SCIENCE

Vol. 86 — Friday, September 17, 1937 — No. 2229

A World of Change: Dr. Edward R. Weidlein ... 249
Rôle of Artesian Waters in Forming the Carolina Bays: Professor Douglas Johnson ... 255
Obituary:
Herman Diederichs: A Correspondent. *Lord Rothschild. Recent Deaths and Memorials* ... 258
Scientific Events:
The Silver Jubilee of the Indian Science Congress Association; Relief Maps of the Rocky Mountains and Pacific Coast States; The Sixteenth Exposition of Chemical Industries; Rockefeller Traveling Fellowships; First Award of the Francis P. Garvan Medal ... 260
Scientific Notes and News ... 262
Discussion:
Observations of a Brilliant Aurora: Dr. Ernest Cherrington, Jr. *Progress in the Control of White Pine Blister Rust:* Dr. S. B. Fracker. *Does the Virus of Influenza Cause Neurological Manifestations?:* Dr. Josephine B. Neal and Harriet L. Wilcox. *The Occurrence of a Possible Mutation, Cancer to Non-Cancer, in the House Mouse:* Dr. William S. Murray ... 265
Special Articles:
Changes in Human Tissue Electrolytes in Senescence: Dr. Henry S. Simms and Abraham Stolman. *Effects of Carbohydrate Plethora in Experimental Diabetes:* Dr. S. B. Barker and Dr. J. E. Sweet. *Brain Metabolism during the Hypoglycemic Treatment of Schizophrenia:* Professor Harold E. Himwich and Others. *Chemical Changes of Fruits Ripened in the Presence of Ethylene:* Professor Elmer Hansen ... 269
Scientific Apparatus and Laboratory Methods:
A New Type of Gnomonic Ruler: Professor G. L. Clark and S. T. Gross. *Hydroponics Solution Used for Daphnia Culture:* Dr. Willis L. Tressler and Thelma Williams ... 272
Science News ... 8

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKeen Cattell and published every Friday by

THE SCIENCE PRESS

New York City: Grand Central Terminal
Lancaster, Pa. — Garrison, N. Y.

Annual Subscription, $6.00 — Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

A WORLD OF CHANGE[1]

By Dr. EDWARD R. WEIDLEIN

MELLON INSTITUTE OF INDUSTRIAL RESEARCH, PITTSBURGH, PA.

The most interesting address that I could deliver to our radio audience would be to pick out at random from this distinguished group of chemists individual persons and describe their work to illustrate the application of science which has transformed the world. Here are gathered scientists from all parts of the United States, as well as representatives from foreign countries, to exchange ideas, and in their presence it would not take one long to realize that something startlingly new and extremely important is happening in the world.

Their gathering is important, and every university, research organization and industry should be represented. Every chemist realizes that scientists stand upon the shoulders of their predecessors. It is for this reason that their gain is exceptionally rapid. A scientific principle once established becomes the property of all science; a piece of apparatus once constructed becomes a pattern for later apparatus of the same kind.

These leaders in the fields of science are the real authors of history. Their work is having more fundamental effects than all the laws that have been enacted or all the armies that have ever marched in triumph. The benefits that flow from their achievements are not limited by race or creed or political boundaries or even by time. They provide physical comforts for all men and gradually free their bodies from disease and their minds from the terrors of superstitions. They give their fellow scientists enchanting new views into the regions they explore.

That this influence does not die with the individual is clearly illustrated by the life of Charles Frederick Chandler, whose one hundredth birthday will be celebrated at Columbia University in October. Dr. Chandler was one of the founders of the American

[1] Address of the president of the American Chemical Society, Rochester meeting, September 9, 1937.

Chemical Society on April 6, 1876, and served as its president in 1881. He knew how, as few others who have lived, to open the portals of chemistry to a pleasing and attractive vista. He aroused curiosity and ardor. He was a mighty force in the introduction of chemistry into medicine. Wherever we go we find traces of this remarkable man—in industry, in sanitation, in the household and in the improvement, comfort and safety of living. He was a great teacher, and his boys were his constant delight and ever-present care.

If one were to probe the methods of an intent, aproned man busy with the test-tubes, Bunsen burners, flasks and reagents in a chemical laboratory, he would hear a story fashioned of numbers. Strange that the infinite variety of the universe can be resolved into a series of numbers! But to the chemist there is little that is strange about it. Nature has demonstrated that the seemingly endless variety of cosmic phenomena, ranging from microscopic dust particles to gigantic stellar systems, is, after all, superficial. For chemistry has reduced the universe to ninety-two chemical elements or kinds of atoms, starting with simple hydrogen and going up the atomic scale to uranium, the most complex element known. All that we see about us can be resolved into these elements. The fascinating realm of nature, from the log that blazes in one's fireplace to the snow-capped mountain chain that lures in summer, is built up from these elements and their various combinations—evidence of the infinite variety of ways in which atoms and molecules can be joined together. Joined in one way, they make a useful textile; in another, a nourishing food.

Not satisfied with the world as they see it, scientists have set their hands and minds to the task of changing the creations of nature or making new products which nature neglected to make. Nature makes her compounds for general purposes, and is not aware of industrial, scientific nor medical needs. Hence nature is not perfect because not omniprovident, and the chemist often finds it necessary to improve on nature. Already he has prepared artificially a vast number of substances that nature never dreamed of making, including dyes unmatched by any flower, alloys that were not created when the earth was a cooling fiery ball, artificial silk and woolen fibers, stronger drugs and sweeter perfumes wrung from such a surprising source as coal-tar. Many products of life processes and a much larger number of new compounds related to them have been made by the chemist. He is changing life more rapidly and inexorably than ever before, and all about us are heard glowing words about "the new synthetic age."

Our future, to a large extent, is in these innocent-looking but all-powerful test-tubes that you will see neatly arranged, row upon row, in any laboratory.

If Aristotle were living to-day amid our chemical successes, his childhood belief in fairy stories probably would be reborn. The Greek philosopher interpreted the universe in only four elemental forms of matter—earth, air, water and fire. These elements represented the four properties of dryness, cold, wetness and warmth. Thus Aristotle taught that all substances were composed of some sort of primordial stuff in combination with various amounts of the four elementary properties.

Out of Aristotle's doctrine of the elements grew the fascinating but futile work of the alchemists, who dreamed vainly of converting base metals into valuable gold. But, though futile, the efforts of the alchemists were not altogether fruitless. Modern chemistry had its beginnings in the mystical vaporings that characterized their gloomy, dimly lighted workshops, full of strange vessels, spheres, portions of skeletons hanging from the ceiling and massive parchment books covered with hieroglyphics. Alchemy may be compared to the man who told his sons that he had left them gold buried somewhere in his vineyard. The sons dug deeply and earnestly, but found no gold. Their cultivation of the soil, however, produced a plentiful vintage. Similarly, the earnest but unsuccessful search for the transmutation of base metals into gold brought to light many useful discoveries and instructive experiments.

These by-products of alchemy—chance discoveries of chemical elements, compounds and principles—were more important than the search for artificial gold.

The first investigator to grasp the significance of the value of chemistry as a separate science was Robert Boyle, whose publication of "The Skyptical Chymist" in 1661 is often regarded as marking the beginning of modern chemistry. Paracelsus, celebrated by Robert Browning, broke with the monks and alchemists, assailed the physicians who treated chicken-pox with the aid of a soup made of the hearts and livers of vipers and laid crudely the foundation of modern medical chemistry. Becher conceived of phlogiston as the active principle of fire. The downfall of the phlogiston theory began with the work of Joseph Priestley, preacher and scientist, who succeeded in isolating and identifying oxygen.

Before even Priestley, however, was Cavendish, shy, eccentric misanthrope, who played with chemical apparatus and weighed the earth, in preference to spending his wealth, and who won immortality as the first experimenter to reduce water to hydrogen and oxygen. But it was Lavoisier, later snatched from his laboratory by the French police to die under the guillotine, who molded chemistry into a science. The brilliant Frenchman, science's greatest loss to the Reign of Terror, formulated what is now known as the "law of the conservation of matter." This fundamental law states that in every chemical reaction the weight of the products is exactly equal to the weight of the substances which entered the reaction. Lavoisier also made a list of thirty-three chemical elements, explained the chemistry of fire and infused into the body of science a new spirit for accurate and patient measurement.

To ponder on the future life of man and on the ability of science to mold and reform the future is to lift oneself to a plane of high buoyance. In the words of the Earl of Balfour, in an address he made as president of the British Association, "The satisfaction it gives is almost esthetic in its intensity and quality. We feel the same sort of pleasurable shock as when, from the crest of some melancholy pass, we first see far below us the sudden glory of plain, river and mountain."

What woman or man but is interested in to-morrow? Judged by the scientific marvels of the present day, what an age it will be!

Photographs by radio; machines that seem to think; lights that pierce fog; gas made from water; cameras recording lightning bolts and taking pictures in the dark; five-million-volt guns smashing atoms to wrest new secrets from nature.

News put into type by direct wire; machines to administer anesthetics, record telephone calls, and measure the billionth of an inch; other machines to measure the smoothness of roads and record the nature of accidents; ways to "hear" light and "see" sound.

Fantastic? Yes, but they're here.

These, and more, we have—although our elders would have scoffed if they had been told that these things would come. But a plane roaring from ocean to ocean between sunrise and sunset is nothing new. People talk across the ocean every day by telephone. The time may come when women will match fabrics by television, when their kitchens will make present-day luxury seem like the drudgery our grandmothers endured.

It is impossible, however, to fathom truly what tomorrow may be like. Only the rare human mind can free itself from the fetters of to-day's accepted forms and think in new terms of a different age. The first automobiles were cranked by hand. They broke many an arm, but people accepted the fact because no mechanical way of starting a car could ever work. Yet research, using a sleeve with threads like a screw, found a way to crank the motor; it had never dawned on science that it couldn't be done!

The pace of the advance has quickened. The resources of science, more closely knit, have speeded progress amazingly in the past twenty-five years. That pace will not slacken so long as human needs must be met. If what has happened already seems incredible, what are we likely to see in the not-distant future?

For we know full well that to-morrow probably won't resemble this age in the least. Too many "impossibilities" have come true in our own life-span. We have not yet forgotten that "man will never fly"; that conversing without wires was labeled an absurdity; that "nothing can ever be done" about typhoid, tuberculosis or malaria.

Yet men have flown around the world, talked by wireless across the seas, stamped out plagues. The oxcart has made way for the soaring plane; the laboring locomotive for its silent, streamlined cousin; the mechanical music box for the miracle of radio.

A finger moves a dial and invokes the human voice. But the telephone is an old story. Manufactured ice and mechanical refrigeration come instantly to the rescue in hot midsummer days. But we already forget the waste and illness of the era before man-made refrigeration. The photograph of a distinguished visitor spans the continent in a few seconds. Telephoto, too, however, becomes prosaic. A modern Dryad wears a gown that last year was part of a tree. Yes, but we grow to expect beautiful new fabrics from the commonest substances, even glass.

If yesterday's miracles are to-day's commonplaces, what an age to-morrow may be, with science as its constant guide, insistent on solving human needs, making the improbable come true.

What kind of homes, for instance, shall we be living in by 2000 A.D.? What kind of furnishings shall we have? How shall we heat our homes? Shall we all be living in the country or in some new kind of city? What kinds of recreation shall we have? What kinds of planes, automobiles, trains? What kinds of bridges, tunnels, viaducts, ramps? What materials and substances shall we wear and eat? How much leisure shall we have for the art of living? We dare not more than guess.

For most prophecy is untrustworthy. We all are too likely to project the present into the future, forgetting that the future may go clear around us, or scrap much that we accept. Scientists speak casually of harnessing the winds for power, of drawing upon the heat of the sun, of using even the surge of the tides for power to replace fuel that by then may be gone. Laws will not prevent men from thinking. And so long as they think, so long as they refuse to accept the present age as perfect, advances will be made.

Back of all change is the wholesome spirit of discontent. There must be a way to make a better stocking, to create a more durable fabric, to make a better dust-pan than those now sold. Dissatisfaction with something less than perfection, desires for something better, refusal to accept things as they are—these are the urges that lead to improvement. These, and a special quality of open-mindedness that keeps the present from closing the door to the future.

Chemistry is constantly seeking through research natural facts on which to base new truths, which bring about these changes. But she can not invoke them alone, without the aid of her sister sciences, any one of which may at any moment find a new bit of knowledge which will lead the others along new trails. This world-wide collaboration is really the hope of scientific progress to-day.

Modern research is characterized by its complexity and the variety of phases which it presents. In the latter half of the past century and the beginning of the present, it was still possible for an individual, working alone, with comparatively limited facilities, to achieve epoch-making results in the borderline fields of research. The surface has now been well explored and it is consequently necessary to probe deeper and to enlist the cooperation of trained specialists in such widely diversified fields as chemistry, physics, biology and engineering. Elaborate equipment and apparatus are now required for the conduct of researches, for they must be performed on a mathematically correct basis with constant control of all variables.

There were ages when science moved haltingly or drooped in discouragement beneath the indifference of hostile rulers and superstitious peoples.

To-day the speed of communications alone has woven the world of science more tightly, so that each bit of fresh knowledge is known everywhere as soon as it is proved. It no longer takes months for a new fact or method to filter from nation to nation, or years for it to be practically applied.

Considering the accelerated pace of recent years and the rate at which science has revolutionized our daily lives, it would be easy to sit back complacently and call this an age of scientific miracles, to remark that we had reached the ultimate in development, that there could be no more worlds to conquer.

It would be easy to say it, but your chemist, above all men, could tell you it is not true. He knows that chemistry, though brilliant its gains, has only scratched the surface—knows how pitifully meager is the hoard of knowledge so far acquired. In physics, in chemistry, in engineering, in medicine—the dearth of knowledge is the same. The swift progress that has been made must not make us over-confident and lose us that humility which we must retain if we are to be dispassionate searchers after truth.

If we take the time to glance back through the pages of history, we can see how easily each age has fallen into the error of believing that it represented the ultimate in civilization. There was a time when Europe, steeped in its troubles, guessed of no new land or opportunity like America. The Middle Ages seemed highly developed to its own peoples, but most of the great inventions and discoveries of science have come long since then. Even as late as 1900, millions felt that we had gained as much from science as we were likely to win. Yet in the short span of thirty-five years we have seen the first "red-devil" automobile become a necessity for the masses, turn transportation ideas upside down, revolutionize our industrial structure. We have seen radio burst upon the world and link distant lands by new seven-league boots. We have seen early ventures in flight give another dimension to transport. Television next, and meanwhile scores of new products, new foods, new industries of which, a generation ago, no one guessed. Wonders indeed! Yet science realizes how truly little headway has been made, how much more remains to be done.

Scientific research is still young, even in the life of the universities, which are primarily responsible for its existence. Having gained the spirit of research from the universities, the industries have applied its methods to their own affairs with really amazing results. During the last twenty-five years the number of industrial research laboratories in the United States has grown from a very few to more than two thousand, which accounts for the great change that has taken place in our standard of living. It was chemistry, perhaps more than any other science, that taught business men the true significance of pure and applied research.

Without the evolution of scientific investigations in the universities, industrial laboratories might never have come into existence. Besides the very idea of research, the universities have furnished the industries with men possessing knowledge not only of the underlying scientific facts and theories but of the methods and techniques of investigational work. The man with a true scientific mind is always open to change. From the universities also proceeds much of the basic knowledge of science on which the industries of to-day have been built and which will be the foundation for the industries of the future. Accordingly this essential contributory part of our universities should be recognized and nurtured by the industries. Colleges and schools have invested some $300,000,000 in chemical buildings and equipment. Real progress is made through the cooperation of pure science, industrial research and the industrialists.

The expenditures for industrial research in this country have increased steadily. The chemical industry, the largest cultivator and supporter of research, has enlarged its expenditures on laboratory investigations; the food industry has likewise increased its appropriations for research. The metal-working field, which during the depression stopped much of its research, is now resuming laboratory investigations on a large scale. Researches have lately been accelerated in the fields of building materials, air conditioning, synthetic fibers, organic chemicals, plastics, "tray" agriculture and new sources of motor fuel.

It may, moreover, be observed that the industries which engaged to the largest extent in scientific research emerged from the depression first and did the most to aid national recovery.

It must be remembered that it is only through applied knowledge that the people have gained the material blessings of our civilization. Every useful agent in our civilization is the product of our industry, and it is only through the industries that these new products of civilization can go to the people. New mechanisms, such as the telegraph, the telephone, the electric light, the x-ray, new medicines, dyes and new alloys come to us only through the industries. We often hear it said that some man eminent in science has "given" his results to the people. That is, in nearly every instance, nonsense. Röntgen's discovery of x-rays, upon which he took out no patents, could go to the people only by the use of x-ray bulbs, and these x-ray bulbs were manufactured and improved by various corporations, through whose factories they went to the people.

The classical example is of course the work of Faraday, on electromagnetic induction, on which is based ultimately the whole immense development of the electrical industry; a development not achieved of course without an enormous amount of capital and directed industrial research.

We are thinking, too, of industry not only depending upon many sciences but being in a real sense science itself. Science pursued in this broad manner will enrich itself and the world. The true manufacturing function consists in making the best thing possible in the most economical way. It does not mean practising the art through the best tradition, but means pursuing the art with the aid of modern scientific knowledge. A good illustration is in the field of synthetic organic chemistry. The development of organic materials of predetermined characteristics to fill definite needs in industry has been employed on a wide scale only in recent years. The more common uses, such as the acetylene flame for cutting or joining metal shapes in the steel industry or the use of glycerol trinitrate or trinitro toluol as detonation agents in mining operations, are generally known. However, a wholly new degree of change is being brought about by interweaving of synthetic organic chemicals with other products. National defense against human aggressors as well as sanitary defense against microorganisms in their modern forms depend largely on synthetic organic chemicals as key products. The modern automobile and airplane, the outstanding accomplishments of the twentieth century to date, would be far from their present standard of excellence without the regulating effect of the synthetic products used in their construction and operation. Anti-knock fuels, special lubricants, durable tires and other rubber goods, anti-freeze materials, lacquer coatings, safety glass, brake fluids, plastic products, among other features, have permitted the remarkable degree of perfection and low cost which these unique products of our generation have attained. A new aliphatic organic chemical industry was created just prior to the depression and has had a rapid and continuous growth since 1929.

Research in the metallurgical industry has resulted in metals without which the production of these new aliphatic organic chemicals, and other processes, needing to be worked at high pressures and high temperatures, would have been impossible.

Chemistry has likewise played a major rôle in the production of better and cheaper motor fuel. Cracking, hydrogenation, polymerization became common terms in the industry. The increasing demand for power plants has resulted in more severe conditions for the lubricants used. Automobile and airplane engine oils are exposed to high temperatures and greater loads each time there is an increase in the horse power yield per cubic inch of cylinder capacity. Under these severe conditions oils are more likely to deteriorate and fail in service. Some progress is being made in the development of addition agents to oils for increasing the oiliness and film strength under severe conditions. By analogy with the well-established practice of adding antioxidants to gasoline to prevent gum formation there is a development under way for adding antioxidants and similar inhibitors to lubricating oils. These may serve to prevent the formation of sludge by oxidation or to prevent corrosion of bearing surfaces, this by some mechanism not yet understood. It is possible that some of these difficulties may be eliminated by change of the engine design so that the lubricants will not be punished so severely. However this may develop, it is interesting to note that chemical research is suggesting a remedy for the engineering difficulty—difficulties caused by over-rapid engineering advances.

Our home construction industry has received much criticism during recent years, and, as the basis of value received for cost and effort, it must be conceded that this criticism is largely deserved. Here is a field that has possibilities of a "world of change." That such a subject has reached the stage of public discussion, however, indicates that improvement has already begun. Our homes may not seem to us to be a chemical project but, in countless applications of plastic materials, quick-drying lacquers and synthetic fibers, we may confidently expect new types of assembly to emerge with greatly reduced costs while giving sanitary, noiseless, fireproof, moisture-proof and vermin-proof construction, in keeping with known possibilities. Let us take a simple example such as a cookstove. Practically every housewife complains of cooking over a hot stove in the summertime, and conditions are almost as difficult any time during the year. This inconvenience is caused by waste heat, which, if scientifically controlled, would eliminate the discomfort, economize on the fuel bill and also save time. There has recently been constructed a stove along these scientific lines, using both new and old materials, which will give a heat efficiency of 80 per cent. instead of the average yield of 20 per cent. In other words, eight pounds of coal will cook sufficient food for a family of twelve per day. You are quite likely to see on the market in the future a combination coal cookstove and refrigerator in which the waste heat from the cook stove will operate the refrigeration unit. Glassware for cooking purposes has become a common article of commerce, but there was a time when glass was used only for windows and for ornamental purposes. The new tunnel under the Hudson River is to be lined with glass. The first all-glass building was recently constructed in North Carolina, and others are under construction. Glass in fibrous form will find its most wide-spread application as an insulating material for use in construction. Textiles made from glass, because of their resistance to acids, heat and moisture, should find a variety of applications in both homes and industry. It is interesting to observe, however, that some of these new products are the ripening fruit of seeds planted many years ago. New mechanical devices and new application of basic scientific principles have made practicable the evolution of these new products. A good illustration is tempered glass, which was experimented with as early as 1875, and has only recently become a commercial product. The mechanical ice-box did not come into its own until chemistry supplied the proper refrigerants. The home construction industry can hardly yet be said to have started its real race.

It is believed that through orderly and persistent research industry will also be able to absorb much of the surplus crops of American farms. Cellulose is "stored sunshine." The alchemists talked of storing sunshine, the English speculators of the time of John Law floated companies for the purpose, the chemical industry of the future will harness sunshine in the form of agricultural by-products and convert them into useful materials.

A striking aspect of the march of organized research is the emphasis in recent years on staple commodities, particularly those of agricultural origin, as industrial raw materials. New products have naturally been forced to pave their way to public acceptance by technical information obtained in the laboratory. The volumes involved in each case were, of course, at first small, in fact so insignificant that they were disregarded by the industries they were affecting. Change is too often considered as a sudden movement, which is misleading, as it is more often a gradual evolution.

To state the situation another way, new products were continually coming into prominence through the pressure of research, while the materials they were in part displacing lacked the informative background necessary to meet this aggressive competition.

As a tangible example, the case of cotton may be mentioned. All the world is familiar with the giant strides of rayon, its "college-trained" rival. On top of such competition comes the falling off of export volume, as a result of increasing quantities of cotton grown abroad.

Forward-looking men with constructive ideas on means of improving the economic condition of the South see here a great need for a vigorous research program of the cotton industry. Many of our southern states are dependent on this one crop, and their people are trained, their industries are geared to a one-crop economy.

It is significant that developments in increasing the utilization of cotton have in the past been made almost altogether without any concerted action or conscious direction on the part of the cotton industry. This situation encourages one to believe that systematic, cooperative effort on the part of growers, manufacturers and various research organizations, in developing new uses for cotton and in expanding present uses, should be much more effective in stimulating increased demand than haphazard, individual effort.

Sugar is another product that is vital in our national economic and social system. Sugar occupies an important place in the normal diet of all the people. It likewise is one of the cheapest, purest raw materials available upon which to base a new chemical industry. This new industry is now in the process of evolution, and to-day chemicals made from sugar are entering into our industrial processes to produce new and better products.

The scientists are doing the fundamental work. Industry is pioneering the commercialization of these new products, and eventually the agriculturist will have to supply the raw material because of the new demand created. So one often may know where a research begins, but rarely where it will end.

All this requires knowledge, will and action. The knowledge which will find these new uses is a product of research. It will come out of the laboratory where the chemist is breaking down the raw materials we call cotton, sweet potatoes and corn into cellulose and starch and these again into the tiny atoms of which they are constituted. It is these atoms that are the chemist's raw materials. He may buy them in the form of cotton or soybeans or milk, but he sells them in the form of rayon, automobile parts, organic acids, new glues and gums and dextrins, new building materials for our homes, new paints and varnishes. These new uses require as raw materials the molecular aggregates which we take off the land in annual crops. It is true that the chemist can synthesize them in his laboratory, and some of them he will undoubtedly produce there, but this year and for many years to come the sunshine and the rain, the fertility of our soils and the patient labor of our farmers will grow the crops industry needs more cheaply than the chemist can make them.

The better living conditions secured through the increased wealth provided by science, together with the application of science to hygiene and medicine, have considerably increased the average expectancy of life. This great achievement in public health is sufficient to justify the belief that those who call our industrial civilization mean in quality have narrow views and scant idealism.

Chemistry and medicine are establishing a more cooperative program of research, and a good example is some work that has been under way since 1926 on the treatment of pneumonia.

The results of this teamwork between chemists and medical scientists have been of outstanding importance. Woven throughout the whole progress of the investigation is ample human drama cloaked from the layman by such chemical names as hydroxyethylhydrocupreine, apocupreine, ethylapocupreine, hydroxyethylapocupreine and other necessarily abstruse terms. Briefly, the problem was less to find a compound effective with pneumonia and allied diseases than to find one that would not harm the eyes. Certain of the cinchona alkaloids were known to be effective in treating pneumonia, but they were not to be used without great probability of eye damage. Such a dilemma is, of course, a challenge to the chemist and to the physician. The results so far indicate the discovery of cinchona alkaloid derivatives, as new compounds, which give the profession of medicine what it has long sought—a safe treatment of all types of pneumonia which will not harm the human eye and therefore can be both effective and safe.

To date, close to eighty preparations have been tested biologically by the medical collaborators. Some were found to cause no eye disturbance, but to have little activity with pneumonia. The most promising drug found, showing greater activity against the disease, lower toxicity than any of the others, has also been tested in scores of clinical cases, which have demonstrated a very high tolerance in the human being to the drug, absence of any untoward visual results and a high proportion of recoveries from severe pneumococcic infections of all types.

The investigations must go on, the clinical trials must be conducted on a wider base, production of the compound on a large scale must be undertaken. All these projects are now under way, and the chances of ultimate success are very promising.

When trained minds and proper facilities are applied to specific problems, practical solutions are expected. If they were not forthcoming—that would be news.

Fifty years ago, Europe led the world, chemically speaking. Far-seeing men predicted even then that in another half-turn of the century the chemical leadership of the world would pass to America. This change has come about, and the American Chemical Society as an organization deserves a large share of the credit. The scientists of each nation have worked with might and main to surpass one another in chemical discoveries; and the advantage that we have gained has been largely due to the cooperative spirit generated by our society activities. A nation must be able to stand chemically alone unless it would be subservient, so utterly does present-day civilization depend upon chemistry for a thousand-and-one everyday foods and materials. And it grows more and more apparent that to help one's country to be chemically independent is the profoundest kind of patriotism.

The objective of scientific research to-day, moreover, is broader than the solution of technological and chemical problems. It takes into its view the responsibility for enlivening the imagination of the masses who will be the chief beneficiaries of these new ways of living.

A true scientist never grows old in his way of thinking. His mind is constantly working to improve his surroundings and to better understand the laws of nature. He expects to live in a changing world.

RÔLE OF ARTESIAN WATERS IN FORMING THE CAROLINA BAYS

By Professor DOUGLAS JOHNSON
COLUMBIA UNIVERSITY

IN an earlier issue of SCIENCE the writer advanced evidence in support of the hypothesis that oval bays of the Carolina coast and adjacent regions were basins of former lakes, that the basins resulted in part from the solution of limestones or other soluble beds underlying surface sands of the coastal plain, and that the rims partially encircling the basins were accumulations of wind-blown sand. In this paper it was shown that