

RAYMOND SWING
Friday
September 7, 1945

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As early as 1905, Dr. Einstein clearly stated that mass and energy are equivalent. He also stated that this equivalence might be found by the study of radio-active substances. He set down his formula, E equals mc^2 , perhaps the most startling and far-reaching assertion of its kind ever made. For it says that energy is the equivalent of mass, multiplied by the square of the speed of light. To put this statement into numbers, and quoting the Smyth report, one kilogram of matter--just over two pounds--if converted into energy, would give 25,000,000,000 kilowatt hours of energy, or as much as is generated in nearly two months by the entire electric power equipment of the United States. So scientists have been familiar with this concept for a long time. Some of them accepted it as probably true, but undemonstrable. Some dared to believe that one day atomic energy would be unlocked and give man the use of power beyond his most fantastic dreams, since he then could wield the basic power of the universe itself.

I am not going into the history of the development of atomic research. I do wish it could be made simple and could be grasped by everyone. For unless the mind fathoms at least a little of the depths of meaning of man using atomic power, there can be no wise political action, which makes that use safe and beneficial.

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It brings me once more to the name of Dr. Einstein. The mass meeting in the Philharmonic in Berlin had not affected the theory of relativity, but the organized bigotry behind it had led the great physicist and mathematician to go abroad, and finally to take up his home at Princeton. And there, on August 2, 1939, just a month before the outbreak of World War II, he wrote a remarkable letter. It is not as remarkable as that formula that E equals mc^2 . But it is the letter that appropriately led to the development of the atomic bomb,

and the demonstration of the validity of the formula. So it was a step to the expansion into another dimension of the power available to the human race.

This letter was addressed to "F.D. Roosevelt, President of the United States, White House, Washington." It starts with the sentence: "Some recent work by E. Fermi and L. Szilard, which has been communicated to me in manuscript, leads me to expect that the element uranium may be turned into a new and important source of energy in the immediate future."

ALEXANDER SACHS VISITS ROOSEVELT

It happens that this letter did not reach President Roosevelt until after the outbreak of war. It was not posted to him. It was taken to him, along with scientific memoranda and data, by Alexander Sachs, of New York City. Mr. Sachs is one of the most brilliant of living economists. He also is a noted student of world affairs, and one of the most brilliant analysts of them. And he is a friend of Dr. Einstein. Both he and Dr. Einstein believed in August, 1939, that catastrophe hung over the human race, and that in the course of that catastrophe atomic energy would have a part. They felt they must bring the latest news of atomic research to the knowledge of the President in the cause of national defense.

Let me quote another passage from Dr. Einstein's letter to President Roosevelt. "In the course of the last four months it has been made probable," he stated, "through the work of Joliot in France, as well as Fermi and Szilard in America, that it may become possible to set up a nuclear chain reaction in a large mass of uranium, by which vast amounts of power and large quantities of new radium-like elements would be generated. Now it appears almost certain that this would be achieved in the immediate future." Dr. Einstein went on: "This new phenomenon would also lead to the construction of bombs, and it is conceivable--though much less certain--that extremely powerful bombs of a new type may thus be constructed. A single bomb of this type, carried by boat and exploded in a port, might very well destroy the whole port, together with some of the surrounding territory. However, such bombs might very well prove to be too heavy for transportation by air."

This was a few months after Hitler had seized Prague, and Dr. Einstein told the President that Hitler thereupon had stopped the sale of uranium from the Czechoslovakian mines. This action, he suggested, was linked with the fact that the son of the German Secretary of State von Weizaecker was attached to the Kaiser Wilhelm Institute in Berlin, where some of the American work on uranium was at that time being repeated. Dr. Einstein recommended that the President appoint someone on his behalf to keep government departments informed of developments, who also could give attention to obtaining a supply

uranium for the United States, and that experimental work in this country should be speeded up.

With the material Mr. Sachs took to President Roosevelt on October 11th, 1939, was a memorandum by the physicist Szilard, one of the men whose work at Columbia had brought uranium research to the brink of culmination. His statement reported that investigations so far had been limited to chain reactions based on the action of slow neutrons. "At present," he said, "it is an open question whether such a chain reaction can also be made to work with the fast neutrons which are not slowed down. There is reason to believe," he continued, "that if fast neutrons could be used, it would be easy to construct extremely dangerous bombs. The destructive power of these bombs can only be roughly estimated, but there is no doubt that it would go far beyond all military conceptions." I hardly need to interpolate that the fast reactions were made to work, which is the secret of the atomic bomb as it finally was used.

BRIGGS COMMITTEE SET UP

To his everlasting credit, President Roosevelt grasped fully what he was told, instructed his aide, General Watson, to act as liaison in the matter, and asked Dr. Lyman Briggs of the Bureau of Standards to constitute a committee of the armed services, a committee on which Mr. Sachs served as representing the President.

There were tedious delays before the atomic project was to be turned over to the entirely new National Research Committee under Dr. Vannevar Bush, which brought the bomb to reality. Of the several physicists consulted, some were anything but sanguine of success. Dr. Einstein and Professor Szilard were the ones most outspokenly confident that results could be achieved. A preliminary experiment at Columbia had to be waited for. It was on a small scale, but it turned out astonishingly favorably, so the Briggs Committee was able to recommend further action. But, in the meantime, priceless months were dribbling away, and the Germans were working with all scientists available to them on uranium.

Our Navy Department put up \$6,000 to buy some materials. And another memorandum about atomic power by Professor Szilard spoke of the possibility of driving battleships with atomic engines. If only slow neutrons were utilized, a ton of uranium, he said, would equal 3,000 tons of oil; if the fast neutrons could be utilized, one ton of uranium would equal 300,000 tons of oil. A battleship with such a reserve of energy could stay away from fuel resources almost indefinitely.

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learned that research there is being carried out in great secrecy and that it has been extended to another of the Kaiser Wilhelm institutes, the Institute of Physics." Dr. Einstein spoke of the need to keep scientists in the democracies from publishing their work on setting up a chain reaction in uranium. Dr. Szilard himself had written up a method for setting up the chain reaction. Later the effort was made to have the physicists in the democracies withhold their work from publication, so as to keep news of it from the Germans. The British agreed, but because one manuscript already had been inadvertently published, the French balked. Later, of course, this research became the top secret of all top secrets.

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And so it became clear that a bigger and better functioning organization was needed to take the place of the modest Briggs Committee. Mr. Sachs recommended his views to the President, and that was the genesis of the National Research Defense Committee under Vannevar Bush, which handled the \$2,000,000,000 and produced the atomic bomb. Naturally what this committee accomplished is the main part of the story. But before this could be done there had to be a chain of actions, which in the field of government can be as difficult to assure as in treating the atoms of uranium. Genius, friendship, and patriotism, and in the President, the intelligence to know what it all could mean, had to combine to get the most original of all government projects under way.

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