APRIL 14, 1969 CHARLES 0. CAROTHERS

Two men came to the Physics Department of the University at Berkeley, California, during the darkest days of the great Depression of the Thirties. In each case they came West to escape the stifling academic status quo of the great universities of the East - Harvard and Yale. They came with dissimilar personal backgrounds and were received at Berkeley by the mentors of the Physics Department with mixed feelings, but these two young men did for the Physics Department at Berkeley exactly what was hoped - they put it on the map.

It was exactly to accomplish this expansion of influence and prestige of their department that caused Edward Hall, Chairman, and Raymond Birge to hire Julius Robert Oppenheimer, who was revolutionizing Harvard with the newest import from the physics laboratories of Europe - the quantum theory. Both Birge and Hall believed in the importance of the Anglo-Saxon American background, thus the mixed feelings when they hired the young Jew., son of a rich New York merchant. Oppenheimer arrived in Southern California in a big grey Cadillac, which should have made his journey easy and uneventful. This was not the case, however, for it was interrupted by an accident when he ran off the road using his windshield for a blackboard to theorize on the tunnel effect (chance for matter to pass through matter).

Their other "find", from Yale, suited their personal preferences for background much better, but Ernest Orlando Lawrence, in his drive across the United States in a slightly used Reo Plying Cloud, brought more personal ambition and less brilliance than Oppenheimer. Lawrence had gained some recognition with his publications on the ph±o-electric effect, but he was stymied by Yale's refusal to give him graduate students who would make greater experimentation possible and therefore would allow him to make a significant mark in American physics before he was thirty. Lawrence was 27, Anglo-Saxon, son of the President of a teacher's college at Springfield, South Dakota.

Perhaps the first experiment assigned by-Lawrence to his first graduate student, Niels Edelfsen, best characterizes this new addition to the staff at Berkeley, for Lawrence assigned Edelfsen for his doctoral thesis the job of building a gargantuan ultra-violet lamp in a tank of water to prove that de-ionization (recovery by an atom of a lost electron) occurred at a predictable rate. This, of course, was experimental physics, but the fact that the predicted rate had already been published in a paper on Wave Mechanics by Oppenheimer suggests to you the relationship of the experimental physicist to the theoretical one - the relationship that these two men would have for at least a decade.

Lawrence was teaching Electromagnetic Theory at Berkeley and Edelfsen went on with glass blowers and brass fitters to make the first model of a hydrogen ion electron accelerator which was to break the nucleus of the atom. On the strength of this accomplishment Lawrence eventually received his first advancement at Berkeley beginning the work which was to result in the building of the cyclotron and for it receipt of a Nobel prize. Durirgthis period of time Lawrence's respect for Oppenheimer, a theoretical physicist with great knowledge of the experimental field, grew. They seemed to be complementary to each other and Lawrence's dependence on Oppenheimer's ability to cut through the headier clouds of theory and come up with the right answer laid the background for a respect which was to cause Lawrence to accept Oppenheimer later in his imposing role in the Manhattan District Project.

An example of Lawrence's power and personal magnetism is demonstrated in the way he handled disappointment when his brother, John, graduate of Harvard Medical School, was passed over by the University Medical School in San Francisco. Lawrence "arranged" to have one of his wealthy patrons, William Donner of Pennsylvania, build a $300,000 Donner Laboratory of Medical Physics. You guessed it - John was installed not only as Director of the Laboratory but also as Director of a Division of Medical Physics which was simultaneously set up in the University.

Lawrence had a fund by the mid-1930's on which checks were drawn "Ernest 0. Lawrence, Personal". He not only traipsed across the United States to mend his financial fences with men such as William Donner and Alfred Lee Loomis of New York, who had financed a great deal of Harvey Cushing's work, but he became a member of the exclusive Bohemian Grove, off-shoot of the Elks Club with a rustic lodge on the Russian River some 50 miles north of Berkeley. Here such men as John Neylan, corporation counsel for the Hearst interests, William Crocker, whose surname is well-known to San Franciscans for philanthropy, and Robert Sproul, President of the University of California, washed dishes together to escape the bourgeois restrictions of the city. Doing KP duty with these men taught Lawrence how to influence the rich and the mighty with whom he was to come in contact. It is not surprising then that on April 14, 1954 when asked by a government lawyer if he were not the most influential scientist in the atomic energy field in this country, Oppenheimer replied, without egotism and with great candor, "I think Lawrence had in many ways more influence".

Before his health failed and he died in 1937, Crocker gave Lawrence $75,000 for a building to house a proposed new cyclotron to be known as the Crocker Laboratory. Lawrence's Division of the University was known as the "Radiation Laboratory" and Time Magazine put his photograph on the cover, labelling him as "foremost U.S. destroyer and creator of atoms". With this notoriety it was small wonder that visitors such as Emilio Segre, famous product of Enrico Fermi's School of Physics and eventual winner in 1959 of a Nobel prize (for the discovery of element 43 Technetium), visited the Radiation Laboratory on their tours of the United States.

In 1939 the Uranium Committee was formed to foster and correlate work on nuclear fission. This committee operated with little true grasp of the pressing needs of a global war, and while an anxious government would have granted millions to any of its supervised projects, the committee members' lack of insight kept grants to a niggardly

minimum. The two ranking members of this committee were Lyman Briggs from the National Bureau of Standards in Washington and Gregory Breit, a theoretical physicist from the University of Washington, who had the ancillary title conferred on him of "Co-ordinator of Rapid Rupture". These two men winced at the use of the word "bomb" in connection with their supervised projects and it was with particular distaste that they heard a prominent British physicist, Marcus Oliphant, use this word in his plea that America use every effort to develop the nuclear bomb. Oliphant cited the remarkable progress which a brilliant refugee group had made in Britain towards bomb production with a mere outlay of 50,000 pounds. His estimate was that the bomb would cost $25 millionand Britain simply did not have the money or manpower for this project. As usual the Uranium Committee dropped the ball and Oliphant retraced his steps to Lawrence's Radiation Laboratory, which he had originally visited in 1937 as was the custom for distinguished foreign physicists making their first trip to the United States. Here he presented his plea again to a group of elder scientific statesmen and it is probably here that Lawrence took up the cudgel and began carrying the country's nuclear burdens.

The Uranium Committee was finally circumvented by James B. Conant, Lawrence, and Earl Compton in a meeting at the latter's house in September of 1940. The outcome was that Lawrence should see to the production of the bomb including the production of fissionable material such as uranium 235 and plutonium, Compton should supervise the actual putting together of the bomb, and Conant would be in charge of all matters dealing with fissionable material reporting directly to Vannevar Bush, who was czar of all science in the United States. Gregory Breit was kept on as theoretical physicist, but the contrast of his uncertain and reticent manner of handling seminars on bomb theory was too obvious when compared to the bold and open manner of Oppenheimer. By June 1, 1942 Breit dropped completely out of the project leaving Oppenheimer the principal theoretical physicist on the bomb project. Now under Oppenheimer, the top theoretical physicists working on the project were

congregated on the top floor of old Le Conte Hall at Berkeley in the summer of 1942. The fall of 1942 found the Army preparing to take over the industrial side of the production of fissionable material and it was probably predictable that the Army's appointee to direct this project would be entertained by Ernest 0. Lawrence at the Bohemian Grove. It was natural that Colonel Leslie Groves turned to Lawrence for help in selection of the scientific director for this project. Groves felt that a winner of the Nobel prize should head the project, but was forcec by "default" (as Oppenheimer later characterized it) into selecting Oppenheimer, who neither possessed the prize nor ever was to receive it. Groves, age 46, was a shrewd, blunt soldier, so lacking in scientific background that he felt that the physicists who would people his domain would be awed by military rank. He put off meeting them until his promotion to Brigadier General came through. It is not surprising then that Groves became greatly dependent on Oppenheimer for digestion and interpretation of information which came from projects scattered across the entire United States; projects run by workers in each instance who had no idea of the ultimate use of their work or of the other projects with which theirs would be dovetailed for eventual bomb production. Groves was the clearinghouse for this information and it was perhaps the maximum irony of the time that the individual who correlated and catalogued this information for him and made the scientific decisions for future steps to be taken, confidant of all phases of the Manhattan District Project, was Oppenheimer, already considered a security risk. The FBI and Army Intelligence had an enormous dossier on Robert Oppenheimer by 1942. His brother, Frank, graduate of Harvard Medical School and co-worker of Ernest 0. Lawrence, was a card-carrying Communist. Oppenheimer's wife, Kitty, was a known friend of hard-core Communist Steve Nelson, whom Oppenheimer himself had described as a "good guy" to an investigator at the time. Perhaps Groves' greatest contribution to the Manhattan District was his continued supervision and review of all security data collected on Oppenheimer, for retention of Oppenheimer in this job brought together at Los Alamos to work in relative harmony one of the most remarkable

collections of scientific minds that the world had yet known.

It is fitting that a new town was built to pull together the sprawling arms of the Manhattan Project, for this town would become the actual and ideological birthplace of man's new age. Unique by most any standard, Los Alamos began with this implausible name - "The Cottonwoods". North of the Pajarito plateau of New Mexico rises the red mesa, cut off from the plateau by a canyon and graced at the least hint of dampness by a rainbow. This site was selected by General Leslie Groves at the suggestion of Robert Oppenheimer. Oppenheimer knew this area well. He was acquainted with this region because he had visited it many times in his rides from the small ranch in the Sangre de Cristo range where he had retired in the summer of 1929 to lick tuberculosis, acquired during his stay in Zurich with Paul Ehrenfest and Wolfgang Pauli, who teamed up to correct "Robert's looseness of thinking". Oppenheimer's love for this desert was second only to his zeal for clear and direct scientific thinking.

One can imagine that it would take just such a man as this to direct the scientific citizens of Los Alamos, whose numbers were studded with Nobel laureates and included most of the first citizens of the new atomic age. Whether they liked Oppenheimer or not, almost to a man the word they used to sum up his contributions to the project was "magnificent". The magnitude and urgency of the problems which faced him is demonstrated by the plans drawn up for the production of uranium 235. Three methods were simultaneously to be explored: electromagnetic separation under the direction of Ernest 0. Lawrence and his Radiation Laboratory, the gas diffusion method, really the brainchild of John Dunning, a bull-necked young engineer-physicist from Nebraska, with nominal direction of this effort under Harold C. Urey from Columbia University, and the centrifuge method of separating uranium 235 under the direction of Edgar Murphree of Standard Oil. Unfortunately Urey held the reins tight on Dunning for he had more confidence in the centrifuge method than in his own project. Had this not been

the case Oliphant's original estimate of $25 million as the cost of bomh production might well have become fact, but this was a small problem compared to the Don Quixote type effort that Lawrence presented to the Manhattan District. Oppenheimer headed the list of the sane, scientific theorists of the time who doubted the potentialities of electromagnetic separation, and his capacities for tact and restraint were taxed to the utmost by the waste of this effort. Lawrence's dynamic personality succeeded in influencing the expenditure of many millions of dollars on this effort, including the use of Fort Knox's silver bars to supply wiring for the core of his new Calutron, yet this method consistently failed to deliver significant amounts of uranium 235. Lawrence was the type of supersalesman who approached Roosevelt and later Truman directly to push his projects.

If Los Alamos was the 20th century utopia for uninhibited scientific thinking and free association between the greatest scientific minds of the day, it was just the opposite materially. Leo Szilard, always first in line for criticism of the Manhattan Project and verbal opponent to the eventual use of the bomb (eventually contacting Truman himself in an effort to prevent this), had this to say of Los Alamos: "Nobody could think straight in a place like that. Everybody who goes there will go crazy". The Mesa was fenced in with barbed wire manned by Army Security Guards. Wives were deliberately uninformed of the nature of the project on which their husbands were working and yet were doomed to uninterrupted residence behind this wire until the project or War was completed. Scientists and technicians from the ivory towers of Boston, Princeton and New York converged on the Sangre de Cristo range and at times their reactions ranged from incomprehension to ordinary homesickness. Three thousand construction workers, themselves miserable in trailers, had built a town of rough lumber and building paper. By April of 1942 the main building and five laboratories were finished and in addition to coordinating the inventive genius of the minds he had collected, Oppenheimer had to walk back and forth through the sand in his wrinkled suit and ponkpie hat attempting to smooth

ruffled feathers and apportion a limited number of Indian serving maids to a burgeoning corps of scientific matrons.

Wives freely expressed the opinion that they were prisoners and constantly chafed at the suspected censorship of their letters by the Army's security man, Captain Peer DeSilva. Two years out of West Point, he had bold, aquiline good looks, was 26 years old, and incongruously enough allowed his wife to escape the desert prison by deception. One evening DeSilva knocked on the door of a neighbor physicist and offered butter and eggs from his refrigerator stating that his wife was leaving "because they didn't get on". After Mrs. DeSilva had a leisurely visit outside of the compound and was satisfied to continue imprisonment, they "reunited" several months later behind the barbed wire.

A sample of the human equation in the Mesa was a soaring birth rate which according to General Leslie Groves, "had to be stopped". Chemist Sam Wiseman said of the Post Exchange at Los Alamos, "you could get icons and mezuzzahs and all kinds of fancy crap like that but you couldn't get diapers". One young wife took on the job of running a diaper service only to find her peers split in two groups, those who thought she was too slow, and those who thought she was making a fortune. One day she simply walked out and left a mound of soiled diapers and a frantically ringing telephone. Among the scientific matrons caught short by the failure of the diaper service was K^tty Oppenheimer, herself, who had her second child on the Mesa. While the scientific families were squabbling with the Military Police who had imprisoned them, they were hiring the same gentlemen for baby-sitters in order to ward off the boredom by attending the only restaurant in the area, Edith Warner's Tearoom, where there was nothing to do but eat, look at Indian rugs and woodwork. Occasionally they attended square dances and Zuni corn dances, some taking to it readily, admitting that they were having the time of their lives. There were parties and even a performance of Arsenic and Old Lace was put on, Oppenheimer dutifully accepting the role which taxed him least

and thus conserved his energies; namely, that of the corpse carried up from the cellar.

While Ernest 0. Lawrence raced ever faster back and forth across the United States, bending the ears of the captains of Industry and the President in spending millions of this country's money to retrieve an infinitesimal smear of gunk from his gigantic Materials Testing Accelerator and Cyclotron, the sounder brains of the scientific community were plodding carefully toward the goal of a thermonuclear bomb. From the reactor pile at Hannahford, Washington, came plutonium and from Dunning came uranium 235 in significant amounts.

The men who labored with unpredictable singleness of purpose towards the use of these two substances behind the barbed wire at Los Alamos, were directed by Oppenheimer, spokesman, arbitrator, trouble shooter, but above all brilliant scientific mind able not only to understand but even to anticipate the diverse thinking which emanated from this remarkable collection of physicists, chemists, mathematicians and engineers. One of Oppenheimer's most outspoken critics, as the years passed, was a man who contributed greatly to the basic principles of the thermonuclear bomb, namely Seth Neddermeyer. Tall, bony and sensitive, his jaws often clamped on a dead cigar butt, this former student of Oppenheimer's at Berkeley was recruited from the National Bureau of Standards in Washington for the Los Alamos Community. It was through the free discussion and unlimited contribution from all workers promoted by Oppenheimer in the seminars, that Neddermeyer was encouraged to oppose the opinions of such big guns as Enrico Fermi, Isadore Rabi, winner of the Nobel prize who said of Oppenheimer, "I was never in the same class with him", Samuel Allison, early co-worker with Oppenheimer at Berkeley and now at the University of Chicago, Hans Bethe, eventual Director of the Institute of Nuclear Studies at Cornell, and Robert Serber, early student and later co-worker of Oppenheimer at Berkeley. The problem concerned was the triggering or igniting of fissionable material in the bomb. Neddermeyer fathered the Implosion theory, which hypothesized that an explosive skin around the

fissionable material would drive the central core of material into closer contact with itself and by this re-arrangement would begin the chain of nuclear reaction bringing about the desired explosion. Quite a contribution by a shy man like Neddermeyer in the presence of Nobel laureates, such as Fermi, who with the most famous product of his Italian school of physics, Emilio Segre (Nobel laureate for discovery of the element 43 technetium), had observed fission of uranium in Rome in 1934 and by happenstance had failed to "discover it". Segre later quoted from Dante, "Oh crucified Jove, do you turn your just eyes away from us or is there here prepared a purpose secret and beyond our comprehension?" Had fission been discovered by these two giants of Ihe scientific world, the atomic bomb would have been a problem for the fascist powers rather than the United States. Again later the Axis powers had a chance for this discovery in 1938 when Otto Hahn, a chemist at the Kaiser Wilhelm Institute in Berlin, identified barium in uranium by repetition of Fermi's experiment. It remained for Lisa Meitner, a Jewish refugee, in Sweden, to announce to the world the theory of fission after a communication from Hahn.

Knowledge of the fact that the theory of fission and its most deadly application was universal drove the workers at Los Alamos to corner-cutting with some remarkably "home-made" methods. An example of this is the work of bachelor Louis Slotin, who made the next-to-last verification of bomb theory by poking together bits of its material on his desk top with screwdrivers. This dangerous task, which cut away much delay, bred in Slotin a disrespect for the familiar which later took his life as he threw his body over an induced ionizing reaction. Perhaps Slotin's presence on the bomb project, his personality and his methods best underline the gigantic desperate effort which was being made to develop the bomb, for Slotin would not have passed any personality profile test now routinely employed in Government or Industry recruitment. Fermi summed it up by his dislike of the way Slotin's eyes gleamed when he talked of "tickling the dragon's tail" when he did his crude last-minute verification of potential blast and

radiation strength.

It is interesting to note that Oppenheimer selected the name "Trinity" for the test site outside Los Alamos where the bomb was first to be tested in 1945. "Trinity" referred to the "three-personed God" of John Donne, whose lines best stated Oppenheimer's faith at the time:

> "Batter my heart, three-personed God, for you
> As yet but knock, breathe, shine and seek to mend.
> That I may rise and stand, o'erthrow me and bend
> Your force to break, blow, burn, and make me new."

At the time of Trinity, no less a person than Fermi presented the imposing speculation that the possible result from the first actual fission explosion would be the ignition of the world's atmosphere and a global thermal reaction which would extinguish all life on earth. His exact words with respect to atmospheric ignition were, "I invite bets against first, the destruction of all human life and second, just that of human life in New Mexico." The theorists eventually ascribed an actual numerical chance for this catastrophe, and it was at one time put down at 3,000 to one against its occurrence. Fermi, in attempting to console Oppenheimer, also gave him the graceful compliment that if the bomb failed to go off, no one else could have done better. On June 12, 1945, two full-sized plutomium hemispheres were delivered to Slotin who checked them for neutron multiplication. Bethe, who had worked under Fermi in Rome, when he left pre-war Germany, was responsible for delineating the theoretical parameters of the implosion bomb. Oppenheimer had set July 20th as a deadline for the bomb test. The strain on Oppenheimer was great and General Groves had had the foresight to summon to Los Alamos two people close to Oppenheimer who might share his hour of trial - his brother Frank from Oak Ridge, and Isidore Rabi from the Radiation Laboratory at MIT.

On his visits to Los Alamos Rabi invariably

carried an umbrella to this desert where rain was rarely seen. Equally invariably it would begin to rain on his arrival. Once again at the time of his visit for "Trinity", rain poured down in cats and dogs as he changed into desert clothes. By the time Rabi had arrived at the test site tower "Trinity", a pool had been formed, each participant selecting the power of the explosion that was expected in terms of tons of TNT. Rabi found that he had the choice of zero tons or 18,000, no level being left between. He selected the latter number. The weather was hot, cloudy and humid. George Kistiakowsky of Harvard, the chief American authority on explosives, had in his control the rind, or explosive lens system of the bomb, while Slotin delivered the two hemispheres which were to be inserted within the rind and which he had stored in an ice house at Los Alamos until July 16. Robert Bacher, a level-headed physicist from Cornell, was to supervise the insertion of the hemispheres and see that the whole apparatus was mounted in a corrugated iron shell on top of the tower. Bacher's crew was engaged in an endless poker game which progressed poorly because of the heat and the tenseness of the participants. The rind system had been brought down that day by Kistiakowsky from the high Mesa and was thus cooler than the spheres which had been brought down the day before andhad spent the night in the hot Journada del Muerto. Until the lens system heated up and allowed the hemispheres to be inserted, there was fear that a miscalculation had been made and that they would not actually slide into place. The spheres were held just far enough apart within the rind to prevent multiplication of neutrons and fission from occurring. These hemispheres would be pushed together by the explosion of the rind of smokeless powder and this rearrangement, according to the implosion theory of Neddermeyer, would touch off the fission reaction. While it was safe to touch the capsule, which was tamper-coated with uranium, it was nevertheless warm.

Weather brought a new word into the jargon of the scientists who surrounded Oppenheimer at the forward station; the word was "fallout". Would the

weather carry the radioactive debris over Amarillo or Albuquerque? Jack Hubbard, the chief meteorologist, along with Fermi and Oppenheimer formed the triumvirate who would decide whether weather conditions would permit the test. The night before the explosion Joseph McKibben, recruited from Breit's laboratory at the University of Wisconsin, lay on a bedrool in the sand beside the tower. Kistiakowsky and Bainbridge had left him there at midnight after watching McKibben fully arm the bomb. Only a few safety switches remained to be thrown. The bomb looked like a peeled orange, 59 inches across, but inside were five kilograms of plutonium ticking away their half-life of 24,400 years. Because of its shape the bomb was known as Fat Boy.

Kistiakowsky and Bainbridge came back and shook McKibben awake at quarter-to-five in the morning, almost an hour before daybreak. McKibben got up and threw the last safety switches. Collecting the armed guards they mounted separate jeeps for the drive back to the concrete block control station. Samuel Allison, an early co-worker of Oppenheimer's who had left Berkeley in 1930 for the University of Chicago, had been selected by the Director to be "chief cowpuncher of a no-red-tape committee to keep Fat Boy moving on schedule" and was in charge of the countdown.

At zero hour the glow outside the block house was much, much brighter than the photoflood lamps inside. Fermi amused himself by dropping bits of paper between the flash and the thunderous blast, a space of a minute or two of silence. By this crude method Fermi correctly estimated the magnitude of the blast at 20,000 tons of TNT, winning the pool himself. Allison, after a minute or two of silence following the thunderous blast, stated, "still alive, no atmospheric ignition". The mushroom cloud feinted frighteningly north and then finally took the easterly course that was expected of it.

What came after the successful test at "Trinity" is perhaps the best-known portion of World War II's Pacific area history. What is perhaps

less well known, was the letdown throughout the Manhattan District after the German surrender. Proponents and antagonists for the plan to drop the atomic bomb on Japan found equally powerful voices. Secretary of War Stimson had estimated for Truman a million casualties in a scheduled November invasion of Japan, while Air Force General Hap Arnold did not believe that an invasion would be necessary. Truman and his top advisors weighed the anticipated deaths of American soldiers in such an invasion against the calculations as to Japanese deaths in a Hiroshima. Vannevar Bush and Conant for the scientists, with George Marshall and Admiral William Leahy for the militarists condemned full use of the bomb against Japan. Eventually, however, the decision to drop the bomb was made, perhaps as much with an eye to the cold war to come as to the true tactical needs of the military situation at hand. Our arsenal contained only two bombs at the time - Fat Boy and Little Boy. On August 6, 1945, Little Boy killed 70,000 or moreinhabitants of Hiroshima, and on August 9 Russia entered the Pacific war, Fat Boy killing 35,000 more at Nagasaki. After this, actual work on the Manhattan District was taken over by the "second team" as .such names as Oppenheimer, Bethe and Fermi moved into advisory positions. Norris Bradbury, who had first known Oppenheimer as a student when the latter was an inept neophyte lecturer at Berkeley, succeeded Oppenheimer as Director at Los Alamos with Teller, Von Neuman and others working on under him.

In September of 1949 detection of the first atomic explosion by the Russians was made by Peter King, chemist, of the Navy independently of the Air Force whose nominal responsibility was to make such investigations. Oppenheimer had suggested at war's end that rainwater samples be routinely collected and analyzed for evidence of micromicrocuries of cerium 141 and yttrium 91 and other telltale fission products as evidence of atomic explosions in the atmosphere. King had been doing just this and his announcement to Truman of his finding precipitated a command performance for Oppenheimer at Blair House. It was difficult for Truman to accept Oppenheimer's statement that this was unequivocal evidence of a Red atomic bomb explosion. Oppenheimer's

sensible reaction to this discovery was to advise Teller to return to Los Alamos, keep working and "keep his shurrrt on" as Teller later told it in his Hungarian accent. Nevertheless this discovery whipped the scientific and political counsels of the United States into a furor of dissention. Truman was pushing for a crash program for rapid development of the super bomb.

In October of 1949 the Advisory Committee of the Atomic Energy Commission met without one of its members, Glen Seaborg, who was travelling in Sweden. Seaborg was the spokesman on the Committee for the California group having worked under Lawrence and Latimer as a chemist, .and he represented Lawrence's views when he suggested in a letter to Oppenheimer that although the super bomb was distasteful, he nevertheless was reluctant to vote against a program recommending its development. The Advisory Committee under Oppenheimer's aegis eventually decided not to make this a crash program and antagonized Lawrence by brushing aside his scientific dreams for a Materials Testing Accelerator to be constructed in the Bay Area with Luis Alvarez as Director. This decision was not what the politicians or public wanted to hear, so on January 30, 1950, Truman convened a committee of three - Secretary of Defense Louis A. Johnston, Secretary of State Dean Acheson, and David Lillenthal. These three voted on January 31, 1950 to inaugurate a crash program for super bomb development. With this decision and with the appointment of Louis Strauss to the Chairmanship of the Atomic Energy Commission, Oppenheimer's doom was sealed.

It was Oppenheimer who had made Strauss a laughing stock before hearings of the Un-American Activities Committee on June 13, 1949 when he answered Strauss' accusation that isotope shipments to Norway, namely one milicurie of iron 59 to be used to trace diffusion through molten steel, represented a breach of the Atomic Energy Act. By the wildest thinking process Strauss deduced that this was a threat to American security. Oppenheimer had the entire Committee laughing when he drew the analogy that a shovel or a bottle of beer could just as well be used for atomic energy production

and thus would be off our list of possible exports to foreign nations.

Oppenheimer was indeed living in a nightmare where sane, scientific decisions only antagonized the respected peers of the scientific community who were under Lawrence's influence, yet the principle that a giant fission bomb could kindle a thermonuclear reaction in frozen tritium was impractical. Oppenheimer's belief in an orderly and well-rounded approach to the problem was supported by the majority of the scientific community. His great mistake, therefore, seems not to have been in his evaluations of the scientific issues but in the honesty and candor with which he presented them to the politicians. These issues had great emotional and psychological content, both in the high councils of the nation and a!lso in the minds of the general public as well.

By January of 1950 the British reported the capture of Klaus Fuchs by the Russians and a check at the documents division at Los Alamos found that the Fuchs-Von Neuman patents contained almost all of the existing information on the super bomb. This placed in Russian hands our most important atomic secrets. With the return of James Tuck, originally of the University of Manchester, to his Oxford laboratory, intimate knowledge of all phases of bomb production was available to the British, for no one knew more about all phases of bomb production than Tuck, who had worked throughout the war at Los Alamos and was a principal developer of the explosive lens system of the bomb. Thus Oppenheimer's opinion that international sharing of nuclear information was desirable was based not only on the knowledge that our friends across the Atlantic were partners to our secrets but also our enemies. How could a logical, scientific mind such as Oppenheimer's believe that international control was not, in fact, a fait accompli?

When Oppenheimer's term as Chairman of the General Advisory Committee of the Atomic Energy Commission drew to a close in the fall of 1952, he made it clear that he would not continue and he received an official letter from Harry Truman informing him of the terminationof this service. Oppenheimer

did remain on the Committee as a consultant and when asked later why he did this in the face of the nightmare in which he was involved, he used these words: "Humanity must have some room to hope." He then delivered a series of lectures over the BBC decrying America's lemming march towards disaster in its race with Russia for the super bomb. Thus it was not enough for the Commission to allow Oppenheimer to run out his term as a consultant never asked to give a consultation, but the Commission headed by Strauss with the backing of the California scientists, including Lawrence, Teller, Latimer and Ulam, felt it necessary to discredit the man. A special board including Gordon Gray, former Secretary of the Army, Thomas A. Morgan, Chairman of the Board of Sperry, and Ward Evans of Loyola University of Chicago, was convened to review Oppenheimer[1]s security clearance with particular reference to two basic types of accusations. The first accusation included allegations of Communist sympathy in his old security file dating back to the early 1940's. The second accusation was that Oppenheimer had sabotaged our nuclear program from 1949 on by his decisions as Chairman of the Advisory Committee of the Atomic Energy Commission and through his influence on members of this Committee. This was indeed a strange accusation against the man who at the time urged strong Air Force capabilities for strategic and tactical bombing in which atomic weapons could be used. With reference to the decisions of the Committee under Oppenheimer's aegis it should also be pointed out that he need only have left Lawrence unopposed in his press for a Materials Testing Accelerator in the Bay Area for this would have indeed sabotaged the program towards the super bomb by diverting funds from the Savannah River Reactor Project, which really could produce the raw materials necessary. Testimony of the California group of scientists who appeared against Oppenheimer was from Teller, Alvarez, Latimer, Pitzer and Griggs; Lawrence seeming to sicken of the task not appearing. Those witnesses who appeared in Oppenheimer's defense read like a Who's Who of American physical science. The list was headed by VannevarBush, Carl T. Compton and James B. Conant and ironically included James Fisk and Robert Bacher

who would eventually be sent in 1958 by America to pave the way for a test ban treaty. The specialist consultants list who appeared in Oppenheimer's defense was headed by Bethe, and to a man they characterized his contributions to nuclear physics and to bomb production as "magnificent" regardless of their feelings towards the man personally. It was the decision of this Committee that Oppenheimer had substantial association with Communists and Communist functionaries and others who engaged in espionage, but no direct evidence of disloyalty to the United States was presented. His security clearance was revoked on the basis of this finding.

After the decision of this investigating committee was announced, Fermi made the last of his very infrequent statements to the press when he announced that "the Los Alamos laboratories have deserved the gratitude of this nation for their development of both A and H weapons." William Higinbotham pointed out that Fermi "wanted to clean up a little after what the country had done to Oppenheimer. After all, Oppenheimer was Los Alamos."

On December 2, 1963 Oppenheimer was presented by President Johnson the Fermi Award which had been signed by John Kennedy:

> "To J. Robert Oppenheimer for his contributions to theoretical physics as a teacher, an originator of ideas and for leadership of the Atomic Energy Program during critical years."

There is no question that Oppenheimer had caused the three-personed God of John Donne to bend his force to break, blow and burn. Oppenheimer had refused the "opportunity" to have his security clearance reviewed and reinstated. On receipt of the Fermi Award he had told Johnson that "We are engaged in this great enterprise of our time, testing whether men can live without war as the great arbiter of history." It is doubtful that at the time of his death on February 18, 1967, his achievements had, to paraphrase John Donne's words "made him new". Perhaps in time the objective retelling of his story will rescue his memory from

the unjust stigma of the 1954 hearings.

Charles 0. Carothers