SCIENCE

Sketch by Sol Resnick

Alsos military, members of the special atomic energy intelligence mission, digging up a cache of uranium.
U.S. Army Photo

Science and the scientists of defeated nations, lately regarded as prizes of war, are also involved in the struggle between East and West now going on in Germany. Developments in the reparations of science and technology are discussed by the former Special Advisor to the Secretary of State on Reparations.

AS REPARATIONS

by ***Julius C. C. Edelstein***

The wars of the latter half of the nineteenth century served to establish scientists as essential subalterns of the generals and admirals in the successful prosecution of large scale conflict. By the end of World War I, scientists had gained a place in the inner sancta. World War II, of course, saw science enthroned and even exalted, a mystery through whose wonders victory could be achieved.

It is no surprise then that in the eventful years since 1945 science and scientists have loomed large in the calculations and disputes of the World War II victors, and in the exaction of tribute—called reparations—from the vanquished. Coincident with the front-page wrangles over Germany and Japan, there has taken place a frantic and sometimes bitter contest for shares of treasure from the rich storehouse of German science. Some of the manifestations of this contest are generally known, certainly to American scientists. Many of the ethical questions raised by this situation have roused qualms in many thoughtful minds. Beyond these, however, there are basic questions in regard to German science which must be resolved. Unfortunately these questions are raised in relation to the fateful struggle between East and West now going on in Germany. These issues must be resolved within the distracting context of that struggle.

The Prize

When the hostilities against the Axis came to an end in 1945, three short years ago, the public resolve of all the victorious nations was to arrange a peace settlement that would insure, as a first principle, that Germany and Japan would never again launch aggressive war against their neighbors. This resolve was based on the fact that from those two areas had come all the major wars in both hemispheres since 1865.

To achieve this objective it was decided that Germany and Japan must be stripped both of arms and of war potential. Acknowledging the primary role of industrial and scientific technology in the prosecution of modern war, the Allies were agreed that Germany especially was to be deprived of its leadership in that field. The fact that the V-1 and the V-2 had been developed and nuclear fission first predicted and pioneered in Germany was enough to frighten the Allied leaders into drastic views on Germany's technologic and scientific potentials.

To begin with, the German scientific tradition, dating from the middle of the last century, had consistently been the most richly endowed in the world. Since 1901, roughly one-third of the Nobel prize awards in the natural sciences had gone to Germans. Many of the great advances in the theoretical as well as the applied fields of science had been led by German scientists. The Kaiser Wilhelm Institute in Berlin had housed some of the world's greatest and most productive laboratories. It was German science which had done more than Goethe, Wagner, and Heine to establish the sometimes lugubrious German language as one of the world's international tongues. The nation in which the title "Herr Professor" had long been considered the

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Julius C. C. Edelstein, who resigned recently as Special Advisor to the Secretary of State on Reparations, is a writer turned to government work who is now writing again. Mr. Edelstein was at Potsdam, for the Conference which resulted in the Potsdam agreement, as Naval aide to Fleet Admiral William D. Leahy. Later he was Deputy to Reparations Commissioner Edwin W. Pauley, and then succeeded Pauley as Special Advisor when he resigned to return to private life.

highest attainable dignity cultivated the sciences with an avidity and intensity exceeding that of any other land on earth.

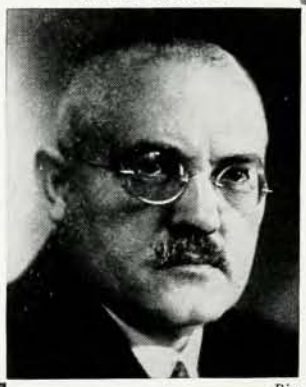
From Robert Koch, the bacteriologist, to Max Karl Planck, who blazed the quantum trail in physics, the German roll of honor in the sciences boasted a length which was difficult for any nation to rival. German universities and institutes had proselyted scientists at the turn of the present century as modern American universities today gather in football players. It is sometimes forgotten that Albert Einstein was a naturalized Swiss, although born in Germany, and was conducting his studies at Zurich in Switzerland when, in 1914, he was induced, by promises of rich rewards and privileges, to return to his native land and to the Kaiser Wilhelm Institute in Berlin. He was renaturalized with respectful ceremony and showered with national honors at a time when scientists in America were still popularly regarded with amiable tolerance but scarcely with national respect.

It is worth restating that this adulation of science and scientists in Germany paid off with rich national reward, paving the way for the dangerous eminence

Wide World

FRITZ HABER

KARL BOSCH



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MAX PLANCK

which German science, industry, and technology attained in later years. Research in chemistry by Adolf Baeyer, Fritz Haber, and Karl Bosch led directly to the building of the huge German chemical industry and to the formation of the tremendous I. G. Farben cartel which, with its patented processes, all but dominated the world's chemical and pharmaceutical industries. The advances made by German metallurgical scientists led to the practical development of the open-hearth steel furnace and to the gargantuan growth of Europe's greatest steel industry.

This was the situation in 1933, when Adolf Hitler emerged on the world scene. Of course, by that time—partly as a result of World War I and the rapid advance of American industrial technology—science had gained, in America and in the world generally, the respect it had always had in Germany. The Axis racist doctrines drove a number of the most eminent and promising scientists from Germany and Italy and occupied Europe—among them Albert Einstein, Hans A. Bethe, Eugene P. Wigner, and Enrico Fermi, to mention a few. These famous emigrés later made essential contributions

toward the Allied development of the atomic bomb through whose use the Axis suffered its final and fatal defeats.

There remained in Germany during these years, however, a sufficient residue of the men and the skills of science and technology. There remained also the great tradition. These enabled German science and industry to develop, in the 1933–40 period, improved techniques for the manufacture of synthetic rubber, an experimental method of synthesizing the higher hydrocarbons of petroleum and gasoline, and, of course, the propellants and aerodynamic devices which led in all too good time to the V-1 and the V-2 bombs. A considerable number of other industrially significant techniques were also improvised. In the expanding field of nuclear physics, Werner Heisenberg at Leipzig had forged beyond the limits reached by Planck and in 1933 had already won the Nobel prize for his further studies in quantum theory. During the succeeding twelve years Heisenberg and his associates unlocked some of those intimate secrets of the atom which led in America to the development of the bomb. Heisenberg has recently explained, rather naïvely, that further studies in this field were not pushed in Germany because it was considered impossible that American and British scientists should be able to probe these secrets and use them.

The Chase

All of this goes to show the importance attached by Allied war leaders to the dangerously rich potentials of German science and technology, and why these were generally included within the scope of the disarmament and demilitarization of the Nazi Reich. While the war was still on, however, the Allies had a much more immediate objective in trying to get hold of German scientific secrets. A special hush-hush section of Supreme Allied Headquarters, armed with the highest priorities, was set up to screen all scientific knowledge captured or obtained along the invasion route through occupied France and Germany. Later, as Allied armies pounded into the heart of Nazi-land, teams of Allied scientists, the famed TIIC (Technical Industrial Intelligence Committee) teams, followed in the wake of the advancing troops to seize and study, on the spot, all scientific and technological information obtained from the enemy or enemy sources. The sole purpose of this activity was to discover technologic and scientific data which could be of immediate use against Germany, but more especially for the developing onslaught against Japan. After the war, when separate American and British military commands were established in Europe, the TIIC teams were replaced by separate American

Fishing papers from the bottom of a deep shaft in an abandoned potash mine in Austria, April, 1945. *U.S. Army Photo*

and British scientific survey teams. The United States organization was designated FIAT (Field Investigation Agency-Technical). FIAT continued TIIC's work, combing the mountains of papers found in factories, plants, and laboratories, caves and hideaways, to ferret out the scientific secrets, the mechanical devices, and the special techniques developed by the Germans in the decades following World War I. Important papers, documented wherever possible by observations, drawings, and photographs, were flown back to Washington.

In Washington, an administrative procedure had already been established for handling these accumulations of vital industrial and scientific knowledge. With the outbreak of war, the President had directed the seizure (or vesting) of all German or Japanese-owned patents on file in the United States. These were turned over to the public domain and made available to all business firms for a nominal royalty. The other Allies took similar action in their countries. Germany and Japan, incidentally, had done exactly the same with U. S. patents. The only exceptions to this practice in the United States were in cases where German and Japanese patents had been exclusively licensed to American firms. Such patents were not disturbed, but the royalties ordinarily paid to the German and Japanese owners were vested and seized by the Alien Property Custodian. But even these patents were, of course, available to any American firm that needed them for the fulfillment of contracts with the armed services.

President Roosevelt issued still another order in this connection, which turned out to be the most vital of all. This order directed the Department of Commerce to make available to American industry, and to Allied governments granting reciprocal privileges, any technical information from enemy sources which could help expand American or Allied war production.

As technological data arrived in Washington from the fighting fronts, the Commerce Department assessed it, abstracted it and reproduced the abstracts for distribution to industrial users in the United States and in the Allied countries that maintained reciprocal arrangements with the United States. From the abstracts anyone could order copies of the original documents.

This administrative machinery, established while the battles in Europe raged, was available when the trickle of technological information from Germany attained flood proportions in mid-1945 and the months following as a result of the activities of the TIIC and of FIAT. Japan collapsed before much of this information could be of use in the war effort, but this technological data helped significantly in the subsequent regearing of the American industrial machine for peacetime production.

Meanwhile the general subject of reparations from Germany—without specific reference to scientific information—was being given major emphasis in the discussions between the Allied Governments on the terms of the peace settlement with Germany. Reparations were to constitute a multitooled implement. Not only were reparations to be taken from Germany for the classic purposes of indemnifying the victors for the destruction caused by the defeated enemy—for the repair of devastation in the nations which had been the victims of Nazi aggression—but they were also to be instrumental in disarming and demilitarizing Germany for the greater security of Germany's neighbors. Reparations were also to serve to build a better economic balance in the continent of Europe by deconcentrating industry and by spreading German industrial facilities and experience more generally throughout non-German Europe.

The Sharpened Contest

There was never a definite agreement among the Allies as to the final disposition of the scientific knowledge to be taken from Germany. Nor was there an inter-Allied understanding as to the exact amount of scientific organization to be left in Germany for carrying on German industry and science. There was no reference to reparations from science in the famed and controversial Morgenthau Plan. There was no mention in the Potsdam Agreement of the treatment to be accorded science and scientific knowledge from Germany. Yet the subject was on the minds of the highest officials of all the governments concerned. The problem was how to "demilitarize" German science, how to make its contributions available to the victor nations, and finally how to deal with the German scientists themselves.

That was the problem in 1945. Three eventful years have obscured, beyond all recognition, that problem and all the solutions which were, at the time, proposed. The course of events in Germany

took a direction totally inconsistent with any substantive solution of the basic German problems. Conflict between Soviet Russia and the western Allies gradually but steadily took over the major burden of effort. Moves and countermoves in that conflict took priority over all other efforts and all other programs. The problem of German science and technology, its disposal and its potentialities, came in for its share of neglect . . . at least in the western zones. Instead, and perhaps inevitably, German science came to play a stealthy role in the deadly East-West contest for supremacy. The effect on the original war aims was, of course, completely demoralizing.

Reparation, instead of being an instrument for the repair of devastation in war-torn areas, became a loose charge on the diplomatic atom, with explosive possibilities and with few constructive prospects. One source of danger and dispute was the fact that by 1948, through the means already described, a considerable amount of German technological information had been taken and distributed through the Allied world. It was a fact that German science and technology had thus made a major contribution to current world resources of industrial skills and techniques.

This contribution, a sort of war prize, had theoretically been distributed among all the victorious nations. In the United States, this knowledge, catalyzed by America's incredible genius for adaptation and exploitation of technology, was of significant assistance in the 1945–48 mushrooming of United States production. The difficult problem was the general assessment of that contribution . . . whether it was to be considered as reparations, or as a sort of reclamation for world benefit of knowledge whose use was essential to world recovery. It is obvious that no dollar value, which is the terminology of reparations, could be attached to this knowledge obtained from Germany. Yet it must be conceded that the United States, because of its own advanced technology, was able to derive a greater share than any other country of the practical benefits of the data from Germany.

At the Moscow Conference of Foreign Ministers in 1947, Soviet Foreign Minister Molotov brusquely charged that the United States had taken ten billion dollars' worth of scientific and patent information from Germany. Molotov cited this as justification for the Soviet demand for ten billion dollars' worth of actual goods from Germany as reparations. The facts in the case were at some variance

The United States' George C. Marshall and Russia's V. M. Molotov at a dinner party given by Molotov during the Moscow Conference of Foreign Ministers. *Press Association Photo*

Black Star

Nazi students at the University of Göttingen.

with the charges. The United States had obtained great stores of knowledge and information from German scientific and technological annals. The United States had also obtained copies of every German patent. All these had been made available to American industry. But this information had likewise been made freely available to all Allied governments which would give the United States access to the scientific information that these other governments had obtained from Germany.

It so happened that the Soviet Government, through its American trading corporation, Amtorg, had by 1947 already secured a considerable amount of this information from the U. S. Department of Commerce. By a fortunate coincidence, Secretary of State George C. Marshall had on hand at the Moscow Conference an official letter from a Department of Commerce functionary, complaining that the Soviet Government had obtained this technical information from the United States, but had proved completely uncooperative in granting to the United States access to technological data in the Soviet-controlled zone of Germany. This letter served to squelch Molotov's charges. Since that conference, Russia has ceased to be eligible for this type of information from the United States; the other Allied countries are continuing to receive it.

The Problem Shifts

As such, the reparations aspect of German science and technology has become, for the moment, fairly academic. While the struggle between East and West continues, there is not much prospect of a reasoned accounting of the benefits respectively received by the various nations from German scientific resources. Other problems have replaced this one—the problem, for instance, of what to do about the German scientists and engineers themselves.

There were among those scientists and engineers many avowed Nazis. Many, if not most, were considered to have contributed to the aggressive war effort of Germany. Such a contribution was judged, in the Nuremberg war crimes trials, to be an international offense, although no exact definition of what constituted a punishable contribution was ever made. Some scientists, who were directors of the I. G. Farben combine, were actually tried; most, however, were merely "screened" for further employment purposes on the basis of active leadership in Nazi Party affairs.

One science program which gained headway with the passing months involved bringing individual German technicians back to the United States or Britain, as the case might be, for interrogation and research work. Each of the Allied countries engaged, more or less quietly, in this practice.

In some cases—especially in the early days of this program—the scientists thus brought back to America were basically anti-Nazi and hence legitimate refugees. In a major number of cases, however, their political backgrounds were given only the most casual inspection. Some of them were passed through the German-operated denazification courts with a broad wink at the judges from the respective Allied authorities suggesting that full clearance was speedily desired. Some were brought out of Germany without even this formality. The ultimate paradox of this practice was the fact that most of these scientists—at least those brought to the United States —were not of sufficient eminence to warrant the compromise with principle involved. The whole

competitive recruiting procedure—for it became sharply competitive between the Anglo-Americans and the Russians—came into the control of individuals whose broad judgment in scientific matters left something to be desired.

This program has raised intensely disturbing questions in the United States and Britain as to the advisability, morally and even practically, of recruiting into the ranks of American and British men of science individuals who had but lately served Nazi masters and were, in some cases, active Nazis themselves. The philosophical attitude of fascist totalitarianism toward science is not essentially different from that of the Eastern totalitarianism which is currently disturbing mankind. Within those regimes science was and is regimented for the service of the state; the doctrines and practices of science must conform to the prevailing political dogmas. This was true in Germany; it is true in the Soviet Union today. It was because of this that German science made but few major advances in the theoretical field during the Hitlerian rule; its major progress was in the adaptation of science and scientific method to avowed state purposes . . . mass production and mass murder.

This is basically a problem of ethical and philosophical complexion. Reduced to its elements, it reads: Is a democratic nation justified in introducing anti-democratic elements into its own body politic, in order to avail itself of the nonpolitical contributions of that element in the form (in this case) of scientific skills? The answer is certainly not an easy one.

In recent months the situation with regard to scientists and science in Germany has raised still another knotty problem. Is it really to the benefit of the world to destroy German science as an organized hierarchy? Contrarily, is it to the benefit of American and western science to make a special effort to revive and reactivate German science? The answers to these questions are unfortunately associated with the implications of the struggle between the West and the Soviet Union.

It is reliably reported that in the Soviet-controlled areas of Germany, scientists, regardless of their political backgrounds or past affiliations with Nazidom, are being given every encouragement to go ahead with their studies and work. Facilities, supplies and money are being made generously available. Scientists and technicians have every privilege and comfort. In the western zones—and especially in the U. S. zone— no comparable support to science is being given. The supervision of German science and scientists in the American zone is divided between two bureaucracies; university scientists are subject to one jurisdiction, industrial scientists to another. The result is confusing, to say the least. Research projects must be approved by Military Government officials whose understanding of science is not excessive. Scientists in the U. S. zone lack funds and facilities. One of the major prewar research institutions in the U. S. zone of Germany is being used as an officers' club. British zonal officials are, it is true, somewhat more solicitous of German scientists. Generally, however, there is among German men of science in the western zones a sense of envy of the relatively privileged position of German scientists in the Soviet zone.

Wide World

Werner Heisenberg, Nobel Prize winner, said in early 1947 that Russia had offered six thousand rubles per month (then about $500) to German atomic experts who would do atomic research for them.

In this situation, the quandary is: Should the United States Government take positive steps to help rehabilitate German science, taking the chance that it may one day again be used to further ag-

gressive ends . . . or should the United States stand idly by and permit German scientific skills in the western zone to be wasted, while in the eastern zone German science is being rehabilitated to serve Soviet purposes?

Unfortunately the final answers to these questions can be given neither by scientists nor by philosophers, neither by professionals nor by laymen. The answers are inextricably involved in the broad decisions to be made by soldiers and diplomats in the course of the European struggle.

It may be suggested, however, that science can serve as a bridge between East and West in Germany. There are already cases of German scientists teaching and conducting research in both the eastern and western sectors of Berlin, under two flags. It is also suggested that continued paralysis of science in western Germany is a loss to the world without commensurate benefit—certainly as long as the present world situation continues, and within the framework of present East-West relations. Every encouragement should certainly be given to scientists in Germany who can contribute to German economic recovery, subject, of course, to those controls which should be exercised over insurgent and resurgent German nationalism.

In the final analysis, the broad problem of German science cannot be solved except by reference to those overriding issues with which men and governments everywhere are grappling . . . with signal lack of success. The problem of Germany itself, its aspirations, and its future role in Europe, remains to taunt and tantalize men everywhere. As of the present date, the problem of German science has been adjourned in favor of what seem to be more pressing problems. Only time will tell whether this change in emphasis has been on the side of wisdom.

MP's on guard along the U.S.-Russian boundary in Berlin.

Keystone