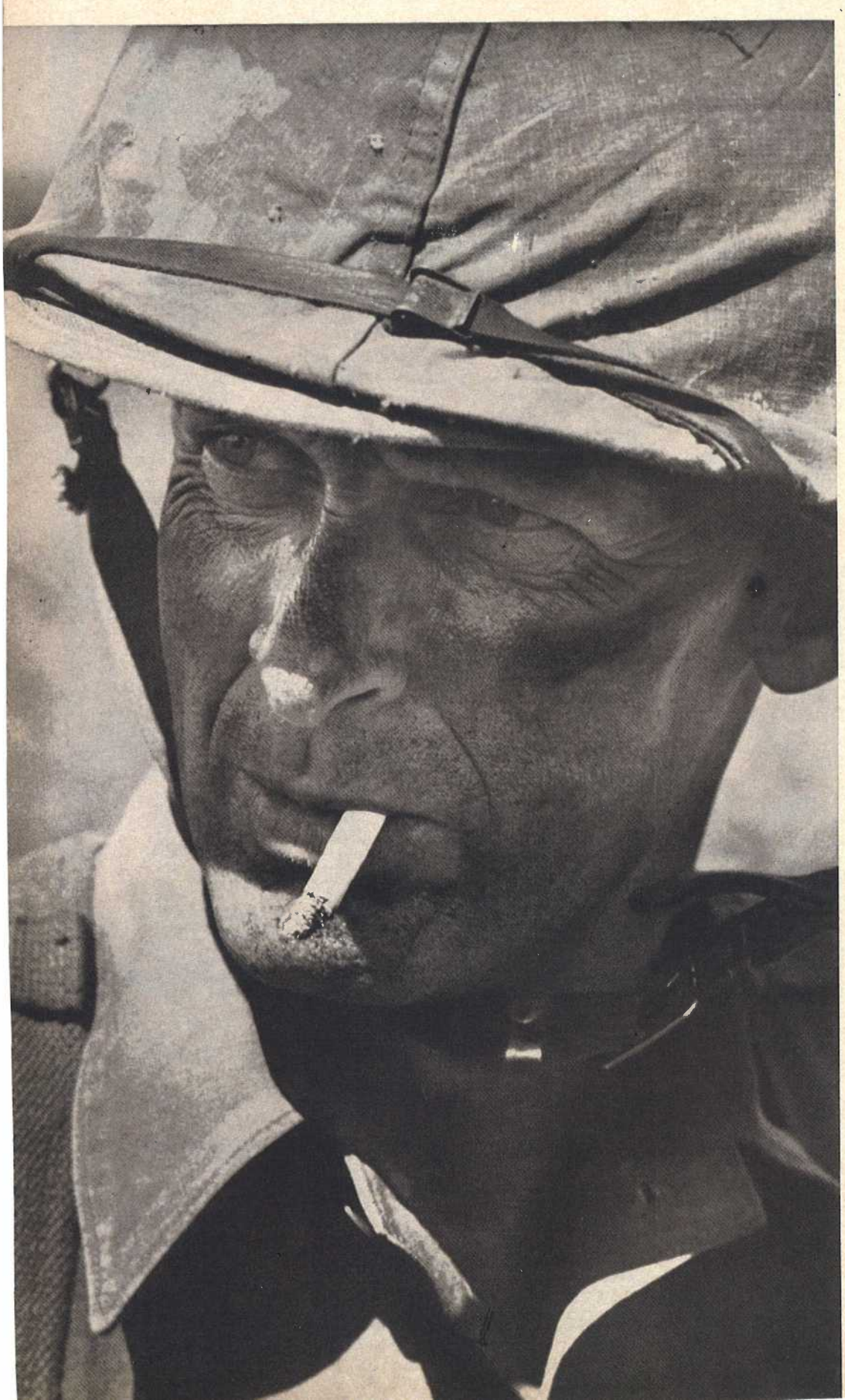
But although Tiparillo is not "men only" it is "men mainly." From tip to tip, it is a completely new and wonderful smoke. Tiparillo is mellow, smooth and so satisfying.

And that new pliable, pearly tip pays more than just lip service to your smoking pleasure. It's your mouthpiece to the careful blending of choicest imported tobaccos. Moreover, there's the exclusive veinless Ultra Cigar Wrapper* that burns so evenly and smoothly it insures complete mildness.

The surprisingly whiter ash is visible evidence of Tiparillo mildness.

And that's your best smoking tip for today. Only 5¢ each. ONLY 5¢? Yes, only 5¢. *T.M. GENERAL CIGAR CO.

THE NAVY'S INFANTRY: Always Ready



Lieut. Colonel Martin ("Stormy") Sexton commanded the Third Battalion of the Third Marine Regiment until his transfer to the U.S.

My battalion of 1,500 Marines is the ready force in the Pacific. We're on a ship and set to go anywhere any time—to act as a police force or to fight a war. Some of the experts say that the countries out here are geographically impossible to fight in, but I don't necessarily believe that. We didn't have roads on Guam or Bougainville either. The Corps' whole history is small, brush-fire, jungle-type warfare. It's our bread and butter.

Our mission is sometimes difficult psychologically. I've always maintained that it's easier to command troops in combat than in peacetime—if you're prepared. But when you're not at war and not really at peace either, all of us feel a little frustrated. For that reason all the men look forward to their time afloat. When the battalion goes afloat, it means that we have reached our peak. The men know that if anything happens they will be the first to go. And these kids are proud of that.

The troops and I are happiest when we're working our hardest. We spend at least half our time ashore in practice exercises, getting ready for the real thing. I believe in personal control of my troops. Some of the young lieutenants swear I have eyes in back of my head. I want to be everywhere and see everything, firsthand. I watch a sergeant to make sure he's keeping his men in the shade, so that no shadows will give them away. I watch the men move across an open area, carrying their weapons at the ready, not on their shoulders. I want to know why some sentry let that civilian through the defense perimeter. In time of war it might be an enemy guerrilla.

Someone asked me if I worried about command in a combat situation. I told him that if I ever did think about it, I shouldn't be here. I feel the same about my men.

I'm a dedicated Marine and I make no bones about it. It's more than a profession. My wife is still shocked when I tell her that of my two responsibilities my first is to the Marines. It has to be that way. How else could I sleep and know for sure that my men are ready?

BATTALION LEADER. Colonel Sexton is a hero of World War II (from Bougainville to Okinawa) and of Korea. His men call him "the best battalion commander in the Marines."

CONTINUED ON PAGE 72B

SCIENTISTS FIND NEW EVIDENCE THAT CANCER MAY BE INFECTIOUS

Clues to a Deadly Riddle

by ALBERT ROSENFELD

There is a certain old log-and-frame house in Sharpsburg, Md. just down the hill from the Civil War cemetery. The house was there, sitting on clay-rich soil beside a quiet stream, even as the Battle of Antietam raged nearby. Among its occupants were a boy and his two little sisters. All had been born in the house. As the years passed they grew up, got married and, one by one, moved away. Then, one by one, they all died of cancer.

A woman who moved in after them and lived there for 19 years also died of cancer. Now, in 1962, still another woman lives in the house. She moved in 14 years ago. Seven years ago she learned that she, too, has cancer.

Five long-time residents of the old house, then, have been stricken with various kinds of cancer during the current century. The odds against such frequency in a single house are overwhelming. Yet this is not the only "cancer house" among Sharpsburg's 304 homes. There are others with multiple cancer histories. And still more are sprinkled around Washington County, Md., which the National Cancer Institute has been studying for the past five years as a "Human Population Laboratory" with headquarters in Hagerstown.

The Hagerstown scientists were not looking for "cancer houses" particularly. They do not even like to use the term. They were simply putting together massive amounts of data they have gathered on scores of environmental factors that might have some bearing on the causes of cancer. The striking incidence of cancer in certain Washington County houses just happened to stand out as a statistical correlation. So did some other remarkable correlations.

A long way from Washington County, Md., in a small Illinois community, eight pupils in the same parish school have come down with leukemia during an 18-month period. Similar instances have been reported in places as far apart as Buffalo, N.Y., Cheyenne, Wyo. and Fort Fairfield, Me. In central Africa there has been a mysterious outbreak of malignant lymphoma in children. A study in New York shows a high frequency of Hodgkin's disease in certain families, and a survey in Texas indicates that women whose mothers had breast cancer have a much higher than average chance of getting it themselves.

Such reports are only a few of thousands that are pouring in from cancer researchers all over the world. As these observations come in from the field, and others even more startling from the laboratory, they stir up vigorous controversies—and vigorous probings into a variety of new research areas. This ferment has resulted in new insights into the nature of the malignant disease that kills 270,000 Americans a year. The insights, in turn, have given birth to new concepts and have brought about a great revival of interest in some very old ones, the most important and dramatic of which is the view that cancer is an infectious disease.

Strong belief that virus is the cause

This is an opinion more and more cancer researchers, especially in the virus field, are coming round to. At a national cancer meeting in Atlantic City in mid-April three full mornings were devoted to discussions of the relationship between cancer and viruses—those disease-producing organisms which are tiny enough to pass through a filter with smaller than cell-size holes and most of which can be seen only with an electron microscope.

"It is difficult to escape the conclusion," Nobel Laureate Dr. Wendell Stanley has said, "that viruses may be the causative agents for most, if not all, cancer, including cancer in man, and that this represents by far the most intellectually satisfying

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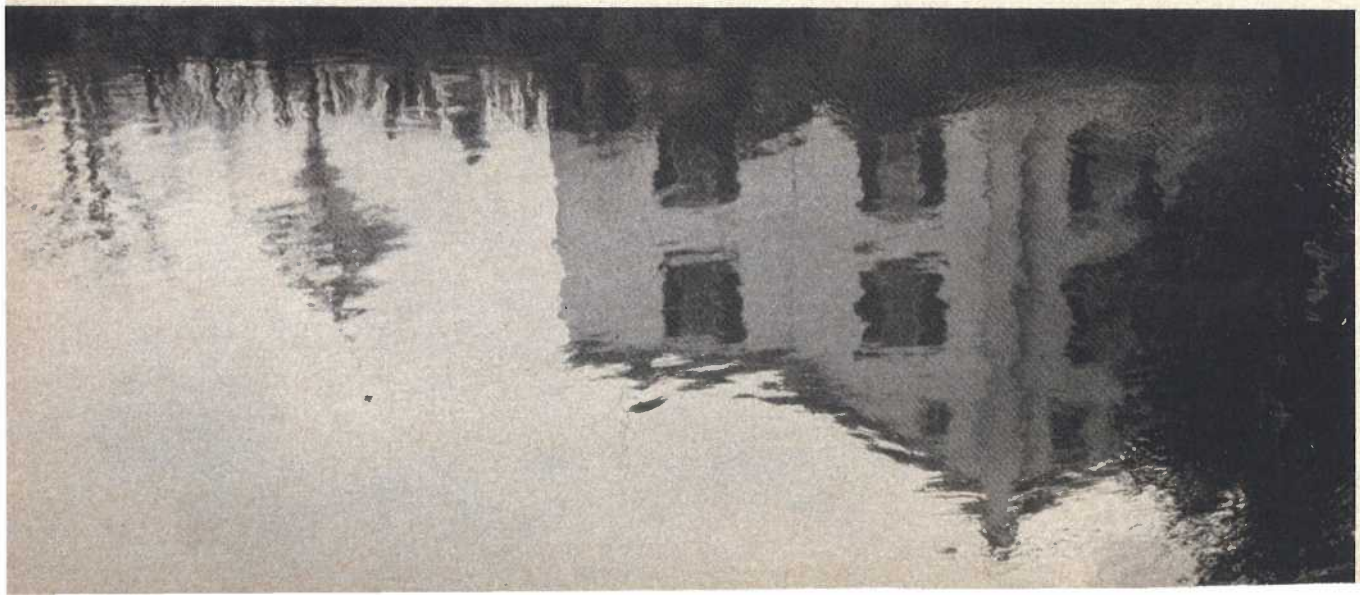


In Washington County, Md., where researchers are sifting the countryside for cancer data, case histories show up in clusters. House at left, mirrored in a small polluted stream, was one of many on its banks whose occupants had a high incidence of cancer. Dwelling above was one of two "cancer houses" near tree (foreground) *whose trunk is swollen with cancerlike galls.*

working hypothesis consistent with all presently known facts."

If it does indeed turn out that cancer is infectious, the news should inspire much more hope than fear because it would mean that cancer might be conquered through use of the same sort of techniques which have been so successful with other infectious diseases—perhaps even through anticancer vaccines.

It should be emphasized at once that "infectious" does not necessarily mean "contagious." An infectious disease is any illness caused by a microorganism such as a bacterium or virus. But it is contagious only if it can be transmitted directly from person to person. Tetanus is an example of a disease which is infectious but not contagious. And we get infectious diseases like malaria and encephalitis not from sick people, but from the bites of infected insects.

Moreover, many contagious diseases require long and intimate exposure as well as a number of predisposing conditions before they can be "caught." What we know about the slow-developing nature of cancer indicates that the contagion, if any, would be of this nature.

But if cancer really is infectious, there is a bewildering multiplicity of ways in which we might be infected. We know, for example, that a good many grain bins and grain mills are contaminated with a common mouse-cancer virus. We know that chicken leukemia is a big worry in the poultry industry. We know that outbreaks of hepatoma were only recently discovered among rainbow trout. (It used to be believed that fish did not get cancer.) We know that a certain type of virulent and fast-spreading cancer can be transmitted among dogs by intimate contact. We know that many vegetables are afflicted with cancerlike growths called galls. We know that there is an unusually low incidence of cervical cancer in Jewish and Moslem women and a correspondingly low incidence of penile cancer in their husbands—a fact usually attributed not to any genetic factor but to the practice of circumcision, which simplifies personal hygiene.

The more we know, and the more we think about what we know, the easier it is for our fears to multiply. But cancer epidemiologists offer quick reassurance. Their reasoning goes something like this: If it is true that cancer is infectious—and this is by no means considered proven—it is also true that cancer organisms apparently are so widespread that nearly all of us probably are infected with them at one time or another. The same is true of polio viruses—yet most of us do not get polio. And most of us do not get cancer.

Also, if men react as mice do, then the mere presence of a virus cannot of itself cause cancer. Other factors must come into play before the mouse becomes susceptible. Some mice are born with a built-in resistance to cancer, while others appear to develop an immunity to it later in life. No one as yet understands how the protective mechanisms operate. But the same sort of mechanisms may very well protect the three of every four human beings who never get cancer.

In any case, scientists agree that, in light of our meager knowledge today, it would be ridiculous to retreat in terror behind elaborate precautions against hazards which may be entirely nonexistent.

Even to consider cancer as an infectious disease is a radical departure from very recent concepts. Throughout most of the 20th Century the public has been constantly reassured that, whatever cancer is, it is *not* infectious. Nearly all cancer researchers have been firmly convinced that cancer is a unique disease, so different from any other that the only hope of conquering it lies in some major breakthrough in the basic understanding of the life process itself.

Cancer is indeed peculiar. Something happens to make the cells multiply uninhibitedly. The resulting "malignant" tumor cells invade and then overwhelm the better-behaved tissues which surround them, disrupting vital body functions and ultimately destroying their host. This wild, runaway growth is due to changes inside the cell itself, changes so basic that until recently very few believed they could be brought on by infection from outside.

Early claims of the microbe hunters

For any widespread attention earlier than the 1950s to the possibility that cancer is infectious, we must go back to the latter part of the 19th Century. In those days of the great microbe hunters, who devoted their lives to discovering the germs that cause diseases, there were researchers who insisted that cancer, too, was caused by a bacterium. The trouble was that their descriptions of the bacterium varied considerably. When one researcher described it as a rod-shaped bacillus, and another as a round micrococcus, how could the contradictory claims be taken seriously?

But still other evidence at the time seemed to support the theory that cancer is infectious. The existence of cancer houses, cancer neighborhoods and cancer families was revealed in studies not unlike those being made in Washington County, Md. today, except that they were conducted on a much smaller scale. These studies were made by doctors in England, France and Germany at least as far back as the 1870s. This evidence was later demolished, however, by statistical analyses, which used the laws of probability to prove that occasional houses or regions could be *expected* to have unusually high rates of cancer, and that cancer houses and the like were products of pure coincidence. Thereafter the idea that a house or a region might in any way harbor cancer was thought of—when it was thought of at all—as mere superstition.

One more important fact made it difficult for doctors to take the infectious theory seriously: there were demonstrably a great many things

TEXT CONTINUED ON PAGE 80

that could cause cancer. Chimney sweeps, for example, developed malignancies from the constant irritation of soot in skin crevices, and people working with radium and X-rays got cancer from too much radiation. Was it not an unwarranted oversimplification to think of cancer as having a single, specific cause? Some investigators even suggested that it was a mistake to class all the different kinds of cancer as a single disease. The more cancer was studied, the more mysterious and complex it became.

The excited renewal of interest in the theory that cancer may be infectious actually goes back to 1910 when Dr. Peyton Rous of the Rockefeller Institute proved that a common sarcoma (cancer of the connective tissues) in chickens is caused by a virus. He then went on to prove that two other types of cancer in chickens were caused by viruses.

After Rous's first experiments, more than a score of years went by before there was a second spurt of activity in cancer-virus research. Then, in the 1930s, a significant forward step was achieved as a result of experiments which proved that some types of cancer in *mammals—i.e.*, rabbits and mice—also were caused by viruses.

But rabbits and mice still are a long way from being people, so only a few researchers showed real interest in viruses as a cause of human cancer until the 1950s. Cancer viruses, the overwhelming majority of experts held, were simply laboratory curiosities. A memorable observation, indicative of the state of affairs during this period, was made by Dr. Charlotte Friend of the Sloan-Kettering Institute. After the skeptical reception accorded her announcement of a new mouse leukemia virus in 1956, she remarked ruefully that anyone who finds a cancer virus is believed to have either (1) a hole in his head or (2) a hole in his filter.

The burst of new activity in the 1950s began with the work of Dr. Ludwik Gross at the Bronx Veterans Administration Hospital in New York. Dr. Gross was able to induce leukemia in newborn mice with a virus. Soon Gross, as well as Drs. Sarah E. Stewart and Bernice E. Eddy at the National Institutes of Health, were causing other varieties of cancer in mice with a second virus. In fact, this second virus—now known as the polyoma (many-tumor) virus—ultimately produced more than 20 types of malignant tumor in mice and other mammals.

This was revolutionary news. Up to that time it had been believed that any one virus would cause only one type of cancer, and that virus diseases were strictly "species specific"—that is, a mouse virus would cause a tumor only in mice, a rat-cancer virus would infect only rats.

It had been demonstrated in 1942 and 1943 that the Rous sarcoma virus could give cancer to ducks, turkeys and guinea fowl as well as to chickens. And now, it turned out, the mouse polyoma virus could make malignant tumors grow in rats, hamsters and guinea pigs. To confuse matters further, a virus called SV-40 (SV for simian virus), extracted from monkey kidneys, gave cancer to hamsters—though apparently not to the monkeys themselves. Most recently, a startling report at the April meeting in Atlantic City told of inducing cancer in hamsters with a common adenovirus which, as far as we know, gives a man nothing worse than a respiratory disease.

Research findings in still other areas have added considerably to the acceptability of the virus hypothesis. Techniques have been developed, for example, which make it possible to watch viruses in the very act of causing malignant changes in cells kept artificially alive inside test tubes.

How a virus does its dirty work

New knowledge about the chemistry of both the cell and the virus has eliminated another objection to the virus theory. This was the belief that a malignant growth, since it is due to basic changes *inside* the cell, could not be caused by an infection from outside. These changes take place in the cell's nucleic acids, the giant molecules that govern heredity and cell growth. Now virologists have learned that the infective heart of a virus consists of nothing but nucleic acids and that the virus does its dirty work by sneaking its own nucleic-acid core into the cell and taking over the cell's functions. Thus, in brief, it was seen that the basic changes inside the cell *could* be brought about precisely by a viral infection from outside.

It is because all these new data have accumulated in the half century since Peyton Rous did his pioneering experiments that virus research is now attracting so much attention.

Most of the remaining resistance to the cancer-virus theory—and it still is considerable—is based on two points.

One is the fact that so many things seem to cause cancer. Those who discount the virus theory readily agree that viruses can cause cancer, but they point out that this fact merely adds one more cause to a long list. Potent chemicals, heavy doses of radiation, chronic irritation, hormonal imbalance, smoking, air pollution and a variety of hereditary and emotional factors have been implicated. Often a combination of causes seems to be necessary. For example, sometimes a virus alone will not cause cancer; it will do so, however, when administered along with certain carcinogenic chemicals. How, then, can it be argued, ask the theory's antagonists, that a virus is *the* cause of the cancer?

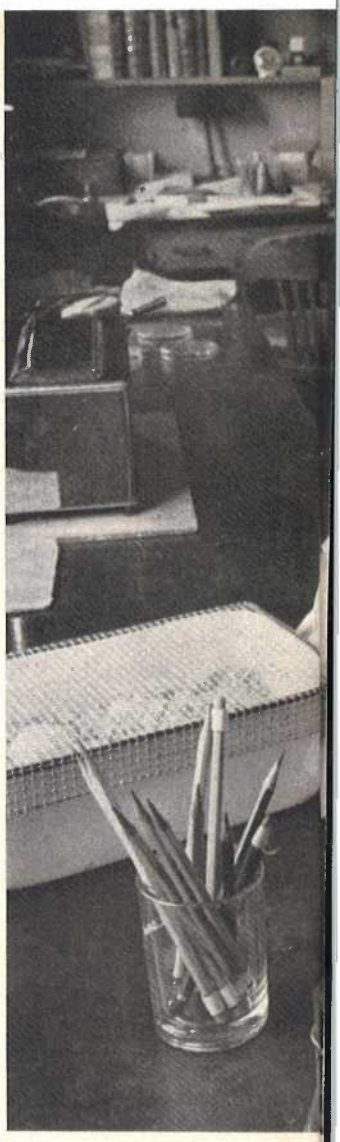
The second objection simply repeats the long-standing and unchallengeable observation that mice and chickens are, after all, not men, and where is the *proof* that a virus has ever caused cancer in a *human being?*

In 1960, Dr. Robert J. Huebner, director of the National Institute of Allergy and Infectious Diseases, was invited to give the November Harvey Lecture at the New York Academy of Medicine. Huebner used his lecture, which was entitled simply "Cancer as an Infectious Disease," to address himself directly to these two basic objections. The lecture, which has received little attention, may very well prove to be a landmark in the search to defeat cancer.

Huebner attributed the widespread refusal to accept the virus theory to an "intellectual impediment," which prevents even the best researchers at times from seeing the problem clearly—namely, their ingrained habit of thinking of cancer as a unique disease. With viruses now definitely, if still hazily, in the picture, Huebner believes there no longer is any real justification for such rigidity.

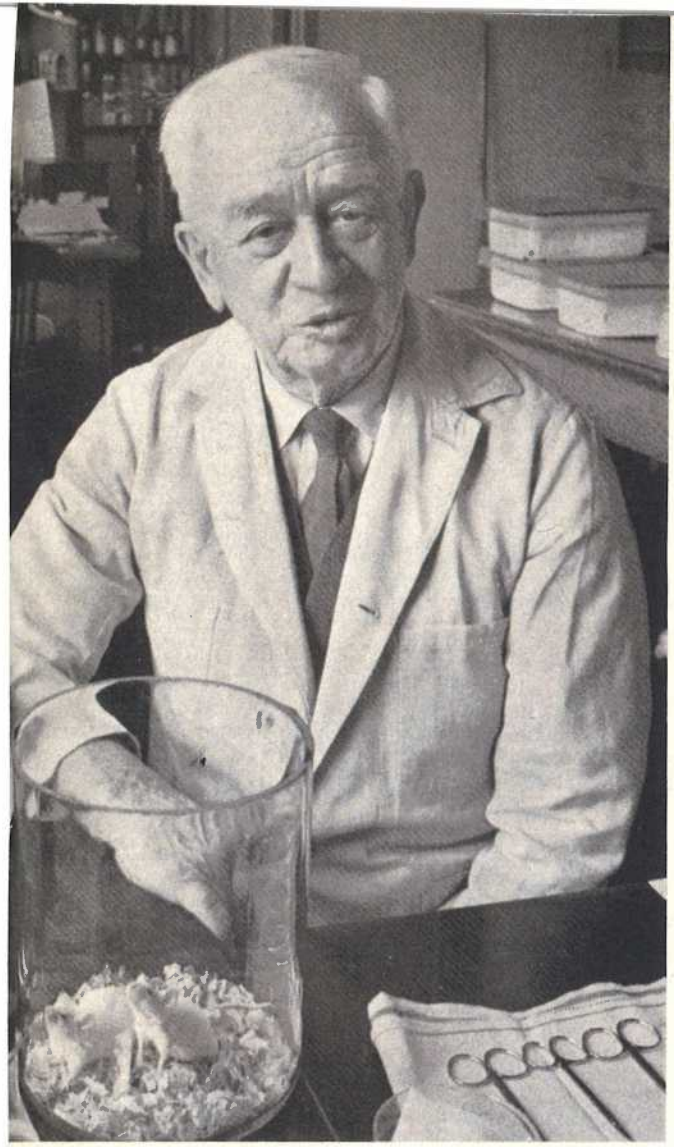
The concept of disease put forth by the old microbe hunters can apply equally well to the virus theory of cancer, Huebner insists. "The central message of the microbial theory," he points out, "states simply that a specific microbe is the 'essential' cause of an infectious disease, and that all other contributing factors necessary for its clinical expression are secondary or 'proximate' causes."

Thus, in tuberculosis, to take one example, the mere presence of the tubercle bacillus does not automatically give rise to the disease. Other predisposing factors or "proximate causes" are contributing—undernourishment perhaps, or hereditary factors, or lowered body resistance caused by some other infection. Without one or more



Tragic threads in a high school mystery

Rare and mysterious concentration of cancer victims occurred in Hagerstown High School classes of '49 and '51, five of whose students succumbed to leukemia. Three at left were in the class of '51: Peter Fritze died in 1959; Carol Fundis, in 1951; Gene Finfrock, in 1949. Patsy Ruth Miller, who died in 1957, and Katherine Widdows (right), *who died in 1946, were in the class of '49.*



Dr. Peyton Rous of Rockefeller Institute, now 82 and still active, pioneered modern cancer virus research more than 50 years ago, is acknowledged dean of the field.

of these factors, most of us can be infected with the TB bacillus yet never show any symptoms of TB. On the other hand, no combination of other factors can give a man TB *without* the presence of the bacillus. The germ, Huebner emphasizes, is the one unvarying factor in TB, and thus its essential cause.

Many cancer virologists, including Huebner, now theorize that a virus could play the same role in cancer as the TB bacillus does in TB. We know that a cancer-causing virus may remain latent for years until either it is activated or the cell is made vulnerable by the impact of radiation, by chronic irritation, or perhaps by the effect of some other virus. In any case, if it does indeed turn out that a virus is the invariably present factor in every case of cancer, then it is just as valid to call a virus the specific cause of cancer as it is to call a germ the specific cause of tuberculosis.

Having disposed, by logic, of the objection to the single-cause theory of cancer, Huebner next turned to the second objection—the absence of proof that viruses actually can cause *human* cancers. Since people cannot be experimented with as mice can, direct proof is hard to come by. Until more conclusive results are available from new human experiments just getting under way, logic must again serve. But Huebner's logic is powerful.

In his lecture he pointed out, first, the remarkable physical resemblance between human cancers and those of mice and chickens. He then cited the impressive list of animal cancers that are definitely known to be caused by viruses. Even more impressive, he said, is a table of diseases caused by the same viruses in mice, in chickens, in cattle and in men. At this stage of his developing argument, Huebner pointed out that nearly every type of virus afflicting the common house mouse also is found in man. So, Huebner concluded, if the same closely related viruses cause the same closely related diseases—hepatitis, influenza, pneumonia—in mice and men, and if mice and men get similar types of cancer, why should cancers in both not be caused by similar viruses? "Any other behavior on the part of nature," said Huebner, "would be quite out of character."

While countering the two basic objections of others, Huebner indicated that he himself had been somewhat bothered by an infrequently discussed consideration—the fact that nearly all existing knowledge about cancer viruses had come from the study of tumors that were *artificially* induced. His concern, he said, had made him eager to study spontaneous cancer—that is, cancer acquired without any prompting by man.

Settling upon the highly infectious mouse polyoma virus for their new study, Huebner and two associates at the National Institutes of Health, Dr. Wallace Rowe and Dr. Janet Hartley, had gone virus-hunting. It did not take them long to find plenty of mice that had been inadvertently infected with polyoma virus in laboratories and in commercial breeding establishments. The cancer virus, Huebner reported, "was maintained and disseminated in the laboratory by infected carrier mice which excreted the virus." Mice apparently got the infection either by breathing in the cancer virus or by eating large quantities of it.

It had been easy enough to see how polyoma might spread from mice deliberately infected with it to healthy mice in adjacent cages. But Huebner and his two associates found infected mice in laboratories where no one had worked with the polyoma virus. How did the virus get there? For a time the answer to that question remained a puzzle.

Leaving the laboratories, Huebner's colleagues began to study the common house mouse in New York City tenements. In heavily infested houses, the mice were heavily infected with polyoma. Moreover, the virus was found in the sweepings from closets, kitchen cabinets and other such areas where mice hunt and play. From these facts it was easy to figure out how the virus persisted once it got there. But how did it get there?

Ultimately, additional studies of mice on Maryland farms provided an answer of sorts. Almost everywhere Huebner and his associates looked—in feed granaries, in hay sheds on livestock farms, in cereal grain storage sections of feed-and-grain mills—mice lived and bred in quantity, and perhaps one of every four was infected with polyoma virus—about the same proportion found among the mice in the urban tenements.

Throughout most of man's history mice have thrived in grain bins. In Huebner's opinion the polyoma virus that spontaneously infects so many urban mice quite likely comes from exposure to uncooked cereal grains that were contaminated by infected mice back on the farm.

In the year and a half since Huebner gave his Harvey lecture he has intensified his field studies of the mouse polyoma virus. His own new data, combined with the new cancer-virus information now flooding in from laboratories everywhere, leave Huebner more convinced than ever, in 1962, that cancer is an infectious disease.

Most of his current surveys of mice-on-the-farm are centered in Maryland, where Huebner works closely with Dr. W. Y. Chen, the cancer epidemiologist who directs the Hagerstown project. A young virologist on Huebner's staff makes his permanent headquarters in Hagerstown, and on Dr. Chen's blackboard there is a diagram showing the possible ways in which infection might conceivably spread from mice to men in Washington County, Md.

There is nothing unusual about Washington County's cancer statistics. The cancer rate there is about average for the nation. As a matter of deliberate fact, it is a remarkably typical American county; this was a major consideration in choosing the area for study. Logically, then, the findings there should be true for almost any U.S. county.

An entire county under close scrutiny

Washington County covers 460 square miles. It has an unusually stable and unusually cooperative population of about 100,000, and it is famous for the thoroughness of its record-keeping. Five years ago the county health officer, Dr. W. Ross Cameron, who already had spent five years making cancer surveys on his own, suggested Washington County as an ideal Human Population Laboratory for the National Cancer Institute. When N.C.I. decided to take up the suggestion, a local undertaker named Andrew Coffman built to order for N.C.I. a laboratory and headquarters in Hagerstown. "I've buried a lot of people in my time," Coffman explained, in offering the gift. "I'd like to help postpone some burials."

The researchers in Washington County have included not only physicians but soil scientists, chemists, ecologists, statisticians, cartographers, virologists and epidemiologists. They have, in the words of one scientist, "put the county under a microscope," going over the entire countryside the way a detective goes over a victim's backyard for clues that might lead to the murderer. In this case the dragnet is out for cancer, which is nothing if not a murderer.

In their survey, the most massive of its kind ever undertaken, the Hagerstown scientists have gathered air samples, radiation counts, soil and rock samples. They have noted geological formations and traced slopes and contours of the land. They have systematically studied the water, the plants and the animals. They already have interviewed 15,000 families, with emphasis on each member's medical history. They have accumulated detailed maps and aerial photographs of every parcel of land in the county.

There is a record of every house—when it was built, what it is made of, its heating system, water supply, soil, proximity to roads and power lines, the radiation levels around it, foods grown, pets kept and a medical history of all its occupants as far back as possible. They have pored over every scrap of the county's well-kept records. They have trapped mice, dissected chickens and autopsied cats. Their laboratory in Hagerstown is equipped with complex apparatus in imposing array, which is kept busy analyzing representative specimens of Washington County's flora and fauna and sticks and stones.

They have found that not only individual houses and individual families but entire neighborhoods in the

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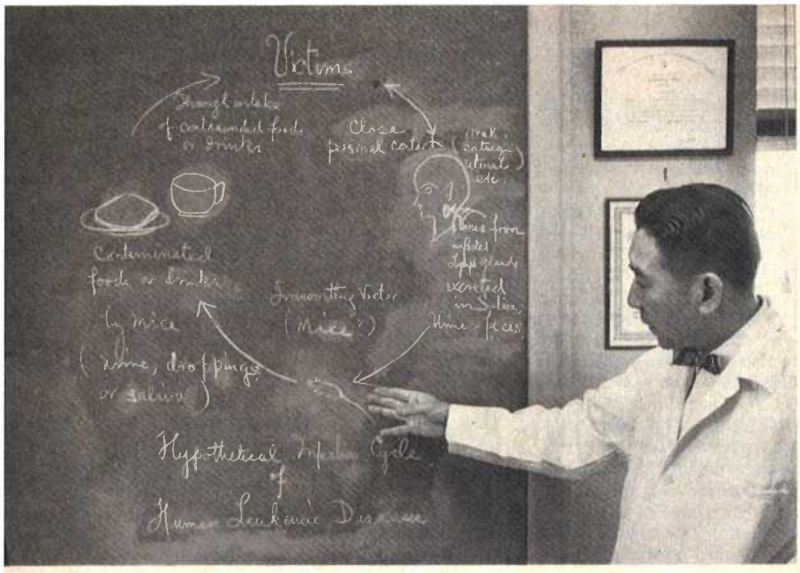


Dr. William Y. Chen, director of the research project in Washington County, Md., points out one possible cycle by which leukemia virus might be transmitted.

county are sometimes afflicted with much more than their proportionate share of cancer. In Dr. Chen's office there are a number of county maps. The red pins on them denoting cancer locations are anything but randomly distributed. They tend, rather, to run in clusters. There is, for example, a map of Hagerstown on Chen's wall with the city arbitrarily cut up into small segments, each about three city blocks square. In one such neighborhood there have been over 25 cases of leukemia and lymphoma in the past 30 years. In the neighborhood adjoining it there have been only three.

Studies of the families, too, have turned up a good many with multiple cancer occurrences. In these "cancer families" the most striking incidence of the disease beyond what normally would be expected is among husbands and wives. The next highest is among sisters, next among brothers, and last among brothers and sisters. This order of frequency, it has been pointed out, probably is also the order of intimacy which exists in most American family relationships.

The Hagerstown family studies are being supplemented by many similar contemporary studies which have repeatedly shown multiple histories of cancer in the same family within unusually short periods of time. Interesting individual cases are reported now and then, too. In one instance an entire family of nine—mother, father, six children and the lone grandchild—died of cancer. In another case four brothers all died of cancer which began on the lip. Similar family patterns keep turning up.

New respectability for discarded ideas

Are such observations additional evidence to support the theory that cancer is infectious? The Hagerstown scientists are unwilling to speculate—for the record, at least. They simply offer up their data.

A good bit of the Hagerstown data remains to be processed through the computing machines even as more is being continuously collected. And the scientists emphasize that their survey is only preliminary to much more intensive studies of much larger population groups. But the tentative results lend new respectability to observations which were long ago discarded as "unscientific." For example, the 19th Century researchers found that cancer houses tended to be located—and even to group—in low-lying areas, in clay-rich soils and near the banks of streams whose water usually was contaminated. The same conditions appear generally to be true in Washington County, Md. in 1962. And the statistical arguments that once were used to demolish these observations no longer seem so convincing in 1962. Nineteenth Century researchers also attributed significance to the presence of certain types of tree growths, which they believed to be caused by parasitic infection, in the vicinity of cancer houses. The Hagerstown scientists, too, have been giving special attention to cancerlike excrescences, called galls, which attack the trees of Washington County. They have found a number of groves full of gall-afflicted trees. Sometimes the growth spreads all the way around the trunk of the tree, practically doubling its diameter. In only two instances have such trees been found in the vicinity of houses. In both instances the dwellings were cancer houses. Despite the minimal size of the correlation, the Hagerstown scientists noted it with interest.

They also noted with interest the high frequency of leukemia and related diseases in closely spaced graduating classes at a local high school. Some of the victims did not come down with the disease until after graduation. But while in school the boys and girls had, of course, enjoyed the contacts associated with normal curricular and extra-curricular involvements.

As indicated, the case histories of these classes are by no means isolated examples of cancer types which have grouped in particular areas. Dr. Michael B. Shimkin, who as Director of Field Studies for the National Cancer Institute also oversees the Hagerstown project, recently reported on several such "micro-epidemics."

But in central Africa something much bigger than a "micro-epidemic" has been raging for some time. In 1958 Dr. Denis Burkitt, a surgeon at Mulago Hospital in Kampala, Uganda, first called attention to the unusual frequency of malignant lymphoma among children who came to the hospital for treatment. During the intervening years Burkitt and his colleagues have pursued this disease, noting carefully the age groups it affects and mapping a sharply limited "lymphoma belt" across Equatorial Africa. The disease, Burkitt's study revealed, does not occur at altitudes above 5,000 feet or in climates where temperatures fall much below 60° F. The best present guess is that the disease is virus-caused, with the virus probably transmitted by an insect. Teams from France, England and the U.S. are now working with Burkitt to see if they can find the insect and the virus—if indeed they do exist—which are responsible for making this strip of Africa a cancer area. If this intensive quest is successful, these scientists will have proved for the first time a *direct* causal connection between a virus and human cancer.

If it can be proved that specific viruses definitely cause cancer, what is the real hope for developing an anticancer vaccine or vaccines? And how long should it take? The answers that scientists offer to these questions, as might be expected, are varied and often conflicting. Opinions about the feasibility of cancer vaccines and the speed with which they might be produced, are surrounded with cautionary qualifications. For one thing, no one knows how many different viruses may cause how many different kinds of cancer. A vaccine that might protect against, say, leukemia might not be effective against other types of cancer. But the more optimistic scientists feel certain that the answers will be in hand reasonably soon and that, when they are, the vaccines will follow within a relatively few years.

Cancer, even if it is infectious, still is a special kind of disease. In addition to all the normal difficulties inherent in developing any vaccine, a cancer vaccine would present peculiar problems of its own. Immunization by vaccination ordinarily works by stimulating the body to produce antibodies that attack the invading organisms. But could antibodies attack a cancer virus once it has disappeared into the cell's own nucleus? A child, if he is vaccinated sufficiently early, might be protected against future infection. Effective vaccines have in fact already been developed which protect mice and chickens against some forms of cancer. But in a human adult, if the infection already has taken hold (even though the virus remains latent), vaccinating against the virus might not suffice. It might be necessary to vaccinate against the malignant cells themselves.

Dr. Robert J. Huebner, head of the National Institute of Allergy and Infectious Diseases, gave impetus to cancer virus research by supporting the virus theory.

No one is sure this can be done. But many experiments currently are in progress in the U.S. and abroad, in animals and in humans, which already have provided promising but inconclusive results. One of the most dramatic of these experiments is a continuing study by the Sloan-Kettering Institute in an Ohio prison, where human volunteers have been implanted with cancer cells. The results indicate that the defenses of the body against cancer—at least after transplant—*can* be stimulated by the techniques of immunology. And in Stockholm, too, Dr. Bertil Björklund of the Swedish State Bacteriological Laboratory is conducting controversial experiments in immunology by injecting a vaccine made of dead cancer cells into volunteers.

An object lesson for cancer researchers

At this point in time, however, the story of cancer-virus research serves best perhaps as an object lesson to all cancer research scientists. Josh Billings, the celebrated folk philosopher of the 1870s, once complained good-naturedly that people "know so much that ain't so." To know a lot that ain't so is an all-too-human frailty—one easy to accept, to understand and to forgive in the ordinary citizen. But in the scientist, whom we expect to be open-minded and objective, such a shortcoming becomes crippling. All those who "knew" with such certainty that cancer could not possibly be infectious now know that what they "knew" ain't necessarily so. The same is true for those who "knew" that a specific kind of virus could cause only one kind of cancer, and for those who "knew" that cancer viruses could not cause cancer in more than one species of animal.

With other long-cherished shibboleths now being challenged on all sides (*see page 85*), and with the public persuaded that the many millions of dollars lavished each year on cancer research are being used to explore *every* promising path, the time has arrived for the scientists to take a sharp look at themselves for lingering symptoms of the Josh Billings syndrome. If they do this, and do it honestly, it must surely speed the day when cancer, in the U.S. alone, no longer takes a life every two minutes of every hour, every single day of the year.

TEXT CONTINUED ON PAGE 85

Medicine's Mavericks Press Germ Theory

All the cancer virus research described in the foregoing article has been done within the established rules set down by medical officialdom—by recognized scientists affiliated with recognized institutions. But the revival of interest in the infectious theory of cancer underscores the plight of a group of maverick scientists who have been working on their own in an allied field. Their work cannot be called controversial; it is being ignored.

Yet many of these independents, working alone in many countries, have arrived at the same conclusion: that cancer is caused by a bacterium—*i.e.*, an old-fashioned germ—which, in its life cycle, goes through several forms, *including a viruslike phase.* Viruses are considered to be quite distinct from bacteria. Bacteria are full-fledged living organisms; the much tinier viruses only spring into a sort of borrowed life when they penetrate and take over a cell.

Can bacteria have several forms, including one of virus size? Many bacteriologists believe so. The idea that a virus can develop into a bacterium is certainly no more startling than, say, the transformation of an insect from a wormlike larva into a butterfly. The results of some research, recognized though still not altogether accepted, seem to prove that the TB bacillus, as one instance, has many forms, including a viruslike phase. And the cancer bacterium—if it exists—is supposed to be in the same family as the TB bacillus.

The cancer-germ theorists claim to have isolated the cancer organism and grown it in culture. Many claim that with it they have induced cancer in laboratory animals. Some, like the two on this page, even claim to have developed vaccines for preventing, and serums for curing, cancer in humans. Similar claims have been made by others since the 1920s.

Nearly all the cancer-germ theorists are doctors with bona fide degrees in science or medicine. Ignored by everyone else, they have in recent years begun to discover one another. They have formed an international organization and have held meetings where they read research papers to one another. A Belgian scientist, Dr. F.J.G. van den Bosch, is now trying to strengthen the 400-member group he helped organize and turn it into an effective voice that will demand a wider hearing.

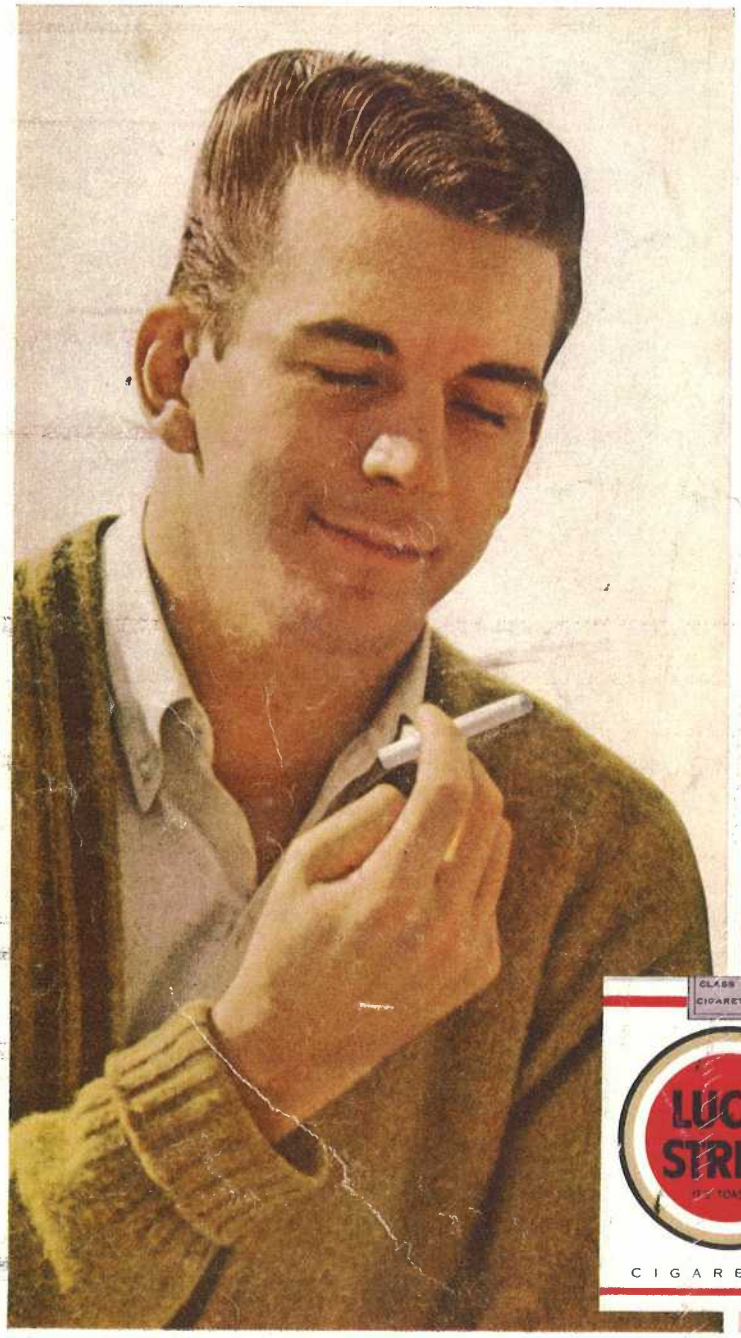
These scientists could be 100% wrong. The capacity for self-delusion in research is well known. But their procedures are straightforward. They guard no secret formulas. Their experiments are easily repeatable. If the medical profession is indeed dedicated to an all-out assault on the mystery of cancer and to an all-avenues search for a cure, the cancer-germ theorists too deserve at least attention and perhaps support—if only because, in light of today's knowledge, science cannot be absolutely sure that they are absolutely wrong.

Dr. W. Mervyn Crofton, a Fellow of Britain's Royal Society of Medicine, believes in the bacterial cancer theory. He must do his research privately and after that publish findings at his own expense.

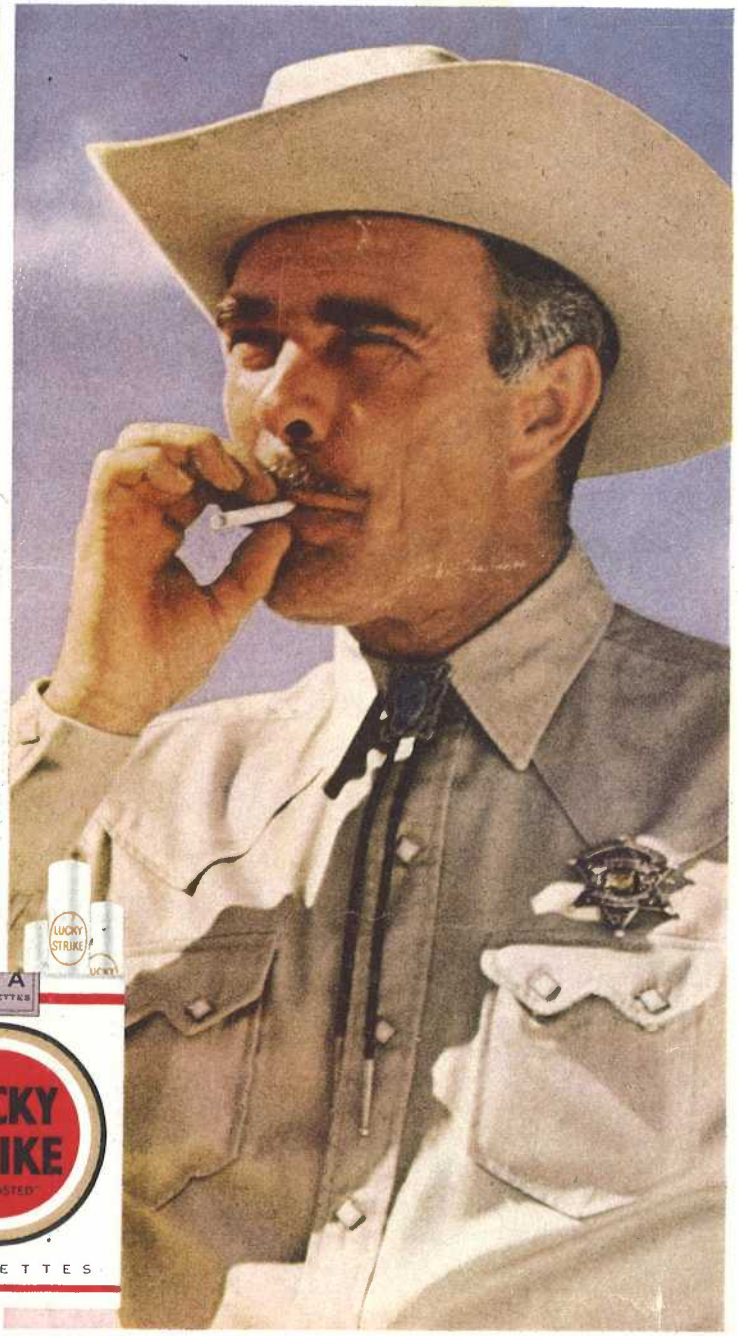
Dr. Clara J. Fonti, who won a prize from France for research and runs a clinic in Milan, holds up vials of her cancer vaccine which she gives to patients. Other doctors in Europe use it as well.

Get Lucky

the taste to start with...the taste to stay with



DON SCHWALL, American League Rookie of the Year, is starting his second year with the Red Sox and with Luckies.



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