the specific dose of radiation that produces a particular effect. This has required a massive effort to determine just how much radiation each of the various survivors actually received. The calculations are complex and depend on a number of variables, including the precise position of the bomb when it exploded, the yield of the bomb, and the location of the survivor at the time of the explosion. Survivors have been interviewed to determine just where they were and what shielding they were behind; replicas of Japanese houses have been tested for shielding effects at the AEC's Nevada test site; and the epicenter of the explosion has been determined as precisely as possible by studying thermal ray shadows burned into gravestones and other granite objects. The yield of the bombs has also been recalculated. It turns out that the 20-kiloton yield attributed to the Hiroshima bomb by President Truman's original announcement was way off—it was probably only 12.5 kilotons. The upshot of all this refining and recalculating is that Oak Ridge National Laboratory has developed sophisticated equations for estimating the dose of gamma and neutron radiation actually received by any given individual. There is considerable disagreement over how accurate the estimates are in any individual case, but on a statistical basis the errors are believed to cancel out. The ABCC has already been able to express some of its findings in dose-specific terms, and it hopes to expand and refine the effort in the coming years. The results are expected to be particularly helpful in establishing the maximum radiation exposure which can be safely tolerated by man.

The ABCC's investigations have occasionally been challenged on scientific grounds—but the critics seem not to have shaken the confidence of experts in the ABCC's findings. Some Japanese scientists, primarily those of leftist political leanings, have long accused the ABCC of suppressing information and distorting data in an effort to minimize the horror of the A-bomb. Some Japanese scientists also contend that the ABCC's negative findings are meaningless because, they allege, the ABCC's control groups actually contain large numbers of people who were exposed to residual radiation or to fallout from the bombs. Thus, they argue, the ABCC is actually comparing various groups of exposed people and naturally no difference is found between these groups. This argument has been taken up and adapted by Ernest J. Sternglass, the University of Pittsburgh radiologist, who has loudly proclaimed that low doses of fallout from nuclear weapons tests have caused fatal genetic damage to hundreds of thousands of children in the United States since the early 1950's. Faced with contradictory evidence from the ABCC—namely, the extensive studies which were unable to detect any significant genetic effect in the offspring of survivors in Hiroshima and Nagasaki—Sternglass has charged that the ABCC control groups are contaminated and he has suggested other reasons why the ABCC findings are not incompatible with his assertions. However, ABCC

Academy of Sciences Selects New Members

The National Academy of Sciences has elected five new Council members and 50 new members. It also reelected Harrison Brown, from the California Institute of Technology, to a 4-year term as Foreign Secretary.

Elected to 3-year terms as Councilors were: Kingsley Davis, University of California at Berkeley; James V. Neel, University of Michigan; James A. Shannon, Rockefeller University; and Robert L. Sinsheimer, California Institute of Technology. Clement L. Markert, Yale University, was elected to a 1-year term to fill the unexpired term of William D. McElroy.

The 50 new members, elected in "recognition of their distinguished and continuing achievements in original research," are:

Robert M. Adams, University of Chicago
Berni J. Alder, Lawrence Radiation Laboratory at Livermore
John D. Baldeschwieler, Stanford University
Jerome A. Berson, Yale University
Paul D. Boyer, University of California at Los Angeles
Lewis Branscomb, director, National Bureau of Standards
Bernard F. Burke, Massachusetts Institute of Technology
Stanley A. Cain, University of Michigan
Robert B. Corey, California Institute of Technology
James W. Cronin, Princeton University
William G. Dauben, University of California at Berkeley
Edward E. David, Jr., Bell Telephone Laboratories
Ralph Emerson, University of California at Berkeley
Sterling H. Emerson, California Institute of Technology
Albert E. J. Engel, University of California at San Diego and U.S. Geological Survey
Robert A. Good, University of Minnesota
Richard M. Goody, Harvard University
Harold Grad, New York University and Courant Institute of Mathematical Sciences
James D. Hardy, Yale University and director, John B. Pierce Foundation Laboratory
Leon A. Heppel, Cornell University
Harold Hotelling, University of North Carolina
Armin D. Kaiser, Stanford University
Nathan O. Kaplan, University of California at San Diego
Irving M. Klotz, Northwestern University
Rebecca C. Lancefield, Rockefeller University
Walter B. Langbein, U.S. Geological Survey
Peter D. Lax, New York University and Courant Institute of Mathematical Sciences
Daniel S. Lehrman, Rutgers, The State University
Aldo S. Leopold, University of California at Berkeley and director, Sagehen Creek Field Station
Cyrus Levinthal, Columbia University
Milton S. Livingston, Massachusetts Institute of Technology and director, National Accelerator Laboratory
Willem J. Luyten, University of Minnesota
Rudolph A. Marcus, University of Illinois
Carl V. Moore, Washington University
Eugene P. Odum, University of Georgia
Ruth Patrick, Academy of Natural Sciences of Philadelphia and University of Pennsylvania
Gerald L. Pearson, Stanford Unversity
Alexander Rich, Massachusetts Institute of Technology
Herschel L. Roman, University of Washington
Paul A. Samuelson, Massachusetts Institute of Technology
Arthur L. Schawlow, Stanford University
Menahem M. Schiffer, Stanford University
Stephen Smale, University of California at Berkeley
George D. Snell, Roscoe B. Jackson Memorial Laboratory
Jack L. Strominger, Harvard University
Michael Tinkham, Harvard University
Benton J. Underwood, Northwestern University
Bruce Wallace, Cornell University
Abraham White, Yeshiva University
Arthur S. Wightman, Princeton University