mechanics and optics, from which grow many by-products and branches—cathode ray tubes, fluorescent materials, lenses and photography.

The laboratories building is a three-story structure with long corridors into which open 150 laboratory bays. To understand what is behind them, the inspection must begin in the basement. It is the nerve center. Into it, through underground arteries of conduits and pipes, are fed the electric power, gas and water supply. Alongside huge water tanks and air-conditioning apparatus are transformers and vault-enclosed power regulators, while the compressed air and steam are supplied from the heating plant. From two 300-foot wells, 600 gallons of water are pumped in a minute.

All the services of electricity, water and gas flow in conduits on the basement ceiling under the main corridor. There are 104 vertical shafts, which rise from basement to penthouse, with outlets on each floor. From these, wires and pipes carry the vital services to 420 work-benches, each 6 feet long. These unique service shafts are described as a most important feature and development—an original contribution to laboratory construction.

Standing at the point where the "T" of the laboratories structure is crossed, on each of the three floors one looks to the right and left down the 244-foot corridors or wings. The total length of a corridor from end to end is 488 feet. That is the span across the top of the "T." The doors on both sides of these spacious hallways on all three decks open to the many laboratory bays, and to nine administrative research offices and workshops. On the main floor, the general office section is near the entrance. Executive offices are in a section on the third floor.

Entering one of the laboratory bays, visitors are impressed with the spaciousness and broad daylight exposure, supplemented by modern indirect lighting, which casts no shadows. The work-benches are so designed and arranged as to be a joy to any worker. A wiring trough extends along the top of each bench, and the markings on the panel outlets indicate that almost any phase of electric current—AC or DC, and at various voltages, is at the finger-tips of the experimenter. In addition, there are taps on the bench for air, gas and water, as well as hydrogen and oxygen in the bays where they are used. And, of course, there are convenient electric plugs for soldering irons and other electrically operated tools. Flexibility in construction is the keynote.

The many laboratory bays indicate a great variety of activity within the laboratories. The Television Laboratory is described as "the last word in facilities for television research." Other laboratory bays are devoted to research in chemistry, especially fluorescent materials; acoustics, radio facsimile, centimeter-wave transmission and reception, receiving tubes, cathode ray tubes, transmitter tubes, under-water sound and various activities associated with the future of radio and electronics.

The model shop is considered to be the most modern of its kind and the best equipped in the world. For example, the meter room has complete calibrating equipment and 3,000 different meters available for covering voltage, current, temperature and speed. The Technical Library of the laboratories is catalogued as "complete in the communication field." There is an ultra-modern kitchen which adjoins a cafeteria with a capacity to serve from 180 to 200 persons at a time.

SCIENTIFIC RESEARCH IN WAR AND PEACE

THANK you, General Harbord and Mr. Schairer, for inviting me to attend the dedication of the RCA Laboratories. It's comforting to know that one is not forgotten by his own family, even when he is as far away from home as Washington. It is a real privilege to be here to-day and see in being the dreams of years.

When the cornerstone of this building was laid in November of last year, I attended the ceremonies by radio on board a ship on the Pacific Ocean somewhere between Honolulu and San Francisco. At that time we were blissfully unaware of what was immediately ahead of us. At the very hour the cornerstone was put in place, the plans of the Japanese war staff to attack Pearl Harbor must have been completed. The enemy ships and planes, which three weeks later were to plunge this nation into war, were in readiness to set forth on their treacherous mission. Our days of peace were numbered, and their number was very few.

It is significant that the foundations of this building were laid in time of peace, and its superstructure has been raised in time of war. Similarly, the modern sciences of radio and electronics have their roots in peaceful soil—in the search by men of good will for ways and means to make the world a better place to live in. Yet these sciences, and all science, are now enlisted in total war.

Total war as it is fought to-day is more than a war of populations or mere quantity of weapons or alone the human qualities of courage and endurance. More than ever before in history, this war is a contest between the brains and imagination and teamwork of the scientists, engineers and production workers of one group of nations, pitted against those of another group. While it is true that the decision ultimately will be made on the battlefield, the high seas and in the air, the fighting men who have the greatest resources of science, engineering and production back of them will be the victors.

Most people are aware that science is making a tremendous contribution to modern war in terms of guns, high explosives, airplanes, radio and synthetic rubber. By developing and improving these vitally important

products, a comparatively small number of scientists may be a far more powerful fighting force than an enemy army of millions of men.

But scarcely less important are scientific developments in many fields of chemistry, medicine and agriculture. Plastics, synthetic textiles, dehydrated foods, high-octane gasoline, aluminum, magnesium and scores of other materials and products important to the war effort are being produced on a vast scale, thanks in large measure to American industrial research.

Developments like these are the result of organized scientific effort, in laboratories such as the one you dedicate here to-day. But organized research is a peace-time product, the result of the slow and careful assemblage of men and facilities long before the urgency of war makes its call for the utmost efforts of a nation.

The United States has been fortunate in the vision of its private enterprises and universities which, long prior to the war, assembled such staffs and built such facilities. True, they did not build them to serve as adjuncts to military forces, as did our enemies. America's purpose was not the conquest of other nations, but conquests over the forces of nature, over ignorance, over poverty, over disease.

Our country is fortunate too that the officers and men in its military and naval establishments, on land, at sea and in the air, have a progressive attitude towards scientific research. They realize its possibilities, not only as a factor in war, but also in peace.

Indeed, the scientists in the laboratories of the Army and Navy and other government departments themselves have made scientific contributions from which our country has benefited in the past and will continue to benefit in the future.

And now, these fine minds and these superb facilities developed to serve peaceful ends are being brought to bear upon the gravest problem which they have ever faced—the problem of survival against ruthless aggression backed by prolonged military preparation.

Only a portion of America's scientific manpower has been fully used thus far in the war effort. The results, however, are already apparent, both in new and improved equipment of our fighting forces, and in the ingenuity displayed by industrial laboratories in developing ways of overcoming problems such as the shortages of critical materials. I have no doubt as to the ultimate result when all our available forces of science are organized and applied to the single purpose of achieving victory.

Of all the fertile fields which American men of science have cultivated for peace and now harvest for war, radio is in the first rank of importance. Speed of communication—on land, at sea and in the air—is the essence of modern warfare.

Aviation, which has so radically revolutionized military and naval strategy, is particularly dependent upon the countless services of radio. We could not have efficient aviation without radio any more than we could have city skyscrapers without elevators.

Admiral Dewey, hero of Manila Bay, would not recognize the radio control room of a modern battleship, where dozens of transmitters and receivers maintain constant communication with other ships, with stations on shore and with planes overhead.

And on land, tanks, armored cars and infantry units carry specially designed radio equipment which enables them to move and to strike with maximum power and precision.

It is particularly fortunate that during the period prior to America's entry into the war the Radio Corporation of America built up its research organization, and that RCA scientists and engineers gained experience along lines that are now of vital military importance.

In the last analysis, a research laboratory consists not so much of buildings and facilities as it does of research men and research leadership. The staff of these laboratories is as fine a group of radio scientists as exists anywhere in the world. They have produced outstanding developments in new electronic devices, in television, in ultra-short waves, in acoustics and in many other branches of radio research. The skills which they developed before the war are now finding direct use in important military applications.

The Spanish writer, Madariaga, once remarked that statesmen were of two kinds—paper men and gold men. The paper men, he said, had value only in a certain place at a certain time. The gold men were good anywhere, anytime.

There are paper men and gold men in every walk of life, but if we were asked among what group we had met the highest percentage of gold men, I think many of us would say it was among the men of science. The explanation may be that they dedicate their lives to an endless search for the pure gold of scientific truth, and are never satisfied with any baser metal.

Consequently, our admiration for these laboratories is based upon more than their obviously fine qualities of architecture and construction. We are moved by the deep respect in which we hold the virtues of scientific accuracy and intellectual integrity. These are virtues possessed to a high degree by the type of men who will work within these walls. These are the qualities which are helping to preserve our civilization, and which in turn make our civilization worth fighting for.

We congratulate you, Mr. Schairer, and your associates upon the completion of this home of RCA Laboratories. You are dedicating it to-day to the cause of victory for the United Nations. Until that victory is achieved, this building and the men who

work here can aim toward no higher goal, can accomplish no greater good, than to serve that cause, heart and soul.

The day of victory will surely come, and the words "Peace on earth, goodwill to men" will again ride the radio beams of all the world. Then America's men of science will draw upon their wartime research to develop finer and more useful products and services for peace-time purposes. Out of the ashes of war, they will bring forth implements for a new and better civilization.

DAVID SARNOFF

THE ROLE OF RESEARCH IN MODERN INDUSTRY

ON behalf of the staff of RCA Laboratories I extend to you a cordial welcome to our new home.

We are happy and proud to show you to-day the initial group of buildings which have been planned for erection here. They are the beginnings of a development which will make this place the center for the creative and forward-looking activities of the RCA family.

By accessibility of location, spaciousness of setting, utility but dignity of architecture and efficiency of equipment, we have endeavored to provide facilities and an atmosphere here that will be especially conducive to effective original work. We intend to make this place increasingly attractive in order to induce you and others to come here frequently for research services and for contemplation of the problems and the future of the radio and electronic art and industry.

These new laboratories are a monument to past research—to achievements which have brought into instantaneous communication with each other the most remote points on land and sea and in the air. By signals, by voice and by pictures, the miracle of radio has disseminated information, education, entertainment and culture to all the peoples of the world. Such contributions have made possible the laboratories we are dedicating to-day.

But these laboratories are more than a memorial to past triumphs. They are concrete recognition that research plays an essential role in modern industry; that it is a vital force for promoting the progress of science and the useful arts. They are intended to be a further contribution to industrial advancement and to social betterment by an organization whose services to the public and whose origin and progress have been based upon scientific research and original development.

Scientific research is diligent quest into the great unknown. It is the key that unlocks the doors of nature and reveals its mysteries and secrets. It frees mankind from fetters and limitations seemingly imposed by natural forces and by environment. It extends the boundaries and horizons of human knowledge and experience.

Research is a modern equivalent of geographical exploration whereby in former times new lands and additional natural resources were discovered and made available. But to-day, when there are no more continents for geographers to discover, the research explorer is faced with no such predicament. He never exhausts his field. Each new discovery seems to make research only more endless. Vast new areas are continuously being opened for development and practical use, and there is no apparent limit to the potential resources yet to be uncovered by science.

In radio and electronics we know this. There research has progressively extended the useful portions of the radio spectrum, until its availability for future communication and other services now appears to be almost limitless. Television is only one of the many new wonders for which a place has been made by such extensions. Great new regions never before seen by man have also been made visible by the electron microscope, which is profoundly influencing further developments in many branches of science and industry. Countless other new things previously undreamed of are being made realities by radio and electronic research.

In other fields science has created new materials, such as plastics; new synthetics, such as rubber and silk; new medicines, such as the sulfanilamides; new textiles; new colors, new metals and alloys; and it has produced new achievements in aviation, in transportation and housing.

Scientific research is a great provider and producer of employment for all classes of people. It affords an outlet for exercise of the imagination and genius of scientists and inventors. Through it their special talents give their best and most useful expressions. And the industries brought into being and vitalized by it employ myriads of other workers and vast amounts of capital.

It is distinctively constructive and beneficial. It does not invade the fields or destroy the rights of others. Its conquests are won only in the realm of the previously unknown and non-existent. Truly it is an instrument of the first order of social and economic importance.

With prophetic vision and wisdom our forefathers framed measures for the encouragement of scientific research—patent laws for protecting the inventions which are its logical results. No more effective or economical method of promoting the progress of science and the useful arts has ever been devised. It has been the bulwark of our industrial and social progress. It has stimulated the translation of scien-