Du Pont
news
VOL 4/NO 11 NOVEMBER 1975

The latest collection of loungewear and sleepwear featuring fabrics of Du Pont fibers is now traffic-stopping through the East, Midwest and South. On display from leading designers and manufacturers are carefree fashions made of "Qiana" nylon, anti-cling "Antron" III nylon, "C" and "Dacron" polyester. These fibers are made at Camden, S.C., Chattanooga and Kingston, Tenn., Kinston and Cape Fear, N.C., and Martinsville and Waynesboro, Va. Most garments cost between $35 and $50.

Company enters joint ventures to ensure raw material supplies

Two major joint ventures aimed at ensuring future supply of important petrochemical raw materials were announced by the company last month.

Du Pont and the Atlantic Richfield Company agreed to enter into negotiations to design, construct and operate a petrochemical facility on the Texas Gulf Coast with a capacity of approximately 100,000 barrels of crude oil per day.

While final negotiations for formation of this joint venture remain to be completed, current estimates call for the installation to include a large (more than one-billion-pounds per year) ethylene plant. This plant will also produce other olefins and aromatics, raw materials used in the production of man-made fibers, plastics and elastomers.

To be owned 50-50 by Du Pont and Atlantic Richfield, the facility is expected to begin operation early in 1981.

David K. Barnes, vice president and general manager of the Energy and Materials Department, explained that the proposed venture would "satisfy only a part of Du Pont's requirements for hydrocarbons, since more than 70 per cent of the company's production is based on raw materials derived from crude oil and natural gas. Historically, the company has been a substantial purchaser of these raw materials and will remain so.

"But, we're facing the realities of the times," he added. "Joint ownership of petrochemical manufacturing facilities with a partner who can supply crude oil should provide some security of supply and improve our raw material cost position. It is [illegible] share of the products but rather to consume them internally."

In another development, Du Pont has agreed to enter into a joint venture with National Distillers & Chemical Corp. of New York to produce and sell synthesis gas and carbon monoxide, important feedstocks used in the manufacture of other chemicals.

The companies authorized engineering design and development of a construction estimate for building the synthesis gas facility. Synthesis gas is a mixture of carbon monoxide and hydrogen.

Du Pont also disclosed it had authorized engineering design and development of a construction estimate for a methanol plant, using the synthesis gas as a feedstock. This plant will increase the company's methanol capacity by nearly 60 per cent.

The new plants are expected to be near one another in the Houston, Tex., area and to be completed by early 1979.

"There is a need for new methanol capacity an essential intermediate in the chemical industry," Harold H. Snyder, vice president and general manager of the Industrial Chemicals Department, said. "The projected market growth for methanol indicates there will be shortages by 1978."

Methanol is currently produced at Beaumont, Tex., and the Sabine River Works, Orange, Tex.

Earnings show upturn

Third quarter earnings for the company were $1.72 per share of common stock, compared with 45 cents in the previous quarter and $2.43 in the third quarter a year earlier.

Net income for the quarter was $86 million on sales totalling $1.9 billion.

Earnings for the first nine months this year were $2.56 per common share, 66 per cent below the $7.53 reported for the same period in 1974. Sales during the nine-month period were $5.3 billion, essentially the same as last year's nine-month totals.

Chairman Irving S. Shapiro said recovery from the low point of the U. S. business recession is proceeding generally as anticipated.

He said improvement thus far has been centered in the company's domestic business, led primarily by fibers, pigments and plastics.

THRIFT PLAN UNIT VALUES	
FUND B $11.59	FUND C $7.73
as of September 30, 1975	

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
WILMINGTON, DELAWARE 19898

JOHN G HAVERTY
304 LINDEN AVE
WOODBURY HEIGHTS N J 08097

Medical's 60th Anniversary

Du Pont's medical program is 60 years old this month. It began as one of the first and most complete employee health care programs in industry. Since then, it has been a pacesetter and a pioneer in industrial preventive medicine.

On these pages DU PONT NEWS shows a sampling of services performed by Du Pont medical personnel.

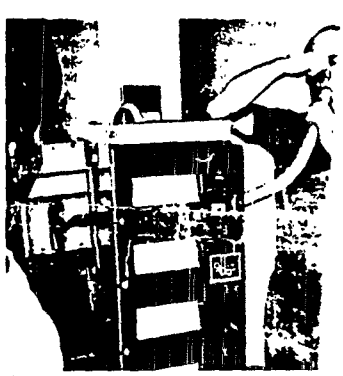
Some other highlights from Du Pont's medical story include:

- Approximately 7.5 million physical examinations have been given over the program's 60-year history, with the emphasis on early detection to enable early treatment.
- Chest X-rays, electrocardiograms, cancer detection tests, flu vaccinations and audiograms have all been vital parts of company medical testing for years — usually initiated well in advance of similar programs throughout industry.
- Blood analysis has been expanded to include chemical and hematology tests, which help company physicians in early disease detection.
- Special, on-going medical control programs — some of which have been required by Du Pont since the 1920s — are conducted at sites for all employees exposed to certain toxic substances.
- An alcoholic rehabilitation program, the first in industry, has helped more than 3,000 employees who might otherwise have lost their jobs or possibly even their lives.
- The company hired the first psychiatrist in industry and has made mental health an integral part of its total medical program.
- The company employs more than 300 full- and part-time doctors and 1b5 nurses, enough to staff a large hospital.

A cardiopulmonary resuscitation technique, which can save heart attack and electric shock victims, is practiced at a Brevard, N. C., first aid training session. Plant physician Leonard Lister (center) guides first aid team members Earl Waldon (left) and James Sanders.

Nurse Molly Price at the Florence, S. C., plant administers cervical traction therapy to secretary Pamela Bregman to relieve nerve pressure caused by a spur on her vertebrae. Physical therapy aids employees in recovery after an operation or disabling illness.

Doctor and employee confer at Chambers Works, Deepwater, N. J. As Du Pont's largest manufacturing facility, this plant has a medical staff of 38 and two laboratories for doing both special and regular medical tests.



Seaford nurse Thelma Raughley administers a pulmonary fu to yarn inspector Jerry Towers. The study checks the condi lungs and respiratory system.

ODOR VAN... being 'nosey' can pay off

Some people collect the strangest things. For instance, there are engineers who walk around Du Pont plants collecting nothing but air in plastic bags.

It probably will never catch on, like amassing stamps or pewter, but this "collecting" is useful for plants faced with a problem.

The collectors, led by James I. Franz, an Engineering Department technical service engineer, have been sniffing around company facilities with a mobile test laboratory called the Engineering Service Division "Odor Van." For almost two years now, the van has helped detect bad odors and track down their sources.

Usually, plants call in the "Odor Van" after complaints by nearby residents about unsavory odors suspected to be caused by industrial operations. Franz says a dozen plants have used his services so far.

First mission at a site is to identify all possible odor sources—no small task since odors can come from stacks, buildings, waste treatment ponds or process leaks.

Air samples are collected at likely odor source points in a bag made of "Mylar" polyester film.

A three-person "odor panel" is assembled: plant employees or local community residents; and presented with dilutions of the bag sample through sniffing ports inside the van. They're asked to independently rate the intensity of each dilution on a prearranged intensity scale and describe the odor.

"We've had people say they smelled everything from dirty sweat socks to perfume," Franz says.

Test results are then analyzed and fed into a computer to determine how much fresh air must be mixed (known as a dilution) with the bad odors to neutralize them.

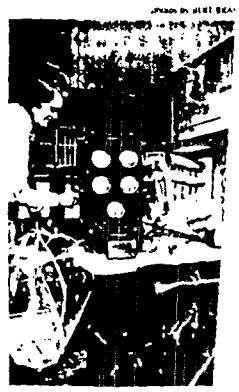
"It might take only ten dilutions," says Franz, "or the odor might have to be diluted 100,000 times to be non-detectable. It all depends on odor strength."

With all the data compiled, he can then recommend control strategies to reduce the significant odor sources. In most cases, field testing is required to select an effective odor control device for each source.

Getting rid of an odor problem can be complicated and costly, particularly if the solution calls for stack scrubbing, direct flame combustion or carbon treatment.

But Franz says plants that have been able to put some of his odor abatement recommendations into effect have been pleased with the results. And, he says the company is committed to controlling odors to meet local laws and to continue to be a good neighbor in plant communities.

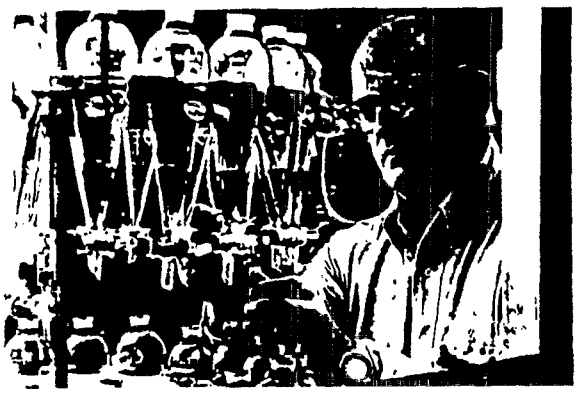
Technician Ralf Baxter brings odor sample in plastic bag to mobile test laboratory for analysis.



Inside "Odor Van," La Porte, Tex., em Annette Hecker (partly hidden in back and Jack Hannan (right) unit; a samp provided by James Franz, the eng charge of the mobile lab.

DUP 1005002

DU 050789



Chambers Works' Technician John Domenico checks for signs of high lead content in urine samples. Employees in tetraethyl lead manufacturing areas are tested at least every two months in one of nearly 40 continuing medical control programs at the plant.

Nationally-recognized for its 33 years of success, Du Pont's alcoholic rehabilitation program is coordinated by Frank Lawlor, a recovered alcoholic himself.

Alexander Czebotari, plant doctor at Seaford, Del., looks for foreign body with a portable light unit. The Seaford medical staff sees about 400 employees per week, which makes the facility as busy as the average hospital emergency ward.

'Watchdog' surveys check on possible employee health problems

For 19 years, the Medical Division's biostatistics section has been closely studying the health of Du Pont employees.

Company-wide and individual site epidemiological studies have been ongoing to uncover potential health problems, and to furnish a "data bank" for special surveys of employees exposed to toxic substances.

Epidemiological studies compare the incidence of disease among various groups to identify factors that are related to the disease.

"We try to determine whether employee disease incidence rates at any site are significantly greater than in the company as a whole or than in the general population," says Dr. Sidney Pell, a biostatistician who has headed the survey program since its start in 1956.

"If a problem develops, we want to detect it as early as possible," he adds, "because then prompt remedial action can be taken."

According to Pell, Du Pont has been doing this employee health monitoring longer than any other industrial company in the U.S.

Four main surveys form the backbone of the company's epidemiological studies — sickness absenteeism, mortality (deaths), cancer and coronary heart disease.

From the data provided by these broad-gauged, computerized surveys, special studies are run. For instance, recent studies of importance to the company have centered on noise, carcinogens (substances which cause cancer) and heart disease.

In the case of carcinogens, according to Pell, when such a special survey is required he asks a site to identify *all* workers, both past and present, exposed to the suspect chemical.

Tracking down all exposed employees is crucial to ensure that survey data are totally unbiased. Delving as far back as possible in plant records is essential, too, since the latent period for a carcinogenic compound can be as long as 20-25 years after first exposure.

A search is made of the company's cancer registry and the computerized file of deaths of employees and retirees to identify cancer cases among the exposed workers.

Then, the cancer incidence rate among the exposed workers is compared to rates in the total company population and in the general population to determine whether the rate in the exposed group is abnormally high.

"Extensive data have been accumulated on heart disease, cancer and mortality for the entire company population," says Pell.

"This work, for example, has shown that the incidence of cancer in the company as a whole is no greater than that of other surveyed populations in the U.S."

Not only do these studies ferret out possible health complications, but they are a way of determining whether existing safeguards for employees exposed to certain hazards are working.

"We recently finished a five-year study to check the effectiveness of our hearing conservation program among employees exposed to high noise levels," notes Pell.

"The study indicated that our protective measures have been successful in preventing noise-induced hearing loss."

With stepped-up Federal pressure for more and better employee health data, Pell says Du Pont's epidemiological studies have paid off.

"We've got a 20-year store of information readily available with which we can do many kinds of studies relating to the health of company employees," he explains.

"Usually when employees read about a potential health problem or concern with a material with which we work," Pell adds, "they can be assured that we know about it and have already responded to the information by using many valuable research tools, such as epidemiology, to investigate the problem."

Ruppe succeeds Campbell as director of DISA

Ernest F. Ruppe, director of the polyolefins division of the Plastics Department, has been named chairman-designate of Du Pont International S. A., the company's wholly-owned subsidiary in Geneva, Switzerland. The appointment is effective Nov. 1. He succeeds Milton H. Campbell, who retires next April after 28 years with the company.

Edwin D. Boelter, Jr., will succeed Ruppe as director of the polyolefins division. Boelter was formerly assistant director of the company's Central Research and Development Department.

Ruppe, a native of New York, joined Du Pont in 1950 with the Engineering Department at the Louisville, Ky., plant.

He served in various engineering capacities until 1960, when he moved to the Plastics Department as a division technical superintendent at the Parkersburg, W. Va., plant.

Ruppe was appointed director of environmental affairs and vice chairman of the Environmental Quality Committee in 1971. He was appointed director of the polyolefins division a year later.

Campbell Ruppe Boelter

Campbell came to Du Pont in 1947 as a chemical engineer at the petroleum laboratory of the Chambers Works, Deepwater, N. J.

After serving in several managerial positions in petroleum chemicals and elastomer chemicals, he was appointed assistant director of sales for the Elastomer Chemicals Department when it was formed in 1957.

In 1958, he was named manager of the marketing services division in the International Department. He became director of the European division in 1960 and assumed his present position in February 1966.

New department to manage pension fund

Twenty years ago Du Pont's pension fund was valued at about $250 million. Today that figure has grown to $2 billion, and the total could reach $5 billion by 1985.

Because of this tremendous growth rate, the company has established a new Pension Fund Investment Department, effective Nov. 1 to manage the pension fund portfolio. For many years, the investments in the fund have been managed by the Treasurer's Department.

David F. Marvin, 35, formerly a portfolio manager with Investors Diversified Services, Inc., (IDS) of Minneapolis, Minn., has been named director of the new department. Prior to joining IDS he was a security analyst with the Chicago Title and Trust Company.

"I do not see any major changes in the investments of the fund," says Ralph B. Cole, vice president and treasurer. "The decision is primarily based on the fact that with the growth of the fund, its management requires the full-time attention of a separate department."

Du Pont's pension fund is known as a directed trust; its investments are controlled by the company, with Wilmington Trust Company, the sole trustee continuing to serve in an advisory capacity and maintaining custody of securities.

CORRECTION . . .

In a photograph in the October issue, NEWS incorrectly identified Harvey Henry, foreman of the tank car repair shop at the Chambers Works, as Dave Pollack. We regret the error.

Du Pont news

Du Pont's employee publication

EDITOR Craig C. Garner
ASSISTANT EDITOR Barbara A. Wolf

Address correspondence to:
Editor, DU PONT NEWS
Rm. 8061, Du Pont Bldg.
Public Affairs Dept.
Wilmington, De. 19898

SITELINES

NEWARK,DEL. . . leaving us well-equipped

Ralph W. Beach placed his first million-dollar order for the company in 1952. He was a purchasing agent then.

Today Beach is getting ready to retire, but he has seen a lot of million-dollar purchase orders come across his desk since that time.

Last year, as manager of the Energy and Materials Department's equipment division, he oversaw $550 million in capital equipment purchases for new Du Pont construction projects in the U.S. and abroad and for all major maintenance and repair work done at plants.

"In the past year and a half," Beach explains, "our equipment division has negotiated 84 separate orders or contracts worth over $1 million apiece."

Beach, who retires at the end of November, has been in purchasing for most of his near 40 years with the company. He has headed the equipment division, which is headquartered at the Engineering Department's Louviers Building near Newark, Del., since 1967.

The biggest change made in company buying policy over the last few years, according to Beach, is that "we're negotiating with suppliers based on equipment characteristics and their ability to provide the specified goods, rather than on competitive prices in every case.

Photo by MICHAEL R. TYLER

Ralph W. Beach

"With our negotiated method of buying, I think we're better able to control our costs."

As he looks back on his career, what does he view as his top accomplishment?

"First, the training and development of purchasing personnel beginning in 1940, and second, the fact that we were able to get equipment delivered to meet the construction schedules of all our major projects," he says.

No mean feat, since Du Pont deals with over 7,000 equipment suppliers and places orders for some of the most complex chemical equipment in the world.

CARNEY'S POINT, N. J. . . a furry tale

While the nation gets set to celebrate its bicentennial, F. Donald Hart, a carpenter at the Plastics Department's Carney's Point Works, donned Colonial garb for the tercentennial (300th year anniversary) of nearby Salem, one of New Jersey's oldest towns. For the occasion, which culminated in a big parade and celebration in September, Hart spent nine months growing his carefully manicured beard. His colleagues at Carney's Point got almost as much enjoyment out of watching the beard's progress as Hart did. [illegible] paid a call to the barber last month. First, the beard went, then the mustache (which measured 12 inches from tip to tip at full flower). So much for beards and tercentennials.

CIRCLEVILLE, O. . . ode to a pumpkin

Yes, Charlie Brown, there is a Great Pumpkin!

It is alive and well and resides in Circleville for four days in mid-October when close to a half million people flock into this central Ohio town of 13,000 for the annual Pumpkin Show, billed by local residents as "the greatest free show on earth."

Many of the townspeople helping to make it the "greatest show" are Du Ponters, who work at the Film Department's Circleville plant.

There are parades, concerts, country and western singing groups, contests in hog-calling, pumpkin pie-eating and egg-tossing — and a competition to find the Great Pumpkin (in size, that is).

"It's an autumn festival tradition that's been going on for about 70 years," says Terry Agin, a data processor at the Film plant who's an entertainment announcer during Pumpkin Show time.

"It sort of puts Circleville on the map," he says.

Carl Manson, a senior clerk accountant at the plant, is in charge of building the "industrial" float, sponsored by Du Pont and other major industries in town. About 40 or 50 floats are entered in the seven parades which take place throughout the Show.

Other employees help out in food booths and in other facets of the festivities.

"There's general, widespread participation by Du Ponters," says Manson.

The aim of the Pumpkin Show is to have fun. "We try to keep it in a light vein with only the slightest hint of seriousness," Agin notes.

The "serious" part takes place when judging for the largest pumpkin gets underway. This year, the winning entry tipped the scales at 378 pounds.

How do they grow them that big? "I heard one farmer hooked up an IV (intravenous feeding) to a stem and kept a steady diet of milk flowing to his pumpkins," says Agin. "They simply baby them; handle them with kid gloves."

Sound [illegible] like they should handle them with a [illegible]?

Photo by [illegible]

Carl Manson (left) and Terry Agin with The Great Pumpkin.

ANTIOCH, CAL. . . from victim to healer

Photo by RULE RATTRAY

Carl Beck (left) and fellow supervisor Tom Young.

How do you tell someone who has been badly burned that things will get better?

That's the problem facing Carl Beck, a maintenance supervisor at the Antioch, Cal., plant, each week.

Beck is president of "Burns Recovered," a volunteer group set up by the St. Francis Hospital Burn Center in San Francisco. The group is composed of former patients at the burn center and is one of only a few in the country.

"The two major problems of burn victims," says Beck, a Du Pont employee for 19 years, "are infection and the psychological effects. Many burn victims die not from their burns but from giving up. The hospital decided no one could relate to these people better than someone who has been through it."

Beck went "through it" four years ago. On October 9, 1971, he received second and third degree burns over more than 35 per cent of his body when he was sprayed with hot, molten caustic at the Antioch plant. He spent 5½ weeks in the St. Francis Hospital Burn Center, but, luckily, was back at work by December.

Beck is one of 25 active members in "Burns Recovered" who make regular visits to patients and meet monthly at the hospital to discuss their problems and progress. Their role is to talk with burn patients, explain what type of therapy they may need and help the patient readjust to society when released. While the volunteers have no formal training, they receive regular assistance and counseling from the hospital staff.

Another 55 to 60 people are semi-active because they live too far from the hospital. These people help any recently-released patients from their home area by providing transportation, doing errands, working with the family and just being available if needed.

"We wait until a patient can have visitors," Beck explains. "Sometimes you feel the rapport right off, sometimes not. But it's great when someone says, 'I'm glad you came, I missed you.'"

He remembers one eighth grade boy who was badly burned in an alcohol flash fire during a school physics experiment.

"It was difficult establishing communication for a long time," Beck says. "He thought his world had ended — and he'd never play ball again. But he's back in school and has a good outlook."

Beck admits his experience has made him even more safety conscious, and he says, with relief, there have been no burn accidents at the plant since his. This, in part, has helped him avoid one problem many "Burns Recovered" volunteers face.

"It's very difficult," he says, "for some burn victims to visit someone who has had a similar accident to theirs. I'm fortunate in that there aren't many incidents like mine."

DU PONT
management bulletin
APRIL 1976 VOL 5/NO 1

DU PONT MOBILIZES AGAINST THE RISK OF OCCUPATIONAL CANCER

The company's experience puts it in good position to meet the challenge posed by new findings on the dangers of long-term, low-level exposure to chemicals.

The news media recently have given a great deal of attention to the search for causes of cancer, with special focus on the problem of cancer resulting from on-the-job exposure to carcinogens (substances that cause cancer). Chemical company employees understandably may be concerned by this public discussion.

This *Management Bulletin* attempts to place the problem in perspective. It discusses the reaction of Du Pont and the rest of industry to the new facts being uncovered, and it describes the company's efforts to insure a safe working environment.

Du Pont is involved in the issue because it makes or uses a few of the materials that have been identified as potentially carcinogenic in human beings. The company's long-standing commitment to the safety of its employees extends to the carcinogen problem. As described later, determining what is safe in handling carcinogens is more difficult than with other kinds of hazards. Nevertheless, Du Pont believes these substances can be handled safely, but the company is committed to closing down any operation where they cannot be.

Du Pont believes these substances can be handled safely, but it is committed to closing down any operation where they cannot be

Du Pont and other chemical producers are supporting legislation that would provide added public protection by giving the Federal government additional power to require testing and screening of new compounds and regulate the use of substances that are toxic. The industry is concerned, however, that some of the proposed laws grant too broad authority to screen and test chemicals.

The Long-Term Exposure Hazard

Much of the present concern over occupationally related cancer arose as a result of two incidents at other chemical companies in which it was discovered that employees had developed cancer after long-term exposure to carcinogens. In one case, vinyl chloride monomer caused a rare liver cancer in exposed workers, and in the other, the chemical bis-chloromethyl ether was found to cause lung cancer. During the long period over which those chemicals were produced, neither had been considered carcinogenic. Substances such as asbestos, beta-naphthylamine and benzidine were known to be cancer hazards on the job, but the number of occupational carcinogens was thought to be limited. Today 17 substances are currently subject to workplace control through government regulation because of carcinogenicity.

"Our understanding of the potential effects of long-term, low-level exposure to certain chemical substances is clearer than it was just a few years ago," says William R. Galloway, Jr., Du Pont's director of environmental affairs. "We've learned that some previously unsuspected materials are more dangerous than was thought to be the case. But, at Du Pont we have several things in our favor. For example, our concern for

safety has led us to tightly control exposure to products that have toxic effects, such as damage to body organs. Chemicals that are carcinogenic are also likely to have other toxic effects. Thus, some chemicals that may turn out to be carcinogens are already under tight controls because of their toxicity.

"In 1935 we established one of the first industrial toxicology laboratories in the country, the Haskell Laboratory for Toxicology and Industrial Medicine. It has done outstanding work in identifying hazards and helping establish safe practices. A major expansion of the laboratory is under way. We have been monitoring the health of our employees through periodic physical exams since 1915. These preventive measures stand us in good stead as we tackle the current problem."

The Cancer Problem

"The attention that has been given to the cancer problem in the media may make it seem that we are in a cancer epidemic," says Galloway, "and that the disease is increasing due to exposure to the products of industry, and especially to chemicals. But the facts give a different picture."

It is true that cancer now causes about one-fifth of all deaths in the U.S., and that makes it the second leading cause of death, after heart disease. Roughly half of all cancer deaths are caused by the three most common forms of the disease—cancer of the lung, the large intestine and the breast.

The incidence of cancer has gone up, but that statistic by itself can be misleading

---

The incidence of cancer has gone up, but that statistic by itself can be misleading. The death rate from cancer has increased in recent decades for men but *not* for women. According to the latest analysis of trends by the American Cancer Society, the death rate from all types of cancer per 100,000 population (age adjusted), *declined* 9 per cent among women between the periods 1951-53 and 1971-73. The rate *increased* 19 per cent among men, mainly due to a large increase (135 per cent) in lung cancer. Thus, increases in the overall cancer death rate have resulted largely from a higher rate of lung cancer. Most experts now attribute the increase in lung cancer to cigarette smoking.

The U.S., incidentally, is not the world leader in cancer deaths. In a World Health Organization list of 44 countries it ranks 19th in deaths from cancer in men, and 18th for women. Many West European countries rank ahead of the U.S. Furthermore, some less industrialized nations have higher cancer rates than more industrialized countries.

The medical research community is now gradually shifting more of its effort toward identifying the causes of cancer in an effort to prevent it (but the main emphasis is still on finding a cure). In the past, research on causes tended to focus on two areas —viruses and the genetic makeup we inherit from our parents. So far, viruses have been linked with cancer in animals, but not in man. Heredity may turn out to be implicated in cancer, but more as a factor that makes a person susceptible than as a cause in itself.

Lately, the attention of scientists has turned to so-called "environmental" causes. The term refers to cancer caused by exposure to all materials in our environment—not just materials in the air and water, but substances we come in contact with because of diet, our lifestyles, our occupations. Cigarette smoking is an environmental factor. Recent estimates by government agencies and private researchers variously attribute 50 to 90 per cent of all cancer to environmental causes, but there are big gaps in the knowledge on which these estimates are based.

The Occupational Risk

How serious a problem is occupationally related cancer? In one sense, of course, any incidence of cancer resulting from on-the-job hazards is very serious because it involves human suffering and probable loss of life. Insofar as it might have been prevented if knowledge of the hazard were greater, any single incidence of cancer is tragic.

But the question must be asked, how serious is occupationally related cancer in the context of the total cancer problem? That question is nearly impossible to answer because research in epidemiology—the study of the distribution of disease in human populations—has lacked data to separate the occupational causes from other causes of cancer. John Higginson, director of the International Agency for Research on Cancer, of the World Health Organization, estimates that less than 1 per cent of all cancers have been shown to be related to occupational factors. But he also says that the causes of most cancers are still unknown. John Weisburger, a widely known cancer specialist with the Naylor Dana Institute, recently said that occupationally related cancer was probably in the range of 1.5 to 3 per cent of all cancer deaths. But he noted that estimates in this area must be largely a matter of guesswork.

The Past Is Not Always a Happy Story

The risks do exist, and they are risks that something can be done about. But it's not simple.

Du Pont's experience bears that out. In the 1930s, the company realized that an unusually high incidence of bladder tumors was becoming evident among employees who worked with dyes at the Chambers Works in New Jersey. Largely to investigate the problem, the company established Haskell Laboratory near Wilmington. It was one of the first industry installations devoted solely to studying potential hazards posed by products.

The bladder tumor cause was identified as beta-naphthylamine, a dye intermediate. Tight controls were established, exposure to the product was greatly reduced, and medical

monitoring of employees was begun. Process redesign was undertaken. In the end, Du Pont stopped manufacturing the chemical largely because it was felt exposure could not be reliably limited to a safe level when the product reached customers' plants. Nevertheless, 276 cases of bladder tumor among Chambers Works employees exposed to the chemicals have been recorded over the years—mainly resulting from exposure during a period of 30 years ago, or earlier. (In addition, 63 cases have been recorded among employees who worked at another plant which Du Pont acquired and owned during the 1930s in Wisconsin.)

Significantly, in scientific, medical and industrial circles, this incident at the time was considered something of a rarity, as explained by Dr. John A. Zapp, director of Haskell Laboratory for the past 23 years.

"The idea that many substances might be carcinogenic was not given a great deal of consideration in the scientific community," Dr. Zapp says. "As late as 1952, a leading pharmacologist of the Yale University School of Medicine wrote a textbook in which he said that only three pure agents were known to cause cancer in man — beta-naphthylamine, arsenic and radiation."

In fact, other materials had been found to be carcinogenic, but this reference indicates something of the state of scientific knowledge in this field at the time.

In studies of new chemicals, emphasis traditionally was on determining acute toxicity, the level of short-term exposure that caused adverse reactions in experimental animals. Less attention was given to chronic toxicity, the effect of low-dose exposure over the lifetime of experimental animals.

The Problems of Testing

Haskell and other laboratories now do increasing numbers of chronic toxicity studies. The trend, in part, is due to Federal legislation requiring long-term tests on all drugs, food additives and agricultural chemicals before they are marketed. It's also due to the recent upsurge of concern over carcinogens, and Du Pont's determination to identify and control this hazard.

Chronic toxicity tests are quite expensive. They call for large numbers of animals and can last two or three years, or more.

"The cost of doing such a study in 1958 was more than $100,000," Dr. Zapp recalls. "Today, the cost can run five times that amount."

Testing for carcinogenicity is a complex matter

Testing for carcinogenicity is a complex matter. One problem is simply the lack of an exact correlation between animal carcinogens and human carcinogens. There is, however, high probability that a substance which causes cancer in appropriate species of laboratory animals may also be a human carcinogen at sufficient dose levels.

There are enormous technical problems in doing studies that pinpoint the effects of very low concentrations—fractions of one part per million, for example.

But the biggest puzzle now is, what substances should be tested for carcinogenicity? Many thousands of compounds are produced by modern industry, and all cannot be subjected to lengthy, costly testing. There are, however, some indicators as to which materials are likely to be hazardous.

For example, if a substance has a chemical structure similar to that of a known carcinogen, it immediately attracts suspicion. But "guilt by association" has its limitations. A notorious instance in which it did not apply was vinyl chloride monomer. This substance is not chemically related to other carcinogens and was, in fact, long regarded as relatively nonhazardous. Now, toxicologists are looking closely at similar chlorinated hydrocarbons.

Recent interest has focused on development of relatively short "screening" tests to determine which chemicals should be tested further. One widely used screening test is for mutagenicity, the ability of a substance to cause mutations in a cell. Rapidly multiplying bacteria or yeast cells are used, and mutagenicity can be established fairly quickly. It appears that about 85 per cent of all carcinogens are also mutagens.

On the other hand, not every chemical that proves mutagenic will prove carcinogenic as well. Very little is known, in fact, about what percentage of mutagens might be expected to cause cancer in animals. Thus, the screen could lead to wide testing of noncarcinogenic substances.

These are some of the difficulties in tracking down potential cancer-causing agents. A great deal of scientific expertise is now being brought to bear on the problem, and it seems reasonable to assume that testing methods will become more reliable in the years ahead.

Lists and More Lists

In the meantime, lists are being compiled of substances that, to some degree or another, have been linked with cancer.

One such list contains 1,500 substances. It was published by the National Institute of Occupational Safety and Health, a Federal agency that does research but has no regulatory power. To be on the list a substance must have been associated in some way with cancer in the scientific literature. Du Pont's view is that many of the items should not be included because the evidence cited is in error, is inadequate, or is contradicted by other evidence.

Undoubtedly, research will continue to identify more carcinogens. At present, however, when definite proof of carcinogenicity is required, the lists are relatively short. The American Conference of Governmental Industrial Hygienists, for example, lists 23 carcinogenic agents for which it has recommended limits of exposure.

The list that is perhaps best known is the Occupational Safety and Health

Administration's list of 17 carcinogens for which that agency has issued regulations. (Many of the regulations are based on information originally developed by industry.) The regulations aim at limiting employee exposure and require monitoring of concentration levels in regulated plant areas.

Du Pont makes two and uses one of the chemicals on the list, and formerly made or used certain others. The two are produced at Chambers Works in relatively small units. On the basis of its experience and on published studies, Du Pont believes that one of these, alpha-naphthylamine, is not a carcinogen. The other chemic identified by OSHA as a carcinor is "Moca" curing agent, a rubber ing agent. The chemical ethylenimine, also on the list, is purchased for use at Ft. Madison, Iowa, in producing intermediates for coatings, but does not appear in the products as sold. The company adheres closely to all OSHA requirements in handling these substances. Du Pont's medical surveillance programs have revealed no health problems among employees working with these substances.

(A fourth item on the OSHA list, beta-propiolactone, has been detected in less than toxic levels in a closed waste stream at Parkersburg, W.Va. The chemical is destroyed in waste treatment.)

The OSHA list of regulated substances undoubtedly will be expanded. Meanwhile, NIOSH and the National Cancer Institute intermittently release to the news media information on other substances that some researchers have linked with cancer.

Du Pont's Decision

"The safety of our products and of the people who make and use them has always been of the highest priority to us," says Galloway. "As a consequence, we have developed our own system for managing the carcinogen problems."

When there is suspicion that a chemical is carcinogenic, an immediate effort is made to assess the potential hazard and determine what action is required. The manufacturing department, in cooperation with Haskell, may determine that the substance is probably linked to cancer, and that further steps are necessary. The first concern is to safeguard the health of employees, with a program which may include revision of work practices, requirements for additional protective equipment, process changes, or other improved engineering controls. Employees are informed why such steps are necessary.

When there is suspicion that a chemical is carcinogenic, an immediate effort is made to assess the potential hazard

A program for monitoring and measuring exposure levels may already be in effect. If not, the program is instituted along with an examination of employee medical histories to determine possible adverse effects on health. Medical surveillance procedures, as well as the recording of employee exposures, are undertaken.

Depending on the circumstances, a variety of groups—employees, customers, appropriate governmental agencies, other producers, the media—may be notified of the actions taken. And if safe handling cannot be assured, production is to be shut down and sales halted until adequate safeguards are developed.

Carrying Out the Intent

As William Galloway has pointed out, Du Pont has the capacity to carry out the program described above.

The process of determining whether a substance may be linked with cancer begins with Haskell Laboratory's review of chemicals made or used at Du Pont plants. The laboratory has been assessing the degree of hazard these substances might present.

The assessment may be based on references to the chemical in scientific studies, the chemical's similarity

to known carcinogens, or the results of screening tests.

Long-term testing requiring lifetime animal tests may be indicated. The growing demand for such studies is the main reason for the current expansion of Haskell. Laboratory space is being increased by 70 per cent.

When all available evidence on a chemical has been accumulated and evaluated, the decision may be made to describe it either as causing cancer in human beings; as causing cancer in animals; or as a suspected animal carcinogen, the evidence being moderate but inconclusive. This identification by Du Pont is in addition to the OSHA list of regulated substances.

At this time, nine chemicals have been identified by Du Pont as causing cancer in animals, or as suspected of doing so:

1. m-Toluenediamine (MTD), a dye intermediate made at Chambers Works.
2., 3. Zinc and lead chromates, used in making pigments frequently found in paints—but not in Du Pont's major lines of consumer paints. Made at Newark, N.J.
4. Ethylenethiourea, primarily a neoprene curing agent made at Chambers Works.
5. Dioxane, purchased for use as a solvent in making adhesive products at Parlin, N.J., and South San Francisco, Calif., and precious metal compositions at Niagara Falls, N.Y.
6. Beta-propiolactone (see above).
7. Hexamethylphosphoramide (HMPA), a solvent used in making "Kevlar" aramid fiber, made at Chambers Works and used at the Spruance plant, Richmond, Va.
8. Carbon tetrachloride, made at Corpus Christi, Texas, used at several other plants as an intermediate for fluorocarbons and "Hypalon" synthetic rubber.
9. 1.-4 Dichloro-butene-2 (DCB), intermediate for nylon and neoprene, made at Pontchartrain, La., and Victoria, Texas.

The steps taken to reduce exposure may range from setting up restricted areas where no one is allowed without protective clothing, to installing new vent and scrubber systems, to redesigning the process, to special maintenance procedures.

Galloway points out that measures such as these are nothing new to Du Pont.

"We have a tremendous amount of experience in handling hazardous products safely," he says. "Just to take two examples, we've been producing tetraethyl lead and chlorine for many years, in large quantities. We've learned to control the risk and make these products safely."

Du Pont's carcinogen analysis may include studies of the incidence of health problems among employees exposed to the chemical. Dr. Sidney Pell, epidemiologist in Du Pont's Medical Division, describes this work:

"In 1956 we established a cancer registry. It essentially is a record of all employees who develop cancer, except for nonfatal types of skin cancer. When company employees as a group are compared to large populations outside the company that have been studied, there is no significant difference between the employees and comparison groups."

Studies are also done of employees exposed to a specific chemical. In this type of study, employees who have been exposed at some time in the past are followed to the present to determine whether they have experienced an excessive incidence of some form of cancer.

Dr. Pell has done one study, of Du Pont employees working with zinc and lead chromates, in which there was some suggestion of a higher than normal incidence of lung cancer. The data were too limited to support definite conclusions. A multi-company study sponsored by members of the industry is nearly complete; and it may provide conclusive evidence as to whether there is a problem.

In another current study being done by Dr. Pell, there will be enough data to support reliable conclusions. Dr. Pell is studying the medical histories of employees exposed to chloroprene, a neoprene intermediate once made at Chambers Works and now made at Victoria, Texas, and Pontchartrain, La., and used at Pontchartrain and

Louisville, Ky. Recent reports in Soviet technical literature claimed a higher incidence of cancer among workers in a neoprene plant, and [illegible] reports prompted the Du Pont [illegible]. So far, Dr. Pell says, the data do not indicate a statistically significant excess mortality from any form of cancer among employees as a result of exposure to chloroprene. The study is continuing.

What is "Safe?"

But the question still persists, what is a "safe" level of exposure to a carcinogen? It is a very difficult question to answer. The problem is not the same as with acute toxicity, where safe levels can usually be fully demonstrated in the laboratory.

"If you want me to give you an absolutely guaranteed level of safe exposure to a carcinogen, I can do it. The level is zero," says Dr. Zapp. "But that's because it's logically impossible to prove that just one molecule of the substance would never have a harmful effect on anyone who might come in contact with it.

> "What we consider ourselves obliged to do is to operate responsibly in the light of the best knowledge we can obtain."

"On the other hand, we know that the carcinogenic effect is dose-related," Dr. Zapp says. "That is, the incidence of cancer and the time it takes for a cancer to develop are directly related to the level of exposure. This means that we can reduce exposure to a point where cancer will not occur in a person's lifetime. There is evidence that we have done just that, with certain industrial chemicals that we now know cause cancer in animals and could expect to cause cancer in man. But there is no indication they have caused cancer in exposed employees."

Another perspective is offered by Galloway: "What we consider ourselves obliged to do is to operate responsibly in the light of the best knowledge of hazards that we can obtain. Fortunately, our employees are very cooperative in the process of establishing safety procedures and they understand the importance of following them. They are accustomed to changes in procedures as hazards are constantly redefined. All this works in our favor."

Toxic Substances Act

The Toxic Substances Act now being considered in committees of Congress may eventually give the government a strong hand in requiring manufacturers to detect and manage the carcinogen risk.

When passed, the legislation would give the Environmental Protection Agency the power to require testing of substances, including tests for carcinogenicity. It would permit the EPA to require testing and screening of new chemicals before they are marketed.

Richard E. Heckert, Du Pont senior vice president, recently outlined the company's response to proposed legislation, a position shared by many other chemical firms.

"The chemical industry supports additional Federal legislation on toxic substances that will close the gaps in present laws and offer greater protection to workers, consumers and the general public," Heckert said. "We support Federal authority to require testing of selected chemicals, and premarket notification or screening of new chemicals and significant new uses of established chemicals. We also support the authority to restrict or limit uses, or ban production of chemical substances."

There are two proposed bills which give the EPA broad power to require testing and screening of a wide range of substances. Du Pont and others would prefer to focus efforts on substances that appear to present significant risks. The industry is also concerned that excessively broad premarket testing and screening requirements could inhibit the industry's traditional emphasis on innovation and development of new products. In the development stages, new chemicals are already routinely handled with great care until their degree of toxicity is established.

Du Pont favors, in general, a bill sponsored by John Y. McCollister (R.-Neb.), according to Heckert. The McCollister bill limits testing and screening to significant risk areas. It also requires that the least burdensome controls be imposed to prevent or sufficiently reduce the risk. Banning would take place only if necessary. Consideration of the economic impact would be required when a substance is controlled. The Ford Administration has endorsed the McCollister bill, with certain amendments which Du Pont finds acceptable. A new bill containing these amendments has been introduced as H.R. 12336.

The Industry Initiative

The chemical industry is initiating its own positive action. Du Pont and 17 other chemical companies have joined to establish the Chemical Industry Institute of Toxicology. The companies have pledged about $15 million for initial costs, and a headquarters site has been selected near Raleigh, N.C.

CIIT will first concentrate on the carcinogenic potential of nonproprietary, widely used chemicals. The first two to be investigated will be ethylene and toluene. Emphasis will be on both testing chemicals and on developing new test methods for studying toxicity. Results of the studies will be made public.

The new institute is evidence of the industry's belief that the hazards can be identified and precautions can be taken to establish safe working conditions.

G. CLINTON COLLINS, EDITOR • ROOM 8074 • DU PONT BUILDING • WILMINGTON, DELAWARE