Two Decades of Science

Vice President Wallace Speaks at Celebration In New Science Service Building in Washington

From the new Science Service Building in Washington the following program was broadcast over the Columbia Broadcasting System on Saturday, Dec. 13, 1941, 1:30 p.m., EST.

ANNOUNCER: "Adventures in Science" brought to you each week by Columbia . . . with Watson Davis, Director of Science Service.

MR. DAVIS: Today Science Service is pausing for a few minutes in its daily work to survey the past and look at the future. The occasion for this is the fact that Science Service is coming of age, as it were. Our institution for the popularization of science for over two decades has interpreted science through news dispatches to newspapers, through our SCIENCE NEWS LETTER, over the radio, and in various other ways.

So, speaking from the new Science Service building here in Washington, we re-dedicate all our energies and our enthusiasms to the fundamental task of providing all the people with the facts and methods of science. In these critical days, in common with all Americans, we pledge our all to the arduous duty of rescuing the world from the dangers of ignorance, brute aggression and the powers of darkness. Science pledges victory.

A distinguished company is assembled here to look at science and the world upon this occasion. Our principal speaker is perhaps less well known as a scientist than he is as the presiding officer of the Senate and the former Secretary of Agriculture. Yet he is widely recognized as a geneticist who has given special attention to bigger and better breeds of corn in his native Iowa. The war and our defense effort have thrust upon the Honorable Henry A. Wallace new duties and heavy responsibilities. Ladies and gentlemen, the Vice President of the United States:

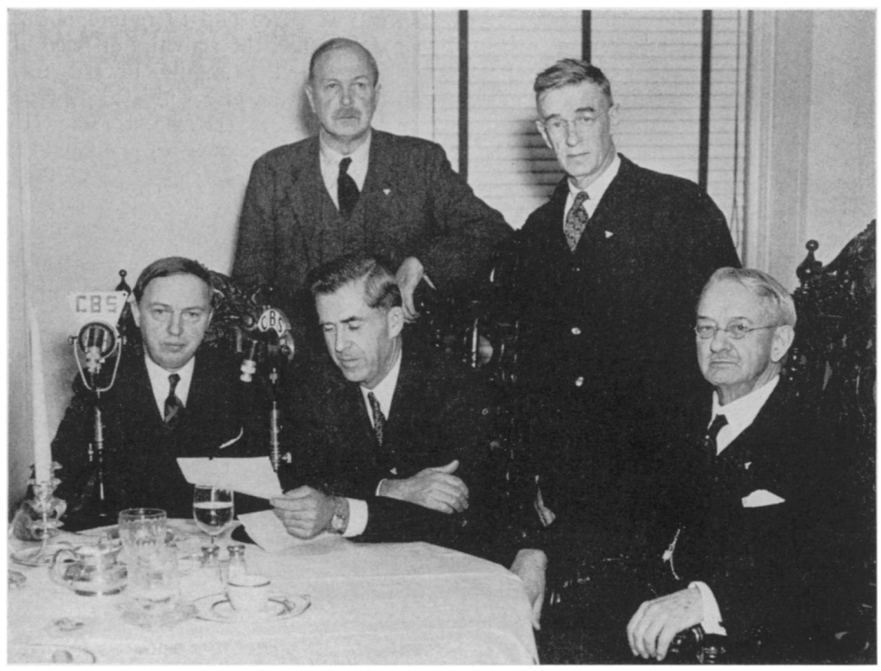
Science and Man's Future

THE VICE PRESIDENT: Science Service today is celebrating its Twentieth Anniversary at the same time as the people of the United States are rejoicing in their one hundred and fifty years of democratic life under the guarantees of the Bill of Rights. Science has flowered in the United States as in no place else in the world and in my opinion its flowering has been due in large measure to the freedoms of speech, press and thought which are guaranteed by the Bill of Rights.

Today the whole world is joined in grim combat as never before to determine whether science shall be the servant of the few or the many. Certain nations, believing in the unscientific doctrine of master races, would use science to exploit so-called inferior races. They would use science to set up a master class in their own nations to exploit their own people, who have been taught to think just as the people at the top want them to think. At the moment there is totalitarian science and democratic science. We know that in the long run totalitarian science cannot survive beause it has no roots. Democratic science can and must survive by serving all the people, not merely in terms of comforts but also by means of widespread diffusion of knowledge.

True science, true democracy and true religion have much in common. A great prophet in the Old Testament said, "Where there is no vision, the people perish." And from the New Testament comes an even greater appreciation of the unity of democracy, science and religion: "And ye shall know the truth, and the truth shall make you free."

Believing that the wide dissemination of truth is fundamental to democracy



ANNIVERSARY BROADCAST

At a luncheon program commemorating Science Service's twentieth birthday, the principal speaker was Vice President Henry A. Wallace (shown here speaking into the microphone. Other speakers were (seated) Dr. Harlow Shapley, director of Harvard Observatory, Dr. Edwin G. Conklin, executive officer of the American Philosophical Society and (standing) Dr. Charles G. Darwin, director of Britain's National Physical Laboratory and Dr. Vannevar Bush, president of the Carnegie Institution.

and religion, we endeavor to use the privileges given us under the Bill of Rights to make education rather than propaganda freely available to our people. But truth is not easily obtained nor is the dissemination of it readily brought to pass. Willful men with strong prejudices try to substitute their passionate views for the truth in all parts of the world. They have worked out systematic distortions which they have spread through the press and over the air and thus we find ourselves in a state of mind where we especially appreciate the statement of St. Paul in his Letter to the Ephesians:

For we wrestle not against flesh and blood, but against principalities, against powers, against the rulers of the darkness of this world, against spiritual wickedness in high places.

Wherefore take unto you the whole armour of God, that ye may be able to withstand in the evil day, and having done all, to stand.

Stand therefore, having your loins girt about with truth, and having on the breastplate of righteousness;

And your feet shod with the preparation of the gospel of peace;

Above all, taking the shield of faith, wherewith ye shall be able to quench all the fiery darts of the wicked.

And take the helmet of salvation, and the sword of the Spirit, which is the word of God.

One of the splendid agencies for the dissemination of pure truth is an organization affiliated with the National Academy of Sciences, known as Science Service. Science Service is not a money-making corporation but the non-profit institution for the popularization of science founded by the late E. W. Scripps when, during the first World War, he realized that the safety of democracy in the future would depend on all of the people knowing more of the facts of science. Scripps was a newspaper man himself and knew what some scientists do not know, that truth can be popularized. And so the ideal of the newspaper man has been joined with that of the scientist and Science Service has been making available in a most unusual way the facts of the ever-advancing science of our day.

Science Service is animated with the ideal of serving the people and not exploiting them. The scientists who express themselves through Science Service know how important it is that the science of the future should be the agent of peace and abundance instead of warfare and exploitation. In the year or two immediately ahead, we have a tremendous job to do in defeating those who are using science for propaganda and destruction. In that job our own scientists will play an extremely vital role. When that job is done, science, properly directed, will open a new day, a day of abundance and peace for all the people.

MR. DAVIS: Thank you, Mr. Vice President.

During the past year and a half there has been an intensive mobilization of scientific research for America's defense. Scientists by the thousands have been pressed into the most urgent sort of military research.

The man who is directing this important contribution is Dr. Vannevar Bush, president of the Carnegie Institution of Washington, and director of the Office of Scientific Research and Development.

Let me present to you Dr. Bush, a soldier of science:

Science In War and After

DR. BUSH: The twenty years of Science Service's life-span to date cover most of the period between the first and second World Wars. It was a period which we hoped represented a time of world reconstruction but which we now see was only a time of uneasy truce.

Because most of us believed that the world, however troubled, was trying to remain at peace and to restore normal ways of peace, the activities of scientists were directed primarily toward their normal ends, which involve generous international cooperation, or rather, cooperation without question or thought of nationalism. The news of events and discoveries in science, faithfully chronicled by Science Service during the past two decades, have shown clearly to what a predominant extent men of science are men of good will. There were, to be sure, some scientists and many men in the armed services who were thoroughly aware of the approaching danger and they worked hard to perfect means for defense. An example of this is the radio locator for detecting airplanes, the fruit of research in pre-war days.

Unfortunately, this hope, held by scientists, with other men whose wills were toward peace, has been rudely shaken. The blasts of enemy bombs last Sunday loosed the last hold we held upon it, until peace may come again. Until that day, men of science will join forces with other defenders of their country, and of democracy wherever it exists. The great contributions which science has been able to make even in the difficult years since the Armistice of 1918, are sufficient earnest of what science can do, is already doing, in support of this country's vast and rapidly increasing war effort. Tools in science's armor for the improvement of weapons—and they are many and powerful—will be used to the utmost for the defense of this country, for the aid of our friends, for the destruction of our enemies. Active organized defense effort, involving thousands of scientists, has been going on intensively for 18 months. This effort will not be relaxed until the war is completely and decisively won.

Nevertheless, this division of the world, this diversion of the efforts and resources of science for the purpose of war and destruction, is not the environment in which science normally works. We must look toward the return of peace and the resumption of the normal world-wide cooperation and exchange of information among scientists. It is exactly in order that this free interchange of the gains of science may again become the rule that the democratic way must prevail and the totalitarian way must perish. For the totalitarian way tolerates no freedom in science or any other aspect of truth. We can therefore expect science to make significant contributions toward world reconstruction only in a free world.

Assuming, then, a re-liberated world with science free to play its beneficent role in the reconstruction, what should we expect of science in the twenty years, the hundred years that are to follow the peace that will some day come?

Men of science will spontaneously and individually do as they have always done —spend their efforts, as before, for the benefit of mankind without question or thought of nationalism. Great things have been accomplished by such individual efforts, and will continue to be so accomplished. But that is not enough. The post-war world will be even more closely integrated than it has been in the past. To promote more general welfare and happiness among mankind it will be necessary to have greater and more accurate information than we have ever had, and to apply such information with more elaborate and more powerful techniques in the solution of such everyday problems as food, housing, health, recreation.

All this will require integration in science — collaboration in research, cooperation in applying the results of research. It will also require dissemination of knowledge among all the people, and in this work, I hope that Science Service will long continue to have a large and useful share.

MR. DAVIS: Thank you, Dr. Bush.

In the defense research which Dr. Bush has just mentioned there is very close cooperation of American scientists with British scientists. The results of researches are exchanged and many problems of prime importance are tackled

jointly. The representative of British science here in America is the illustrious namesake and grandson of the great evolutionist. He is Dr. Charles G. Darwin, who at home is director of Britain's famous National Physical Laboratory, and who here is director of the Central Scientific Office of the British Supply Council.

Dr. Darwin will speak on behalf of our British colleagues.

Message From Britain

DR. DARWIN: It has been my responsibility during the last nine months to promote contact between the U. S. and Britain in the scientific aspects of warfare.

As might be expected, the Atlantic Ocean exerts a certain insulating effect on the transmission of scientific thought, but with the enthusiastic cooperation of everyone concerned this difficulty has been overcome, and in the work on the new developments there is a fine spirit of friendly rivalry which has resulted in quicker progress and better machines than either of us could have achieved unaided. We shall look forward to a later time when the same cooperation, inaugurated for the destructiveness of war, may continue in the creativeness of peace.

MR. DAVIS: We thank you, Dr. Darwin, for these words on behalf of our fellow scientists in Britain.

An occasion such as this is a fitting time at which to take stock and look forward. The chairman of the executive committee of Science Service and as such the executive officer for our trustees is Dr. Harlow Shapley, director of the Harvard Observatory, an astronomer of world fame. We perhaps need an astronomer to help us gain perspective in viewing this troubled world today. Dr. Shapley:

The Physical Sciences

DR. SHAPLEY: A story of the major scientific developments since 1921 would be a suitable commemoration of the twenty years that Science Service has served science. But many large volumes would be necessary to give an intelligent account of the remarkable growth in all fields. I shall choose for the few minutes at my disposal to name half a dozen scientific discoveries and developments of the past twenty years, some of which have profoundly affected the daily lives and thoughts of men. The events that I shall name will be only within the physical sciences. They may not seem the most significant to the future historians of our times.

In my opinion unquestionably the preeminent scientific developments, with widest influence and service, are in the field of radio. It would have taken a mad imagination to predict twenty years ago that on this occasion a talk on science by the Vice President of the United States could be heard by a million people as they comfortably and speedily ride in their automobiles and trains. The actual facts have transcended our imagination.

The radio has contributed as by-products at least two developments that deeply affect our lives. One is the extensive application of vacuum tubes to many phases of science and industry, and the other is the growth of the appreciation of great music. Later this afternoon many million Americans will be listening to grand opera, grandly performed, accurately transcribed. Again the imagination probably fails to grasp the significance of this one contribution on the advance of civilzation.

A second high-light that now radiates more significantly in the research laboratory and the philosopher's study than in the life of the public is the discovery of the fundamental particles of matter, and a partial understanding of them. I refer to deuterium, positrons, neutrons, mesotrons, and the rest of the family that now supplement the electrons and protons of twenty years ago to make up atoms, and molecules, air, water, microphones, and radio listeners. Ingenious men have put these particles to work, in the laboratories of science and hospitals.

And a third major development of the past two decades is closely related to the foregoing and it is going to touch the interests of the public much more as time goes on. This third item is artificial radio-activity and its use in the care of the human body, its use in the understanding of nature, and in the building up of entirely new fields of research. Vacuum tubes and neutrons, which I mentioned a minute ago, contribute to this startling new technique of making almost any element radioactive, usefully radioactive; but the most important machine for atomic transmutations is the cyclotron—an American invention and chiefly developed and used in America. These great electrically operated devices can impart enormous velocities to electrons, and thus give such particles ability to break up, transmute, and make radioactive the atoms of arsenic, potassium, calcium, and similar substances. The cyclotrons with their "treated" substances are now making major contributions in the study of desperate diseases. They would do more if we could afford, with our limited resources, to keep them efficiently in operation, and for more hours of the day. The cyclotron was made originally in the interests of pure research on the structure of matter; its later enormous importance to the body, as well as the mind of man, was hardly foreseen.

A fourth development since 1921 has been the exploration of our nearest star, the Sun, upon which terrestrial light and life depend. The coronagraph has been invented in France, and used in France, Switzerland, and Colorado, to study the mysterious corona of the Sun without waiting for the rare and difficult total solar eclipse. At Michigan and Harvard Observatories, as well as in France, important discoveries have been made concerning the ever present storms on the Sun's surface—storms involving radiation, magnetic effects, violent explosions, that have measurable terrestrial consequences, such as northern lights and radio static. Among new facts about our Sun should be included the sensational discovery just this year of the iron, nickel, and calcium in the Sun's corona, with its implication of astonishing temperatures in the Sun's upper atmospheres. Also in this field of knowledge is to be placed the solution, or partial solution, of the mystery of the source of energy that runs the Sun and the other stars. The key to the mystery comes from the theories and experiments of the physical laboratories which show how energy-releasing hydrogen is burned deep inside the stars into helium ash.

A fifth field of scientific triumph involves the synthetic products of chemical industry, and I need say only a few words to remind you of our current dependence on the chemical researches and discoveries that Science Service has been reporting since it started twenty years ago. Here are some words: polaroid, cellophane, nylon, lucite, and the newer plastics. Dr. Conklin no doubt will mention bio-chemical advances, including vitamins and the sulfa drugs.

As a sixth item, an astronomer may be excused for mentioning the expanding universe—or at least the more surprising expansion of knowledge concerning the universe—knowledge that has come through the application of other sciences to astronomical problems, also from the growth in the power of telescopes, the power of the photographic plate, and the interest of the public and of the patrons of science in knowledge of man's place in the universe.

Finally, should I turn from the immediate past toward the immediate and long range future and venture some predictions?

Again the radio and related science and industry may take a lead in further transforming the common life, for once peace and prosperity return we have ahead of us frequency modulation, television, remote radio controls of machinery, new forms of dramatic art. We shall have further development of the radio-sonde — that balloon-carried tiny automatic radio-sender, that already now daily from ten miles above the earth reports temperature, pressure, moisture, winds; such weather reporting gadgets will float in the seas, fly in the air, cover the Arctic snows and, quite unattended, except by waves and winds, inform us continually of the planet's meteorology.

Another prediction: We shall have much new knowledge of the Sun, and therefore of stars in general, coming not by way of the great reflectors like the forthcoming 200-inch, but from the new type solar instrument, and new type photographic cameras.

In conclusion, we might venture the prediction that research in materials, especially in metallurgy, may affect the world's dependence on a few rare minerals. The price of one battleship devoted to research on raw materials in the next twenty years could save us the price of ten battleships, save us vast quantities of human blood, and unmeasurable quantities of illwill.

MR. DAVIS: Thank you. Dr. Shapley.

The President of Science Service is Dr. Edwin G. Conklin, famed Princeton biologist who is executive officer of the American Philosophical Society. He will look upon the life sciences of this earth in retrospect and prospect. Dr. Conklin:

The Biological Sciences

DR. CONKLIN: Dr. Shapley has left to me the whole field of the biological sciences and their applications. He has been generous—too generous. For if you were to go through the files of Science Service publications for the past 20 years you would find such an array of brilliant biological achievement that a whole day's discussion by a much faster talker than myself could make only a beginning.

Dr. Shapley said that I might want to mention the sulfa drugs and the vitamins. Indeed I do. These have been among the most important developments of the last twenty years; important not only in their direct significance to human health but also collaboration between biologists and chemists. The sulfa drugs have been making a sweep of diseases that used to be terrors but are such no longer: pneumonia, streptococcus infections, trachoma, gonorrhea — a dozen others. Better understanding of the vitamins is overcoming the one-time mysterious ailments that we know now are due to malnutritions of various kinds —hidden hungers. If we come through the present ordeal of war without the pneumonia epidemic that marked the last one, without the aftermath of sickly young people, it will be due largely to progress in these two fields.

As we gain new knowledge and new power over the bacteria, almost unknown until after Pasteur, we move also into the still largely unknown kingdom of viruses, casual agents of such diseases as smallpox, influenza, hoof and mouth disease of cattle, mosaic disease of plants. Invisible under the highest powers of ordinary microscopes, they have been photographed by the electron microscope—gift of the physicist.

Dr. Shapley also mentioned the use of radioactive elements in the treatment of cancer. The same elements, used simply as tracers, are being used also for research into the normal life processes of animals and plants, as X-rays were used in the preceding generation.

Control over living things is not confined to the conquest of disease. We have learned how to improve plants and animals for man's convenience and use. During the last few years, greatly improved breeds have been produced by hybridization. The first speaker on this afternoon's program, Vice President Wallace, is one who has done just that, with corn. X-rays and other radiations, colchicine and other chemicals and growth-promoting substances greatly speed the production of new characters with which hybridizers can work.

Recently discovered electric brain waves are giving psychologists a tool for the study of mental activity and sleep, as well as of abnormal activity such as epilepsy. The shock treatment for certain forms of insanity is a discovery of great promise. These discoveries are in the field of applied biology, most of them in medicine, but in large part they have grown out of theoretical science. In one respect biology is unique among the sciences. It has not yet been used in warfare to destroy life, but always to preserve and improve life.

These are only a few scattered samples; but I want to follow my colleague's example and venture a few steps into the field of prophecy.

Chemical and biological control, so successful already against bacteria, will be extended to the control of virus diseases, the so-called degenerative diseases like high blood pressure, perhaps even against that last citadel of death, cancer.

We shall solve the riddle of the virus, that ultra-tiny particle that seems to be a chemical molecule, but also seems to be alive. It may mean the elimination of the once sharp boundary between the living and the non-living.

Non-professional scientists, amateurs in the true sense of the word, will make important contributions to the progress of science as they have always done. Indeed some of the greatest discoveries have been made by amateurs. Science Service is pioneering in this field also, in promoting the formation of science clubs, both for young people of school age and for adults whose other occupations demand most of their time but whose interest in science is such that they gladly devote their leisure to the pursuit of knowledge.

MR. DAVIS: Thank you, Dr. Conklin. From these reviews and forecasts you can realize that the work of science in war and peace is unending.

Science Over the Radio

THIS radio program marks not alone two decades of Science Service but over a decade of cooperation of Science Service with the Columbia Broadcasting System. This program carried weekly over CBS as an educational service to the public has been a major channel of interpretation of science to the public.

Since the first broadcast on March 23, 1930, over 500 scientists have talked to the public over CBS. We hope that many hundreds more will participate in the years to come.

In closing this program of re-dedication, I report to you the affectionate greetings of our trustees and staff to Science Service's co-founder, Dr. William E. Ritter, biologist and philosopher of the University of California, who a few days ago celebrated a hale 85th birthday.

ANNOUNCER: "Adventures in Science" has presented a special program dedicating the new Science Service Building here in Washington and presenting an address by the Vice President of the United States. Adventures in Science . . . a CBS presentation . . . will be heard again next Saturday, same time, same station. This is the Columbia Broadcasting System.