



THE

# WONDER WORLD OF CHEMISTRY

NEW YORK WORLD'S FAIR . . . 1939

DU PONT

WORLD OF CHEMISTRY





STANDARD AERIAL SURVEYS, INC.

**WHERE DU PONT TELLS ITS STORY AT THE FAIR.** *This view shows the west side of the grounds, with Manhattan's mid-town district 8½ miles away. Note in the upper left corner the Empire State Building in which the Company maintains extensive office quarters. At the right in this picture you see the Perisphere and Trylon. The arrowhead, lower left, points to the "Wonder World of Chemistry" Exhibit. In the entrance court of the building stands the 107-foot Tower of Research which is effectively illuminated at night. See cover illustration.*



*At the "Wonder World of Chemistry" preview, which was attended by du Pont Company officials and their guests a few days prior to the formal opening of the Exhibit, President Lamont du Pont expressed so well the significance of the New York World's Fair and what the "Tower of Research" means that we are quoting his remarks in full:*

## "Chemical Research"

EVERY believer in democracy should find a revived confidence in America and its industrial institutions in this greatest of World's Fairs. Told here is the story of what is right with the country, in contrast with the emphasis over the last decade of what is wrong with it.

"Notwithstanding that the world is racked by weird experiments in government, burdened with debts and harassed by wars of conquest, science and invention fostered by American enterprise are effecting industrial advances offering great promise for the future comfort and happiness of the world's people. Proof of this assertion is to be had in every building scattered over these grounds. It is visible. It is tangible.

"To my mind, the World's Fair is a gigantic demonstration not only that the American system works despite any difficulties and discouragement, but that, granted freer opportunity, it will solve many of the problems for people in the 'World of Tomorrow.'

"In the new industries and new products, featured in every major industrial display, which many millions of our people will view during the months immediately to come, is one answer at least to unemployment. Here are wholly new materials, man-made and beyond the comprehension of our fathers. They open new avenues for safe investment. They offer new opportunities for gainful labor.

"This 'Wonder World of Chemistry' exhibit is typical. Within the walls of this building are numerous products which were non-existent ten years ago; one, indeed—nylon—in only the earliest beginning of its commercial production. I am sure you will be interested to know that twelve new lines of du Pont products, developed largely since 1929, account for about 40 per cent of our total sales. No less than 19,000 of our 47,000 employees, working in 78 plants in 27 states, are making and selling these new products.

"Bear in mind each of these new developments meant jobs . . . work for old employees and new employees, not only in our Company but in the hundreds of industries to which du Pont supplies the raw or semi-finished materials.

"Many a product developed or improved that you see here has come only after intensive scientific research and consultation with technical men in various lines of business—men who have come to us with their problems and requested help in finding a solution. We say warrant-

edly that continued progress—tomorrow's unpredictable public benefits—will surely come through greater coordination of technical knowledge and research skill . . . in the laboratories of our universities, industry and the government.

"So we regard the tower which symbolizes chemistry at the entrance to this exhibit, for that matter the World's Fair itself, as a physical expression of that indomitable spirit of research and accomplishment which motivates the minds and hearts of the men and women who each day, each month, each year are working to push forward the frontiers of scientific knowledge so that the World of Tomorrow may be indeed a better place in which to live.

"Here in these structures is evidence of a new economic freedom, a new security. Beyond any possible doubt, this nation is provided today with the means to supply its every reasonable need. This in contrast with a very few years ago. To illustrate, the United States then was dependent upon foreign lands for such vital materials as rubber, fertilizers, dyestuffs and fine chemicals, among many other things. Now this country has all of them through the ingenuity of man.

"The Fair presents them for all the people to see, presents a pageant of American industrial preparedness in a troubled world. It is more than a pageant so far as its industrial participants are concerned. It is a public recognition not alone of the public's right to see the inner workings of modern business, but of the obligations that business has to the public. These may be summed up as follows:

"(1) To produce the highest quality of goods of which business is capable, at the lowest cost consistent with prudent practices.

"(2) To produce as many jobs as possible through expansion of products in quantity and variety, and to see that those who fill the jobs are fairly paid and justly treated.

"(3) To provide such a return to the investor as to attract capital to new ventures and to the support of all healthy industrial growth.

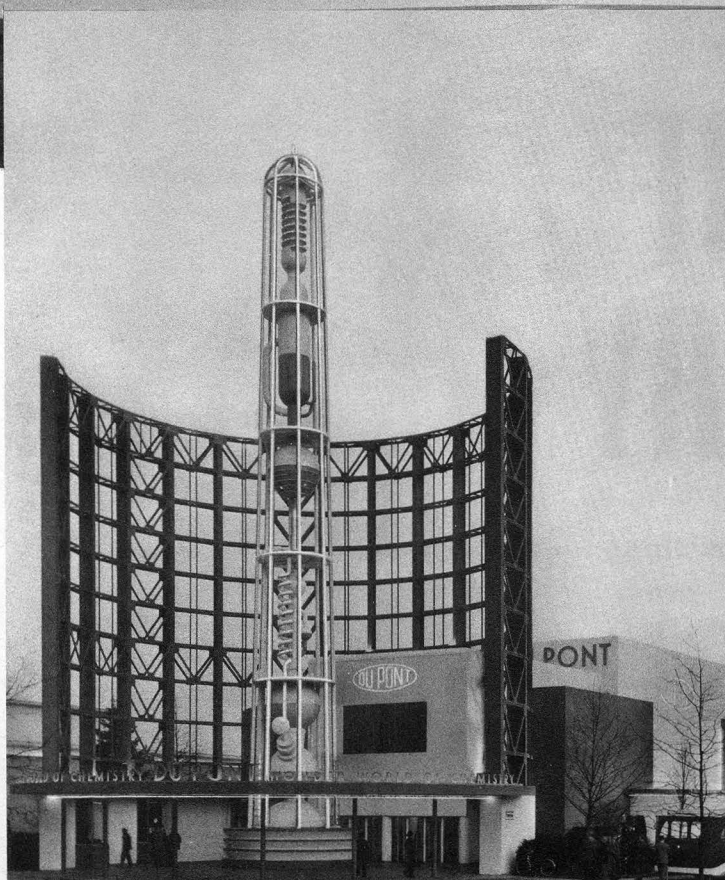
"(4) To be good citizens.

"Thus here throughout the summer and fall, the public will see for itself what business is doing for the World of Today and Tomorrow through health and happiness in contrast to what is being done in other fields through conquest and war to produce sorrow and death."

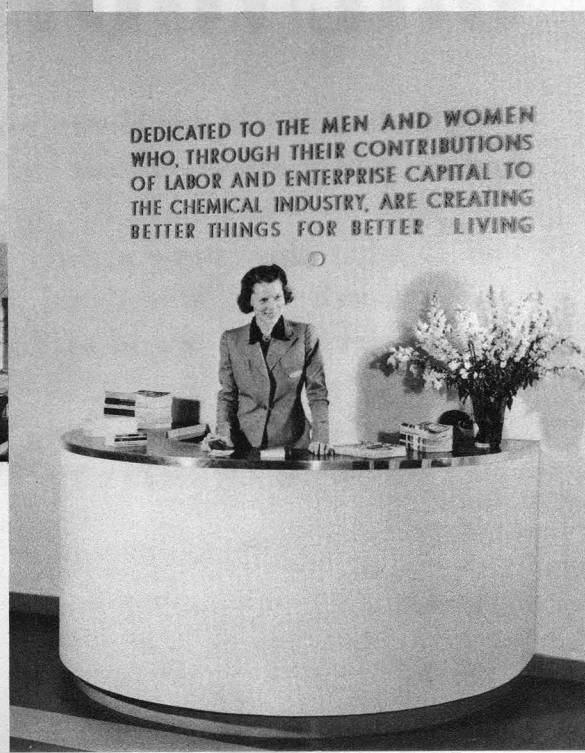




Domenico Mortellito's sixty-foot mural depicts Chemistry's part in creating products for "better living" from the raw materials of forest, farm and mine. The theme figures are carved in intaglio relief from vari-colored "Lucite" methyl methacrylate resin, while smaller carvings of "Plastacele" cellulose acetate add contrast. Subtle highlights are achieved through hidden illumination. Thus du Pont contributes plastics as a new media of art expression.



Half enclosed by a 70-foot shell of steel tracery is the Court of Chemistry, in the center of which rises the Tower of Research, forming an impressive entrance to the building. This 107-foot tower, a symbol of modern chemistry, is a giant representation of a distillation unit, an indispensable tool of chemical research. It is 35 times larger than the apparatus from which it was modeled.





# NEW YORK PRESENTS

## "A Drama of Opportunity"

It is a show worth serious study. The star of the cast is Chemistry as exemplified by its rôle in all industries

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By WILLIAM S. DUTTON

WHERE, yesterday, was a sour city dump littered with the débris of a century, New York this year is presenting a spectacle resplendent in the panoply of super-showmanship that well might have taken "Go to the Fair, Young Man!" as its theme song, with Editor Horace Greeley's full approval were he alive.

The Official Guide Book to the big show—purchasable for a quarter from iron-lunged vendors—uses 258 pages merely to highlight the array of wonders on display. "We show you here," says the Fair Corporation's president, Mr. Grover A. Whalen, "the best industrial technique, social ideas and services, the most advanced scientific discoveries." And Mr. Whalen adds that the exposition was three years in the building and cost more than \$155,000,000.

The figures are imposing. Not even Hollywood has approached them. Yet were the number of years multiplied by five and the dollars by twenty, the results would still be but a part of the total in effort and money that has been expended by the country's enterprise to make the New York World's Fair what it is in fact, namely, a drama of opportunity as it exists today in America. Moreover, the opportunities offered are not limited to any age, group, class or section. They are everybody's and the nation's.

All world's fairs are dramas of opportunity. The telephone made its bow at the Philadelphia Centennial of 1876. Rayon was introduced at the Paris Exposition a decade later. Hopeful builders of motor cars found clues to success at Chicago in 1893, where also a splurge of electrical illumination dazzled crowds still living in the gas and coal-oil lamp age. Men with vision have found roads to careers and fortunes indicated at every world's fair since the first, held in London in 1851.

At New York's greatest of all fairs, however, the signposts of progress are many times more numerous than ever in the past. Industry has done more than open its front door for a peep inside. Eager to win popular understanding and good will, it is inviting the public and its brother onto the ground floor of developments that are both underway and impending, from

which it believes will grow new industries, new jobs, new wealth for everybody, and possibly, too, the eventual solution of such pressing problems as unemployment, if its program is accorded reasonable support.

The invitation comes after unprecedented preparation. The nation's bill for industrial research was in excess of \$250,000,000 for 1938 alone. It was shared by 1769 laboratories. In the twenty years since the World War, it is conservatively estimated that not less than three billions of dollars were laid out for the research necessary to the development of the new raw materials, processes and finished products for which the fair is in large part a glorified showcase. And research is only one item of cost in transforming ideas into useful products.

Today, wherever a person lives or whatever his income; whether he runs a store or a factory or works for somebody else; whether he is young or old, a student, a farmer or a leader in the professions, he can start with the assumption that in some way his present and also his future have been affected, vitally perhaps, by the changes which have been inaugurated by the industrial effort of the past two decades. The economic prospect of the United States has been changed, potentially for the better, industry believes. The proof is the show now playing in Flushing Meadow.

It is a show worth serious study. A star of the cast—some, indeed, would say *the* star—is chemistry. Not chemistry as it is exemplified by the work of any one company, but by all industry. Almost a quarter of all manufactured goods produced in America today are chemical goods, and few articles among the remainder escape the chemist's influence. The science crosses and intermingles with all other sciences. It is dedicated to change—to change through creation of new substance as distinguished from change induced by mechanical invention. Get that fact and what it connotes and you will have mastered the biggest lesson to be learned at the Fair.

The inventor takes wood and invents a new bootjack, but it is still a bootjack made of wood regardless of his skill. On the other hand, the chemist takes wood as such and transforms it, literally, into a wide category of wholly new materials. What he makes may resemble





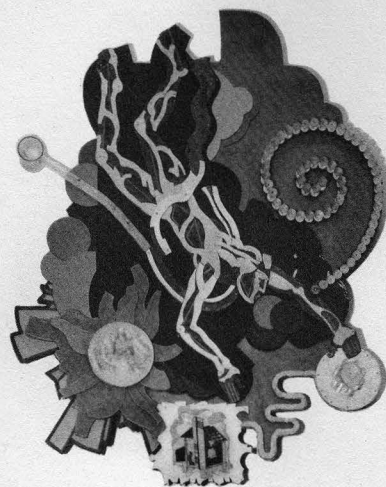
*In the first section is disclosed the background of du Pont research by means of working models and demonstrations. Here, visitors see how, by analysis and synthesis, new products are developed from such raw materials as coal, cotton and wood, vegetable oils, ores and salt.*



*The next section is devoted to laboratory control, where equipment and demonstrations show how rigorously-conducted pre-testing insures constant quality and uniformity of various du Pont-made materials.*



*In the third section of the Exhibit is presented the manufacturing story, with plant-size machinery actually fabricating several du Pont materials into finished products for consumer and industrial use.*



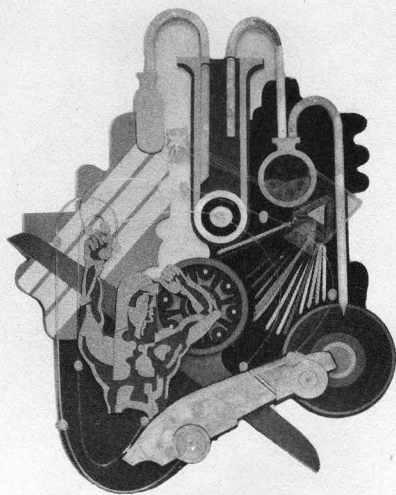
ivory or shell, but be much cheaper and far more useful. However, it will be more valuable than wood! He may produce a textile fiber from which may be woven the finest velvet, or he may create a sponge that will do things a natural sponge won't, and wear longer; or it may be a vastly superior finish for automobiles, or a wrapping film that is transparent and moisture-proof. And none of these creations will be wood!

The significance of the latter fact is tremendous, because now in addition to wood the inventor has a variety of raw materials that previously did not exist on which to exercise his genius. He may conceive ten new devices where before he conceived one. His old field had been worked over for centuries and he had about reached his limit in thinking up improved devices fashioned from wood. His new field is virgin soil and comparatively limitless in extent. For example, the pyroxylin plastics, which are derived basically from cotton, are said to have been utilized in the manufacture of more than 30,000 different kinds of articles, ranging from plastic tips for shoelaces to the binder used in fabricating the first automobile safety glass.

And wood is only one starting point of the chemist creator. He also takes coal, which is plentiful and cheap, and from it derives dyes, perfumes, medicines for the sick. From coal, limestone and salt he obtains a product superior to rubber. From coal, water and air he gets a hundred-odd things, including a textile fiber that may be spun finer, stronger and more elastic than any other fiber known to man. The number of products developed from chemical modifications of cotton and cottonseed oil runs into the thousands. Camphor is produced from turpentine, the whitest of white pigments from the blackest of sand, a means of increasing the power of gasoline-driven motors is found in sea water.

The secret of these transformations is a simple one. In wood and cotton, the chemist sees neither wood nor cotton but cellulose, which is a primary building material used by Nature in her creation of all plant life. In coal, he sees mainly carbon; in water and air mainly hydrogen, oxygen and nitrogen. All organic things are made up largely of these four elements, while ninety-odd elements constitute the building blocks from which was formed the world and all that is in it. So what Nature has employed in creating her wonders, the chemist employs also in creating his—but with a new objective. His goal is cheaper, better, more easily





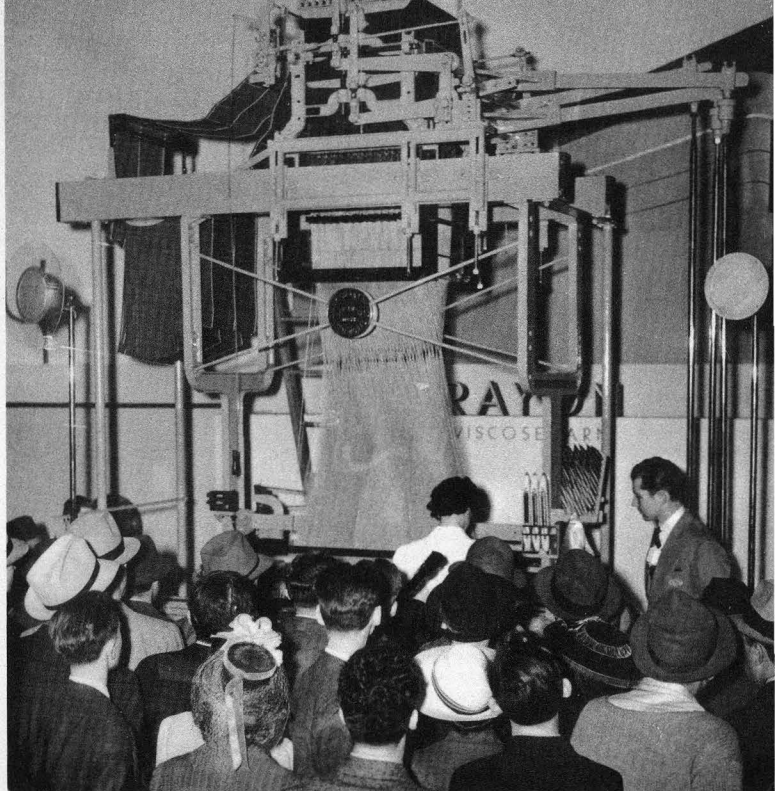
worked materials which industry can utilize *in addition* to those Nature has provided.

In the span of a single generation, not a few but tens of thousands of such new man-made compounds have been produced, none of which was available to our fathers and grandfathers. Here is a vast kingdom of virgin materials, of which to date but a small part has been converted to everyday use. It is as if a wholly new continent had been discovered containing riches of which nobody had dreamed. And that isn't all. The chemist is just getting really acquainted with his job. He has only begun to create. The money spent annually on research in America, while considerable, is still less than is being spent, for instance, on cosmetics.

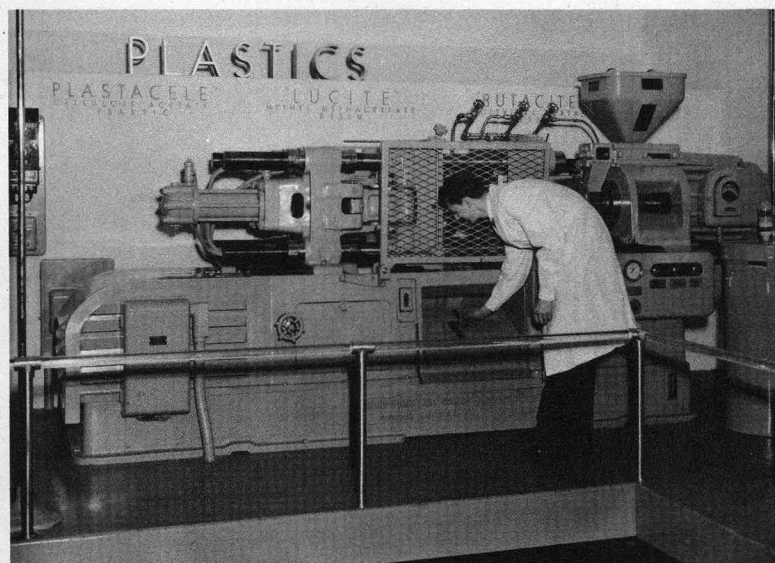
The chemist is doing something else significant. He is improving Nature's products as such. Wood is being subjected to special treatments to render it fireproof, rot-proof, insect-proof. Fabrics are being made water-repellent, wrinkle-proof and spot-proof. Minute quantities of chemicals added to rubber have helped quadruple the life of automobile tires, while their original cost has been cut drastically. Beginning with improvements in the soil and extending right through to the home kitchen, food is being made more wholesome and nutritious. The result is a healthier, taller, broader-shouldered coming generation. A huge bill exacted yearly by spoilage, the ravages of pests and other wastes is being whittled down, so that every dollar spent on living will buy more usable value.

A leading magazine devoted to the chemical industry said recently that there isn't a business in the country which could not at once reduce its costs, or better its products, or increase its profits by adopting more fully the chemical discoveries of recent years. That is a broad statement. The reason it may be a true one is that every week, almost every day in fact, brings forth some new chemical development. For by progress alone can research laboratories justify themselves. The industry is dedicated to change, not idly, but because it thrives on it, and because it has found that to stand still in today's world is economic suicide.

The du Pont Company's "Wonder World of Chemistry" exhibit at the New York Fair is, in effect, a panorama of recent chemical progress and change. It is the largest undertaking of the kind by the country's largest chemical manufacturer, which in itself makes the exhibit notable. Set against the background of pre-



Here, for example, visitors are watching a loom with a jacquard attachment weave viscose rayon yarn into a colorful fabric, the pattern of which is a picture of the "Wonder World of Chemistry" building.

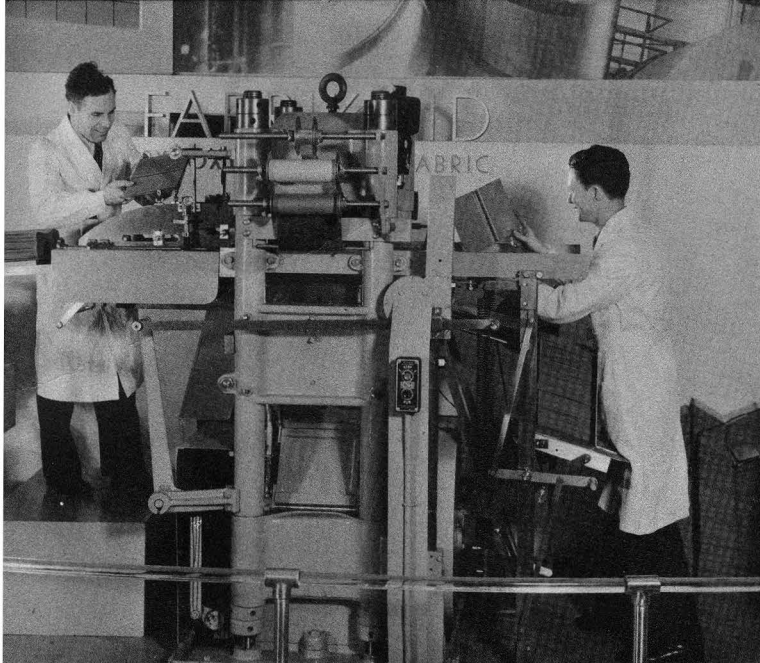


An attendant removes perfectly-formed combs from an injection molding machine, after "Plastacele" molding powder has been subjected to heat and 175 tons pressure. The operation requires about half a minute.



Here, the process of manufacturing "Cellophane" cellulose film from the raw material to the finished sheet is visualized. At the right is a candy-wrapping machine which turns out individually-wrapped pieces.

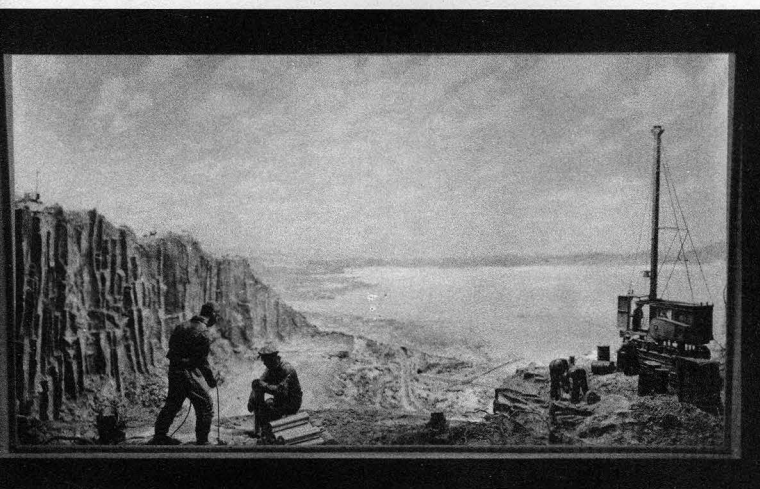




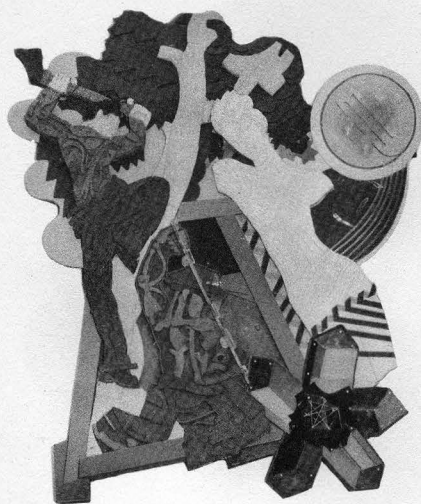
Here, several types of foil are applied to book covers of "Fabrikoid" coated fabric. In the same operation covers are stamped and embossed. The operator, right, is shown holding a sample of this machine work.



Here is demonstrated the operation of the "Sink-and-Float" process by means of a small plant model that separates pieces of coal from slate.



The service of du Pont explosives in building the world of today and tomorrow is pictured in this colorful diorama with its quarry, highway, railroad tunnel and river channel. All indicate important uses.



World War fairs, it stands out as a unique example of how far life has moved forward in a generation in the United States. Only a few of the many products shown existed in 1914, and then only in relatively crude form or as the products of foreign nations. Most of the developments are less than a decade old. At least three of major importance were born within the past year.

Just one of the three—nylon, of coal-water-air origin—almost would have "made" one of the older world's fairs, industrially speaking. In 1876, it might have enjoyed as great a sensation as Bell's telephone, and at Paris it would have made Chardonnet's forerunner of modern rayon seem like a puny stepchild. Both telephone and rayon's ancestor were in a primitive stage of perfection when introduced. Nylon, on the contrary, is a remarkably advanced product, although still under experiment.

Several aspects of nylon are displayed. In one it displaces natural hog bristles in a leading make of toothbrush, wherein it has proved in actual service that the bristling filaments made from it will outlast natural bristles two or three times. In another it appears in new and stronger fishing lines and leaders of interest to sportsmen, and the young ladies of the Exhibit staff are wearing nylon stockings.

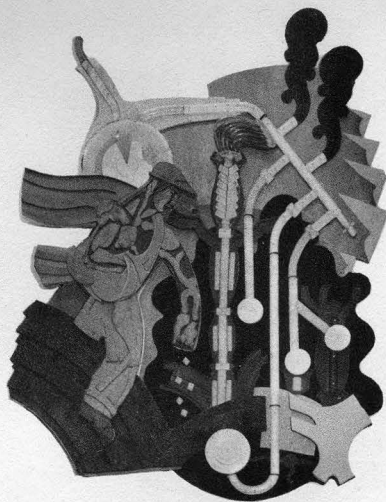
Experimentally, it is lending itself most satisfactorily to the making of fine hosiery and other knit goods, such as underwear. It is applicable to an increasing number of other textile products, and products differing very widely from textiles.

Nylon is so versatile that the extent of its varied commercial uses can only be guessed today. Experimentally, it has demonstrated greater strength—elasticity factor—than any fiber now in general use. Moreover, the filaments can be drawn as fine as a spider's web.

It goes without saying that nylon fiber, as good as it is, will be improved, which is a fact that might lead the imagination almost anywhere. But yet it is only an incident of nylon's real promise. Unlike the telephone, which was designed for communication purposes alone, nylon is a whole class of new raw materials that in one form or another might conceivably cut across all industry before its possibilities are exhausted.

What cellulose has been as a chemical raw material, entering into the manufacture of tens of thousands of different articles in daily use, nylon may also be on an entirely new plane. Here is the very essence of what





the newer chemical creations connote in the way of change, as contrasted to the strictly limited promise of inventions conceived for one use only.

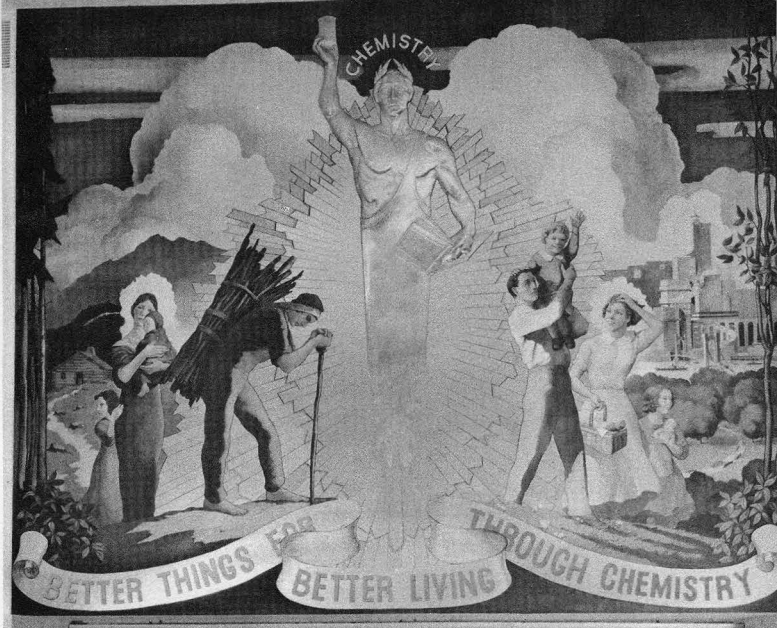
A second major development of a different sort than nylon is du Pont's new "Sink-and-Float" process for mining. After years of research, it presents an economical method of separating slate and other waste from coal simply by passing it through a chemical bath, in which the coal floats and the refuse sinks to the bottom. Though less than a year old, in the "Sink-and-Float" process engineers even now are seeing opportunities to reduce costs in fields other than coal mining, and to salvage tremendous quantities of ore heretofore considered beyond the reach of all known mining methods.

"Lucite" methyl methacrylate plastic, offspring of the coal-air-water trinity, is several years old but the uses to which it is being put are as new as nylon. "Lucite" has unusual optical properties and will convey light around curves and bends. It is light in weight, substantially unbreakable, water-white and as transparent as crystal. These qualities have excited inventors.

One has devised highway reflectors of the plastic which have many times the light-reflecting property of similar discs made of pressed glass. Tested on a busy stretch of highway in Michigan, the night accident toll in the first three months dropped 79 per cent, in large part because the discs, set a gleam as far ahead as headlights reached, more clearly marked the way. In other states the new reflectors are now on experimental duty, promising an inexpensive and practical method of reducing fatalities in night highway accidents.

Inventors are adapting "Lucite" to surgical and dental purposes. Operating instruments made of the plastic convey a heatless white light from a bulb in their base directly to the recess of the body under scrutiny in an operation. In hospital operating rooms, light has been so "piped" experimentally a distance of ten feet. Possibilities of using the plastic in home lighting in a manner that would do away with all visible light sources are under study.

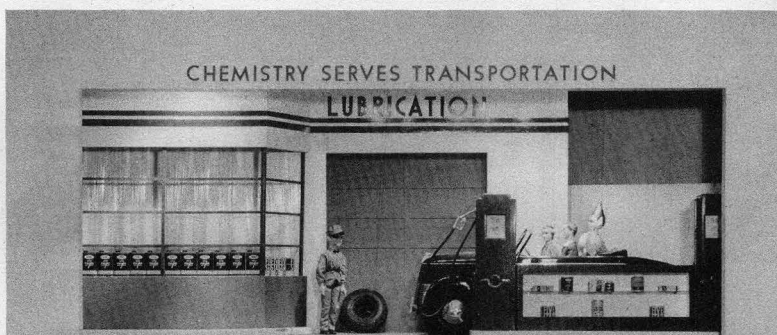
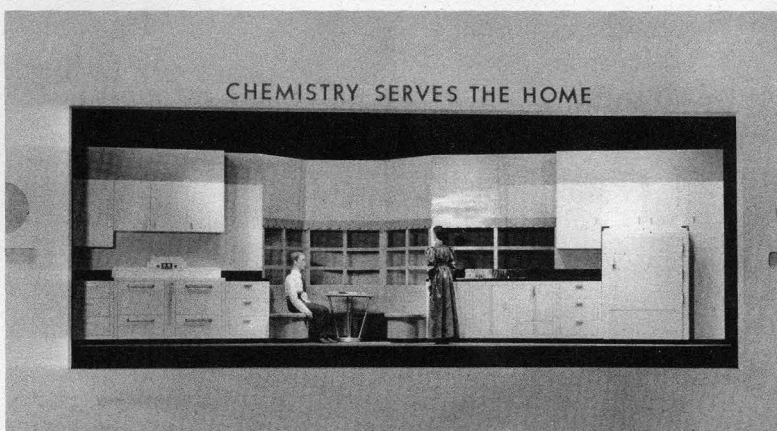
As one enters the Du Pont Exhibit Building, the eye is caught by a large mural of delicate shades of coloring. Carved and cut out figures symbolize the story of chemistry. The figures were fashioned from "Lucite" and from "Plastacele" cellulose acetate plastic. It is the only such work of art in the Fair.



*Chemistry's contributions to mankind are symbolized in this mural by a Delaware artist, John W. McCoy II, who has used "Fabrikoid" coated fabric and other du Pont products extensively in this presentation.*

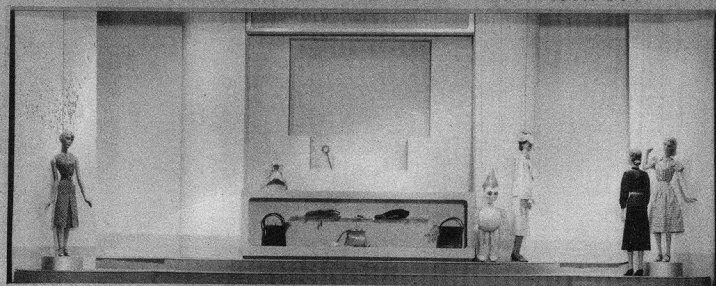


*Three of the five marionette stages in the Cavalcade of Chemistry Hall. Here, dramatized versions of Chemistry's service rôle in the home, in transportation, in Fashion's realm, agriculture, and the World of Tomorrow are presented. Above the stages Pierre Bourdelle's murals executed in du Pont materials, interpret these themes.*





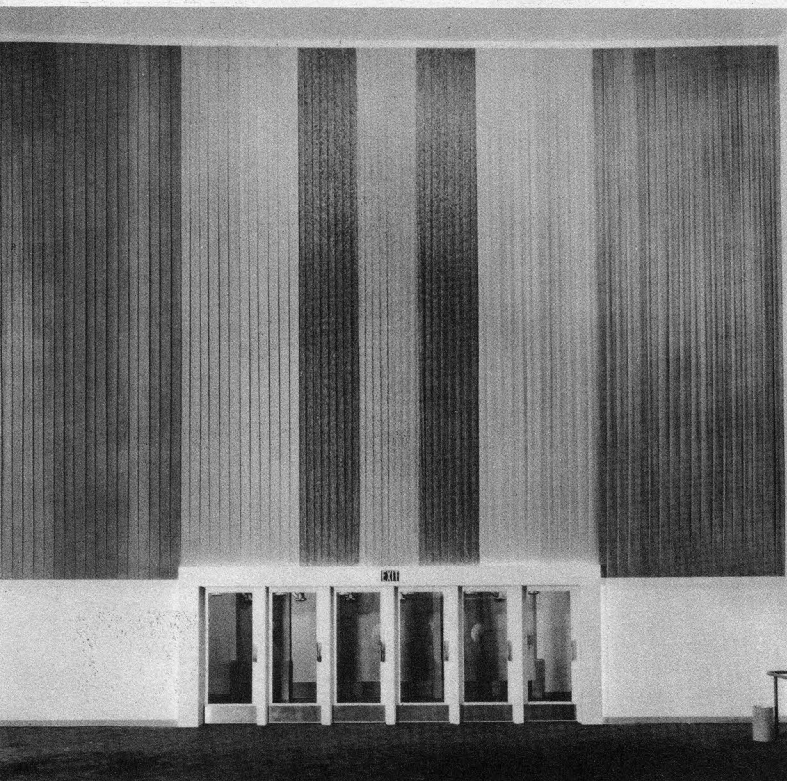
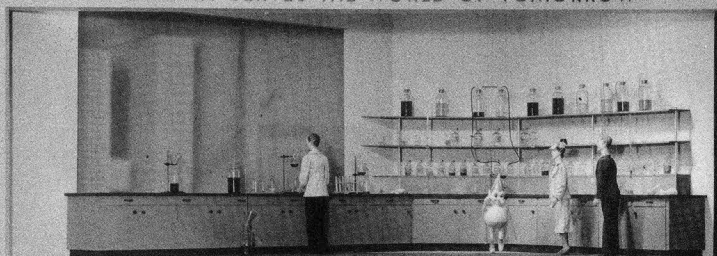
# CHEMISTRY SERVES THE REALM OF FASHION



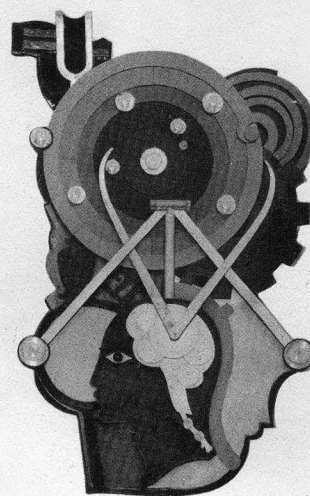
# CHEMISTRY SERVES AGRICULTURE



# CHEMISTRY SERVES THE WORLD OF TOMORROW



Above the exit is this huge color panorama, a draped fabric wall covering which features du Pont rayon and dyestuffs. These beautiful fabrics are flameproofed with du Pont fire retardant "C".



Its creator, the eminent artist, Domenico Mortellito, believes that it also symbolizes a new day in art when new materials of chemical origin will displace the traditional media of expression used by artists for centuries.

In all, more than a score of discoveries, each of which in its time and field might rank with nylon, "Sink-and-Float" and the newest plastics, are dramatically represented in the "Wonder World of Chemistry."

None of these chemical creations are of the hit-or-miss kind. They've been conceived to meet real needs. They serve instead of natural materials that are too rare and costly for general use, answer purposes that no known natural material will, and relieve the nation of dependence upon foreign sources alone for vital supplies. The United States, for example, grows no rubber at home but consumes one-half of the world's output. Factory-made neoprene, which can be used wherever rubber is used, forestalls the dangers of a rubber shortage in emergency. No other nation is today so nearly self-sufficient as this one, thanks to chemical developments of the past twenty years.

At the New York World's Fair, du Pont strips the mystery from these developments. Demonstrations and displays are arranged to show Chemistry's creative rôle in converting Nature's raw materials into improved or wholly new products, following the orderly sequence of work in Research, Chemical Control, and Manufacture. The story of modern research is told from its beginning in the laboratory of the fundamental explorer, on through other laboratories where applied chemistry seeks a practical use for an original discovery, to the experimental or pilot plant operation where the new product is subjected to the test of actual production, and finally to the large-scale factory. New products are both exhibited and demonstrated. The visitor has only to use his own imagination and vision to fit the story into the general economic scheme, and into his own life.

"Go to the Fair, Young Man!" Somewhere on the grounds, in the halls of some exhibit, possibly lies hidden the solution of America's home building problem, of its farm problem, of the problem of a more even distribution of the common wealth, of unemployment, of future national security whatever comes. Here, certainly, are clues to careers—to tomorrow's lucrative jobs.

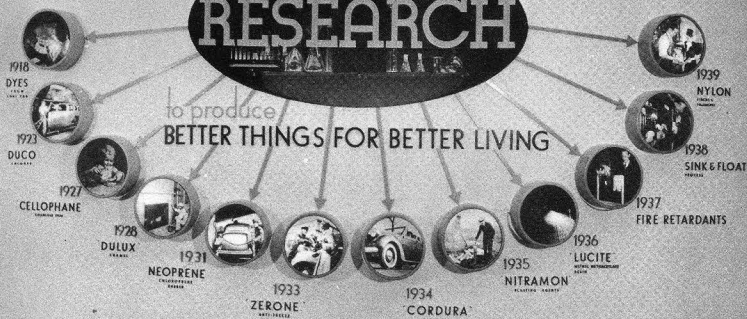
Industry is on parade in Flushing Meadow, and so too is opportunity—as never before in the life of any living man or woman.



du Pont invests \$7000,000 a year in

## RESEARCH

to produce  
BETTER THINGS FOR BETTER LIVING



The importance of research in the du Pont program of product development is graphically portrayed on one of the walls of the main exhibit room. Shown here in chronological order are some of the outstanding contributions which have been made during the past two decades. Another display in the research section calls attention to twelve groups of products that have been developed or largely expanded since 1928 — lines that account for about forty percent of the Company's total sales.

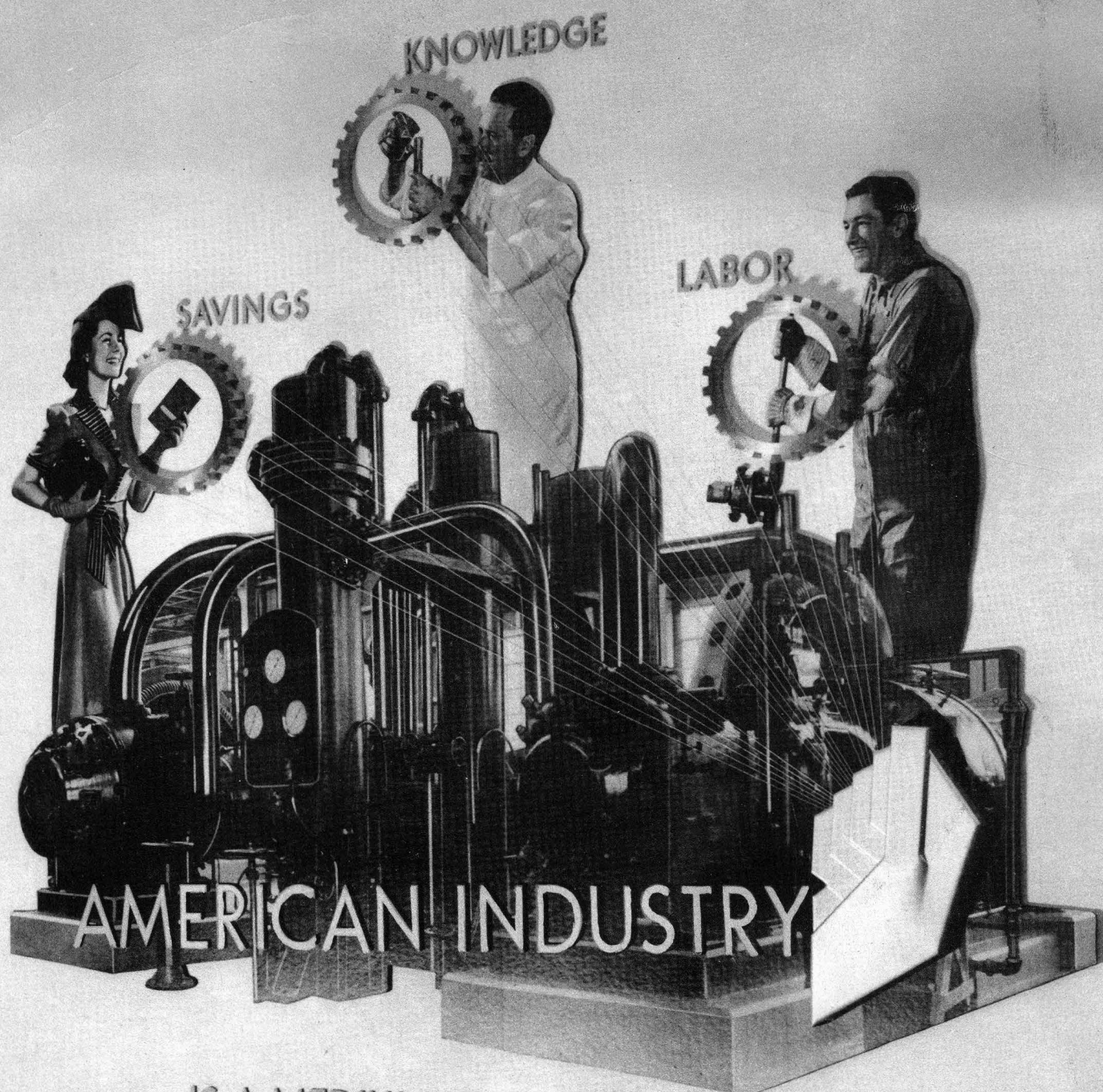


SUCCESSFUL RESEARCH IN CHEMISTRY  
CREATES *New Jobs*. DU PONT PRODUCT  
DEVELOPMENT AND IMPROVEMENT  
SINCE 1928 NOW GIVE JOBS TO 8,000

*Additional du Pont Employees*

Displays and demonstrations in the Laboratory Control section of the "Wonder World of Chemistry" Exhibit enable visitors to learn about various types of testing equipment used in this important work. Here interesting laboratory control tests are visualized and explained and much information presented about insecticides, dyestuffs, water repellents, fire retardants, paints, varnishes and finishes, electroplating materials, ceramic colors, neoprene and the "Sink-and-Float" process developed by du Pont.





IS A MEDIUM FOR THE EXCHANGE OF  
SERVICES.. THE SAVINGS OF SOME,  
THE KNOWLEDGE AND LABOR OF  
OTHERS ARE POOLED, SO THAT BY  
COOPERATION ALL MAY LIVE  
MORE FULLY