History of Physics
NEWSLETTER
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News of the Forum: Three Physics Sites Honored for Their Historic Roles

By Paul Halpern

The APS Historic Sites Committee has selected three sites this year pivotal to the development of physics to be honored for their roles. The sites are the IBM Thomas J. Watson Research Center, Los Alamos National Laboratory, and the Carnegie Institution of Washington Division of Terrestrial Magnetism. A plaque will be placed at each of these sites to commemorate their place in physics history.

Headquarters for IBM's Research Division, the Thomas J. Watson Research Center in Yorktown Heights, New York has been the home of numerous physicists and physics advances. Notable physicists working there have included Rolf Landauer, Charles H. Bennett and 1973 Nobel laureate Leo Esaki who received the prize for electron tunneling in

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Three Physics Site Honored

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solids. Breakthroughs at the Watson Research Center have included superlattice crystals, dynamic random access memory (DRAM), field effect transistor (FET) scaling laws, amorphous magnetic films for optical storage and thin-film magnetic recording heads.

Los Alamos National Laboratory began as a top-secret military site, established by the US Army in 1942 as the home of the Manhattan Project on the grounds of a boys school in the mountains of northern New Mexico. A teacher's house, made of logs and stone, was converted for use as the home of physicist J. Robert Oppenheimer, scientific leader of the project. "Oppie," as he was affectionately known, lived at the home between 1943 and 1945, along with his wife Kitty, son Peter and daughter Katherine (born in December 1944) as he led the program to design, build and test the first atomic bomb. Today, the Oppenheimer house is one of nine buildings intact from that era, on a block preserved as part of the Los Alamos historic district. South of his house was the home of Nobel Laureate Hans Bethe, head of the laboratory's Theoretical Division during the war. Other well-known physicists who resided on that block during the wartime era included James Chadwick, Richard Feynman and Enrico Fermi. The Los Alamos National Laboratory is currently the home of numerous research projects, for civilian as well as military purposes.

The Carnegie Institute of Washington Department of Terrestrial Magnetism (DTM) was founded in 1904 in Washington, DC. While its primary initial goal was to map the Earth's magnetic field, that aim was accomplished in 1929. Thereafter, the DTM's mission has expanded and researcher have focused on numerous other terrestrial and astronomical projects, including the search for exoplanets. Starting in the late 1960s, and throughout the 1970s, astrophysicist Vera Rubin, along with Kent Ford and other colleagiues, began a study of the speeds of stars in spiral galaxies. Through these studies Rubin showed how the visible mass of spiral galaxies was not enough to account for the stellar motions, particularly of peripheral stars. This missing mass became known as dark matter. Today, the nature of dark matter is one of the greatest mysteries in physics.

The APS Historic Sites Initiative was established in 2004 to help make the public more aware of physics and to increase awareness among physicists themselves of the discipline's history. Each honoree receives a plaque during a special ceremony, often by a member of the APS presidential line. More information about the APS Historic Sites Initiative and a list of past honorees can be found at:

http://www.aps.org/programs/outreach/history/historicsites/

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History *of* Physics
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The articles in this issue represent the views of their authors and are not necessarily those of the Forum or APS.

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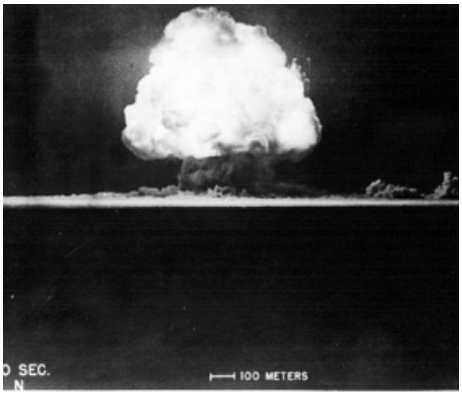
Searching for *Trinity* Witnesses and their Survivors

by Cameron Reed



I am attempting to compile a list of witnesses to the July, 1945, Trinity test conducted at Alamogordo, New Mexico. While a number of descriptions of the test have been published by individuals who were already famous or who would become so after the war, a list of personnel given in Kenneth Bainbridge's 1946 report on the test indicates that it may have been witnessed by some 300 people altogether, with the vast majority being lower-echelon scientific, technical, and military personnel. If you are a Trinity witness or a colleague or family member of a witness, I would very much appreciate hearing from you. Where were you (or your colleague/family member) stationed during the test? Do you have any descriptive material or reminiscences you would be willing to share? Please contact Dr. Cameron Reed, Department of Physics, Alma College, Alma, MI 48801; e-mail: reed @alma.edu

From the March Sessions: Session Report: "Celebrating 100 Years of Physical Review at APS"

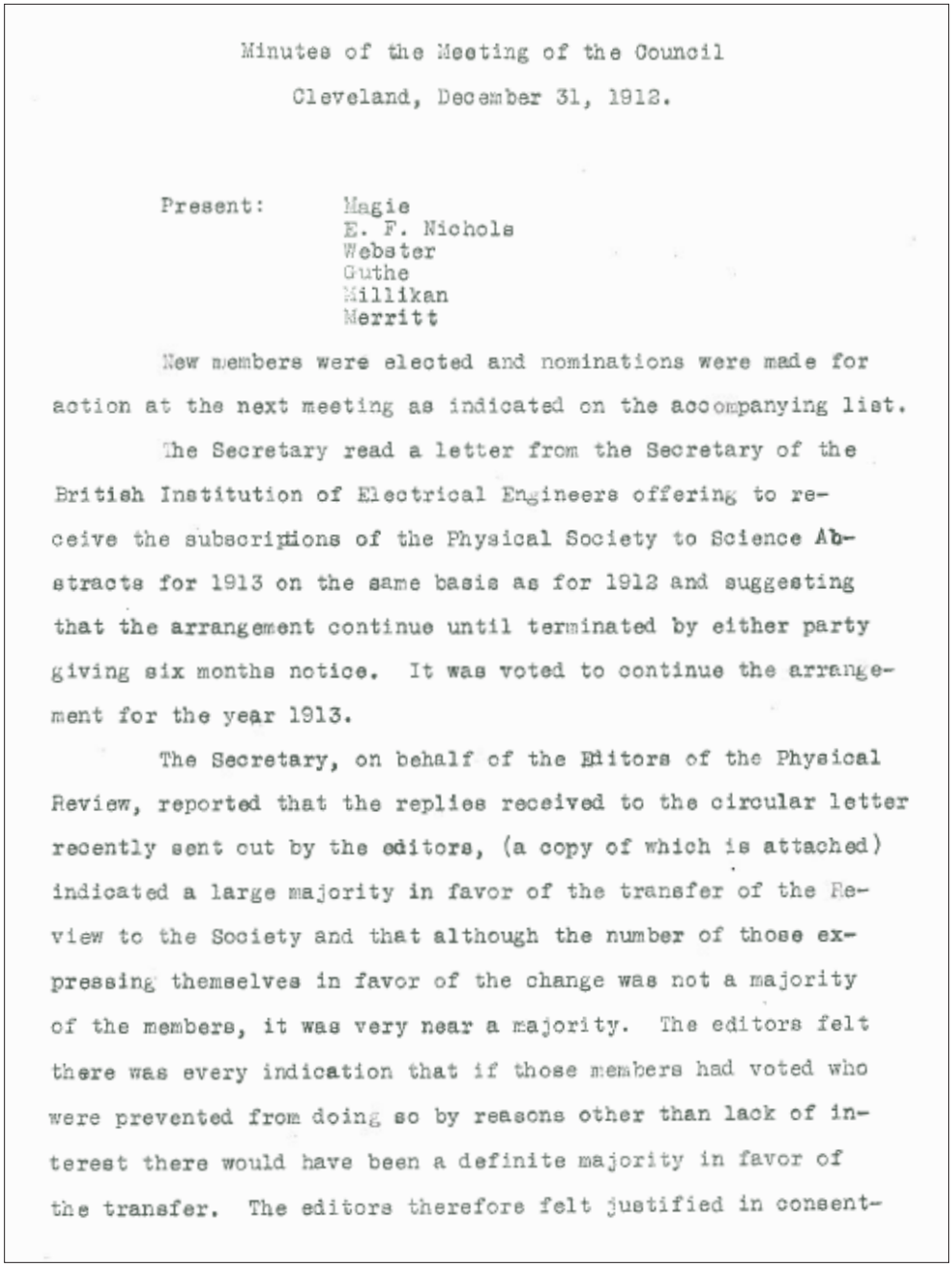
by Don Howard

A highlight of the FHP program at the 2013 March meeting was the session on "Celebrating 100 Years of Physical Review at APS." Organized by former APS Editorial Director, Martin Blume, this session both commemorated an important anniversary in the history of APS and used the occasion to reflect on the future of APS publications.

The session opened with Blume, speaking under the title "In the Beginning…," about the founding of Physical Review at Cornell in 1893, under the editorial direction of Edward L. Nichols, Ernest Merritt, and Frederick Bedell, and about the decision in December 1912 to bring the journal under the control of APS the following year, albeit with the editorial operation remaining at Cornell for many years.

Two talks examined specific issues of importance to the Physical Review in the first half of the twentieth century. First, Robert Crease looked at "The American Reception of the Quantum as seen by the Physical Review, 1900-1927," highlighting the scant mention of the quantum theory during the years of Series I of the journal (until 1912), and then the rapid acceleration of interest during Series II, especially in the 1920s.

Daniel Kennefick then summarized the history of Einstein's relationship with the Physical Review, including the publication in 1935 of the very famous Einstein-Podolsky-Rosen paper, "Can Quantum-Mechanical Description of Physical Reality Be Considered Complete," and the publication also in 1935 of the Einstein-Rosen paper on "The Particle Problem in General Relativity," which featured the first introduction of the idea of the "Einstein-Rosen bridge," now much better known by the name "worm holes." Kennefick also discussed the curious episode of Physical Review editor John Tate's rejection of the 1936 paper by Einstein and Rosen on gravitational waves, this on the strength of an anonymous referee's report that the paper contained a crucial error. Recent detective work by Kennefick (with help from Bloom) identified the referee as H. P. Robertson. While a corrected version of paper later appeared in the Journal of the Franklin Institute, a clearly peeved Einstein wrote to Tate in July of 1936: "We (Mr. Rosen and I) had sent you our manuscript for publication and had not authorized you to show it to specialists before it is printed. I see no reason to



Minutes of the Meeting of the Council

Cleveland, December 31, 1912.

Present: Magie
E. F. Nichols
Webster
Guthe
Millikan
Merritt

New members were elected and nominations were made for action at the next meeting as indicated on the accompanying list.

The Secretary read a letter from the Secretary of the British Institution of Electrical Engineers offering to receive the subscriptions of the Physical Society to Science Abstracts for 1913 on the same basis as for 1912 and suggesting that the arrangement continue until terminated by either party giving six months notice. It was voted to continue the arrangement for the year 1913.

The Secretary, on behalf of the Editors of the Physical Review, reported that the replies received to the circular letter recently sent out by the editors, (a copy of which is attached) indicated a large majority in favor of the transfer of the Review to the Society and that although the number of those expressing themselves in favor of the change was not a majority of the members, it was very near a majority. The editors felt there was every indication that if those members had voted who were prevented from doing so by reasons other than lack of interest there would have been a definite majority in favor of the transfer. The editors therefore felt justified in consent-

First page of the minutes of the December 1912 APS meeting outlining the decision to take over Physical Review.

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address the—in any case erroneous — comments of your anonymous expert. On the basis of this incident I prefer to publish the paper elsewhere."

An important transition for Physical Review, starting in the 1990s, was the move into the world of digital publication. Mark Doyle, himself instrumental in guiding the transition, gave an informative summary of these developments, emphasizing the often leading role that APS played in pioneering new forms of publication and access, such as PROLA, the Physical Review Online Archive, and the conversion of the entire editorial process to an online form.

The session concluded with a forward-looking talk by current APS Editorial Director, Gene Sprouse, "The Physical Review Grows into a Family of Journals." Among the several important points made in this talk, perhaps most noteworthy were the data presented about the rapidly changing demography of APS journals, as readership, manuscript submission, and refereeing become ever more international in character. The recent and rapid growth of Chinese physics as represented in the readership of and authorship in Physical Review points us toward a dramatically different intellectual landscape in the twenty-first century.

Dr. Don Howard is Professor of Philosophy at the University of Notre Dame and Director of Notre Dame's Graduate Program in History and Philosophy of Science.

Herrn John T. Tate
Editor The Physical Review
University of Minnesota
Minneapolis,Minn.

Sehr geehrter Herr:

Wir (Herr Rosen und ich) hatten Ihnen unser Manuskript zur Publikation gesandt und Sie nicht autorisiert, dasselbe Fachleuten zu zeigen,bevor es gedruckt ist. Auf die - übrigens irrtümlichen - Ausführungen Ihres anonymen Gewährsmannes einzugehen sehe ich keine Veranlassung. Auf Grund des Vorkommnisses ziehe ich es vor, die Arbeit anderweitig zu publizieren.

Mit vorzüglicher Hochachtung

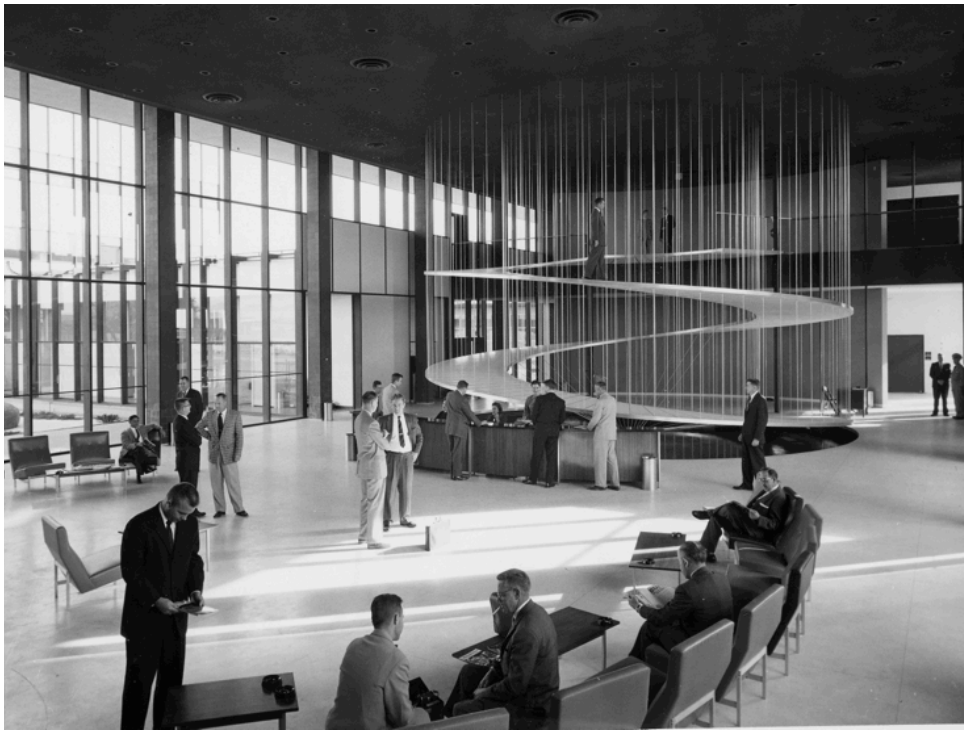
P.S. Herr Rosen, der nach Sowjet-Russland abgereist ist, hat mich autorisiert,ihn in dieser Sache zu vertreten.

Original of the letter from Einstein to Tate when Einstein's "gravity waves" paper was rejected.

Mark Doyle, APS director of Journal Information Systems, at the Physical Review Centennial Session.

From the March Sessions, Session Report: "A History of Physics in Industry"

by Joseph D. Martin



Investigating the history of industrial physics poses characteristic challenges. Corporate records are sparser and more difficult to access than university or non-profit archives. The disciplines that university departments wall off from one another often blend smoothly together on the floor of an industrial laboratory. Industrial research, rather than being shepherded rapidly into publication, is often subject to internal embargos. At the recent APS March Meeting in Baltimore, Maryland, an FHP-sponsored panel showcased various and creative ways in which historians are circumventing these challenges to understand the relationship between physics, industry, and enterprise. The four historians in panel M9: A History of Physics in Industry, explored four separate scales at which physics and industry interact, indicating just how rich a vein of historical insight future research in this direction promises.

Tackling national trends, Orville Butler of the American Institute of Physics (AIP) provided the large-scale context that framed the panel. His progress report on the History of Physics Entrepreneurship project—a follow-up to the 2008 History of Physicists in Industry report—described the evolution of the resource ecology in which physics-based startups have emerged, emphasizing regional variation. With Joe Anderson, also of the AIP, Butler conducted interviews in 12 US States, from Massachusetts to California, and from Texas to Wisconsin. Especially notable conclusions include the unexpected rise in venture capital as an impetus for new enterprise, even after the 1990s tech bubble, and preliminary indications that the deepest well of innovation over the past two decades has come from new university-based startups rather than established corporations, which dominated the laboratory-to-marketplace pipeline in the mid-twentieth century.

Another perspective on the academia-industry connection came from Brittany Shields of the University of Pennsylvania, who focused on an individual institution. Shields's case study of the Laboratory for Research on the Structure of Matter (LSRM) at the University of Pennsylvania demonstrated how the physical structure became an interdisciplinary space for the study of materials, and also a nexus where industrial, academic, and government interests intermingled. With the blurring of disciplinary lines came a parallel softening of institutional boundaries. Although the LSRM was a university laboratory staffed by university scientists, financial arrangements with IBM, Union Carbide, Westinghouse, and other local companies ensured that the lab remained attuned to industrial needs and interests.

Cyrus Mody—Rice University—directed the panel's attention to the individual scale, considering physicists who parlayed their academic research and training into an electronics cottage industry—or, more appropriately, garage industry—in 1970s Santa Barbara. Mody highlighted conspicuous differences in how the boundaries of scientific legitimacy are negotiated in the marketplace as opposed to the academic power structure. Physicists like Philip Wyatt and David Phillips became interested in applying physical methods to parapsychology and alternative medical practices. Marginalized by the academic establishment, these physicists found a ready market for their skills within the 1970s counterculture movement. Mody, placing these physicists in the tinkerer tradition, demonstrates that their conviction that any phenomena could be fruitfully subjected to a rigorous experimental approach can't be dismissed as mere quackery. The same impulse that drove their interest in devices to locate acupuncture points by measuring skin resistivity grounded research that helped the hearing impaired learn to enunciate, or assisted with hospital blood tests.

Finally, Johns Hopkins's Stuart W. Leslie introduced some of the other colorful personalities participating in Californian industrial research: the

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laboratories themselves. Leslie focused on laboratory architecture, suggesting that the edifices of Southern California aerospace and other high-technology industries reflected the aspirations of the space age. Western research firms did not merely offer jobs to physicists and engineers; they sold a lifestyle meticulously designed to lure talented young researchers who would typically be drawn to established East Coast labs. Leslie, like Shields, highlighted the spaces of research, aptly demonstrating how the futurist glass and steel structures, surrounded by gardens, pools, and tennis courts, encoded the prevailing values of mid- to late-twentieth century industrial research.

Evident from these talks were the ways in which the story of industrial physics does not fit neatly into the standard historical narratives crafted on the basis of universities and National Laboratories. Butler demonstrated that, although historians have come to think of federal funding as the engine of physics, a diverse array of venture capital, angel investment, state grants, and university commercialization funds have stoked an impressive array of physics-based innovations; but each funding mechanism brought with it different risks. Shields showed how industrial interests gained a toehold in an academic setting, complicating what are often treated as clean institutional categories. In an era of big science, a laboratory might still have been as modest as a garage, and Mody's analysis exposed the academic gatekeeping mechanisms that can obscure the full range of physicists' interests and activities. Industry, as Leslie illustrated, pushed the boundaries of laboratory design, and so offers crisp case studies historians can use to understand the sites of physical research. Together, these talks presented a convincing case that the history of physics has much to learn from closer inspection of industrial research, in all its dimensions.

Joseph D. Martin is a Faculty Fellow at Colby College.

Bill Leslie

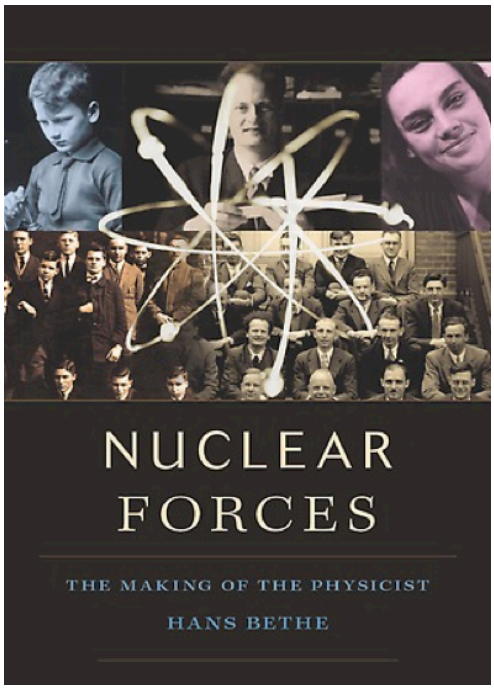
Brian Schwartz (left) and David Cassidy (right) at the discussion following the staged reading of Cassidy's play Farm Hall, at the March meeting, March 20, 2013

New Books *of* Note

Nuclear Forces: The Making of the Physicist Hans Bethe

By Silvan S. Schweber, Cambridge, MA: Harvard University Press, 579 pages, illustrated, $35.00

Reviewed by Michael Nauenberg



Hans Bethe was among the most versatile physicists of the 20th century, contributing to virtually every branch of the discipline, writing superb review articles, and teaching and mentoring students. In addition, in World War II he directed the Theoretical Division at Los Alamos during the development of the atomic bomb. Later in his life, he called upon all scientists to "cease and desist" from working on any aspect of nuclear weaponry.

When I was an MIT undergraduate in the early 1950s, I asked Victor Weisskopf for his suggestions about graduate schools, and he recommended without hesitation that I should go to Cornell to study physics with his friend Bethe. I followed Vicki's advice. It was my good fortune to attend Bethe's lectures and seminars, and later to become one of his Ph.D. students. By then he was the chief scientific US adviser during the initial negotiations with the Soviet Union toward nuclear disarmament. This activity often kept him in Geneva, Switzerland, so he had less time for his Cornell activities in this period.

Nuclear Forces is an excellent personal and scientific biography of Bethe covering the first third of his life. Schweber also provides biographical sketches of prominent physicists who interacted with Bethe and played major roles in the early development of quantum mechanics, plus chapters on two women in his life: his life-long wife and partner, Rose Ewald, and an earlier love, Hilde Levi. The book also contains mathematical discussions of some of Bethe's major achievements, such as his well-known "ansatz," which can be understood, however, only by readers with an advanced background in physics or mathematics.

Bethe was born in Strasbourg in 1906. His father Albrecht Bethe, a distinguished physiologist, nurtured his precocious talent and scientific interests. His mother Anna, however, appears to have crimped his emotional development, particularly with respect to female companions. Later, after he married Rose, his mother lived for some time with them and "nearly wrecked their marriage," according to Schweber.

In 1926 Bethe began to study physics in Munich under Arnold Sommerfeld, who taught him to apply advanced mathematical methods to physical problems. When he later visited Enrico Fermi in Rome in the early 1930s, he learned Fermi's back-of-the-envelope approach to obtain physical insights and semi-quantitative answers to physical problems more rapidly. During these visits Bethe also learned quantum electrodynamics in the form Fermi originally developed. In his own words, "Fermi changed my whole style of doing physics and weaned me from the formal structure of most European universities."(quoted from *Physics Today*, June 2002).

Early on, Bethe also exhibited his sense of humor when he and two collaborators published a hoax in 1931, in the first issue of Naturwissenschaften. Following Eddington's numerology, they claimed to obtain a relation between the value of the inverse fine-structure constant, 137, and the lowest possible temperature, $T_0 \approx -237°C$. This hoax should have been obvious to the editor, as the value of T_0 depends on the arbitrarily chosen temperature units, but he and the reviewers were fooled.

Bethe had a lifelong close friendship with Rudolph Peierls, his fellow classmate studying under Sommerfeld. Peierls introduced him to the problem of nuclear forces, whose study had been initiated by Werner Heisenberg after Chadwick's 1932 discovery of the neutron. Before that, the constituents of the nucleus were believed to be protons, with embedded electrons accounting for the nuclear charge and beta decay. Although Schweber used the phrase "nuclear forces" as the title, only a fraction of Bethe's diverse achievements described in the book occurred in this area.

Bethe's early fame and growing recognition stemmed from his masterful review articles, starting with a *Handbuch der Physik* article on the one and two electron problem. Later his reviews of nuclear physics, written in collaboration with M. Stanley Livingston and Robert Bacher in *Reviews of Modern Physics* became known as "Bethe's Bible." In 1939 Bethe was asked to write a review article on stellar energy generation for *Reports on Progress in Physics*. In this case he uncharacteristically asked his student Robert Marshak to draft it, with the proviso that it would be published under both names and that Marshak would receive any earnings.

When Hitler was appointed German Chancellor in 1933 and persecution of Jews began in earnest, Bethe (whose mother was Jewish) lost his appointment as a lecturer in Tübingen. It rankled him that he received only a "cold note" confirming his dismissal from

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Hans Geiger, who initially had welcomed him warmly. Fortunately, Sommerfeld helped Bethe obtain a year-long position in Manchester. Afterwards, he received a visiting position at Cornell, and soon he became an assistant professor in its physics department. He liked Cornell and his colleagues, and he remained there his entire career, building the Cornell physics department into a world-class institution.

In addition to his mastery of physics, one of Bethe's advantages was the speed with which he could carry out calculations. In 1934 Weisskopf, at the time an assistant to Wolfgang Pauli, asked him how long it would take to do a certain calculation; Bethe replied "Me, it will take three days. You, it will take three weeks." But he wasn't just bragging. After the 1948 Shelter Island Conference, in which Willis Lamb announced his experimental discovery of the splitting of the $2S_{1/2}$ and $2P_{1/2}$ levels in hydrogen, predicted to be degenerate in Dirac's theory, Bethe applied Hendrik Kramers's seminal idea of mass renormalization, which he and Weisskopf had learned at this conference, to calculate this Lamb shift, finishing it during the short train ride back to Cornell. Bethe's non-relativistic calculation demonstrated for the first time that renormalization made higher-order calculations with quantum electrodynamics (QED) possible. At the conference, Julian Schwinger, Robert Oppenheimer and Weisskopf had suggested that the Lamb shift was due to the electron's interaction with its radiation field, but they thought that calculations of this shift would turn out infinite. According to Freeman Dyson, Bethe's calculation "broke through a thicket of skepticism and open the modern era of particle physics. It showed us all how to connect QED with the real world." (quoted from *Physics Today*, October 2005).

Bethe attended the 1938 Washington Conference organized by George Gamow, at which the constitution of stars and nucleosynthesis were discussed. With his knowledge of nuclear physics and stellar structure, Bethe concluded that he could solve the problem of stellar energy generation. Collaborating with Charles Critchfield, he calculated that the p-p chain reaction of hydrogen into helium is the primary source of nuclear energy in the sun, and he reported their results before the end of the conference. For this achievement, Bethe won the 1967 Nobel Prize in physics. He deserved this prize for many of his other major contributions, the most important being his calculation of the Lamb shift. But to this reviewer, the 1967 prize, awarded for energy production in stars, should have been shared with Gamow and Critchfield.

As Schweber points out, Bethe on several occasions failed to give appropriate credit for ideas that influenced his work. For example, his Lamb shift calculation was based on Kramers's idea of mass renormalization, but he did not acknowledge Kramers in his paper on the subject.

Successful physicists often tend to be or become arrogant, but Bethe never revealed this trait, in spite of his numerous accomplishments. His students, including myself, can testify to this. An oft-repeated story recounts how Bethe skipped testifying at a delayed Senate hearing because of a prior luncheon appointment with one of his students.

In 1947 Sommerfeld invited Bethe to succeed him at Munich, but Bethe declined the offer, responding:

I am very gratified and very honored that you have thought of me as your successor. If everything since 1933 could be undone, I would be very happy to accept this offer…unfortunately it is not possible to extinguish the last 14 years.… I am much more home in America than I ever was in Germany.

Like Fermi and Peierls, Bethe was among the most versatile physicists of the 20th century, able to contribute significantly to many subfields. General readers, and physicists in particular, will enjoy Schweber's masterful biography and benefit from learning not only about Bethe's life and work, but also about the history of physics in the first third of the century.

During a walk with Bethe at a University of Washingon workshop in 1990, he asked me whether I knew the status of this biography. I think he would have been very pleased with the long-awaited result.

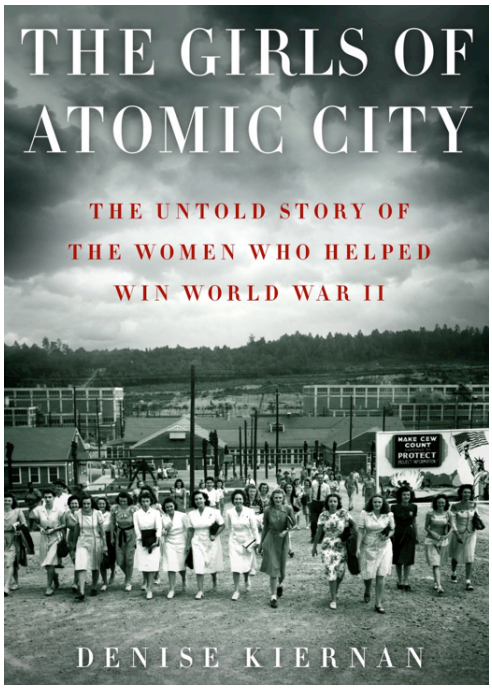
Michael Nauenberg is Professor of Physics Emeritus at UC Santa Cruz. He just received the University of California's 2013 Panunzio Award for his research and writings on the history of 17th-century physics.

New Books *of* Note

The Girls of Atomic City: The Untold Story of the Women Who Helped Win World War II

By Denise Kiernan, Touchstone/Simon and Schuster, New York, 2013. xvii + 373 pp. ISBN 978-1-4516-1752-8, $27 hardcover

Reviewed by Cameron Reed



Seven decades have elapsed since Robert Oppenheimer began gathering a cadre of scientists and engineers to Los Alamos to develop the first generation of nuclear weapons. At the same time, enormous construction projects in Tennessee and Washington were beginning to literally lay the foundations for fissile-material production complexes. Biographical materials on the leading scientific, military, and administrative personalities of the Manhattan Project – people like Oppenheimer, General Groves, Enrico Fermi, Hans Bethe, Vannevar Bush, James Conant, and many others - are extensive and well-known to scholars and students of the Project. These individuals are now long gone, but the level of their contributions and the strengths of their personalities keep them in the forefront of most Project literature. As a consequence it is easy, even for those of us who study the Project in detail, to cast into an anonymous background the tens of thousands of "ordinary" people who worked at those production plants, most of whom had no idea on what they were working. In her Girls of Atomic City, Denise Kiernan gives life and voice to a selection of these individuals: women who worked at the Clinton Engineer Works uranium-enrichment facilities at Oak Ridge, Tennessee.

By focusing on a selection of about 10 women who hailed from various places and who performed a diverse array of jobs, Kiernan gives us a compelling cross-section of life in "The Secret City." We meet women who served as administrative secretaries and calutron operators, a statistician who processed uranium-production numbers, a chemist who analyzed product from the calutrons, a pipe-leak inspector who worked in the mammoth K-25 gaseous-diffusion plant (which, ironically, was shaped like giant letter U), a nurse who worked at the Oak Ridge Clinic, and a janitor in K-25 who helped to keep the plant spotlessly clean against the incursion of even the slightest iota of grease or moisture into miles of process piping and almost 3,000 diffusion tanks. Virtually all of these women had a brother, a boyfriend, or a husband off at war; one had lost a brother at Pearl Harbor. Some came from distant states, while others – notably the locally-recruited recent high-school graduates who operated calutron vacuum tanks – had grown up in the area, only to have their family homes and property seized to make way for the Clinton reservation. Clinton represented good jobs at good wages, and, most important, a way to contribute to the war effort.

Life at Oak Ridge was not easy. For many, housing was cramped and contained few amenities; conditions for black workers were particularly appalling. Contact with outside friends and family was discouraged and closely monitored; the pervasive presence of secrecy and censorship, surveillance by ever-present plainclothes "creeps,", need-to-know, and don't-ask-don't tell took an enormous mental toll, particularly for non-working wives and mothers. It can be hard for us now to imagine that there was a time when people trusted their government and were willing to make personal sacrifices in a time of national need. But the motivation was powerful: the sacrifices of the brothers, boyfriends, and husbands were often infinitely greater.

This book is not aimed at explaining the scientific aspects of the Manhattan Project, but brief prefaces to the first 12 chapters (each titled "Tubealloy" – a code-word for uranium) give readers brief descriptions of relevant background material such as the discovery of fission, why it was necessary to separate U-235 and U-238, the principles on which the various Clinton facilities operated, reactions of German scientists interned at Farm Hall to the news of Hiroshima, and scientific and governmental considerations surrounding use of the bomb and post-war policy. Kiernan uses these prefaces to also introduce other women who were more-or-less directly associated with the project, such as Ida Noddack, Lise Meitner, and Leona Woods. I found a few errors, such as assigning Philip Abelson a Nobel Prize (p. 107), a tendency to confuse elemental mass and physical size (p. 33), the statement that all of Clinton's calutron vacuum tanks were up-and-running before the end of the war (p. 243), and a mis-spelling of the name of American-born Soviet intelligence agent George Koval (as "Koral," p. 243), but these are minor quibbles that would catch the eye only of a reader already very familiar with the details of the Project.

Qualitative works on the Manhattan Project often include attempts to

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The Girls of Atomic City

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"analyze" or "interpret" the Project through the prism of an author's dubious pet pseudo-intellectual psychological or sociological "theory" of some flavor or other. Oak Ridgers developed a vibrant social scene, but General Groves did not establish the town as a social experiment; also, it is always convenient for such authors that the principals involved have no means of responding. Kiernan is to be heartily congratulated for avoiding this aggravatingly nonsensical genre: the stories of the lives - personal, social, and work alike - of her protagonists are richly engaging in their own rights; they have no need of any veneer of academic puffery. Kiernan relates these stories with warmth, humor, and humanity, and that is all that they require to come alive.

The news of what those thousands of people at Clinton were doing burst over Oak Ridge on the morning of August 6, 1945, as dramatically as their product had over Hiroshima only hours earlier. Reactions ran the spectrum from jubilation (mostly) to more somber reflections, but the vast majority of Oak Ridgers took immense and justified pride in what they had contributed to the war effort. For many, the end of the war meant an end to their employ in east Tennessee, but friendships and marriages made there lasted for the rest of their lives. Many others remained, building their own careers and families.

This book should be on the shelf of anyone seriously interested in the Manhattan Project. Denise Kiernan set out to bring long-overdue attention to the contributions of thousands whose task was, as soon as possible, to squeeze every atom of U-235 out of trainloads of raw material that poured into Clinton. Most had no idea what that product was, or ever laid eyes on a single gram of it. We can be grateful that they succeeded admirably, and so has she.

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Seeking Help with Garwin Biography

A number of physicists, who have worked for years in the intersection of physics and national security, are gathering support for a biography of Richard Garwin, the major figure of the early atomic age, who is still very active in providing the government with technical advice and analysis related to defense and defense policy. Dr. Garwin has had an incredibly eclectic career contributing advances in many areas of physics and applied mathematics, lasting well over half a century. Many, but not all of these were had important defense and intelligence applications. Beyond a mere list of diverse and major contributions, his career could alternatively and interestingly be interpreted as a paradigm and metaphor for the efforts of leading scientists—indeed of the scientific community—to influence government policy in their areas of expertise since World War II. For example, Dr. Garwin is famous for, among many other contributions, leading the design of the world's first thermonuclear device, and later becoming a leading advocate for test ban treaties and stockpile reductions. A prospective author has been identified, and the project is proceeding. Comments and support are welcome; please send to Tony Fainberg, fainberg666@comcast.net or tfainber@ida.org.

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