phic Institution, Harry Hess of Princeton University and Maurice Ewing of Columbia University. In marked contrast to the earlier period of research in local waters, this was a time of oceanographic activity over all the world's oceans.

Roger's stewardship of the Scripps Institution provided a productive environment for the extraordinary collection of researchers there who were principals in the development of the theories of sea-floor spreading and plate tectonics: Russell Raitt, Victor Vaquier, Albert Engel and H. W. Menard. Almost all of this work was supported by ONR via the Marine Physical Laboratory, a major unit of Scripps devoted mostly to antisubmarine warfare.

Roger's interests beyond marine geology were many and varied. He is most famous to the public for his investigating and stimulating interest in global warming due to the anthropogenic emission of carbon dioxide. He did this research at Scripps with Hans Suess and Charles D. Keeling, and the work is notable for a famous example of his incisive epigrams: "Thus human beings are now carrying out a large-scale geophysical experiment of a kind that could not have happened in the past nor reproduced in the future." This statement parallels his other famous aphorism, "We know less about the ocean's bottom than about the Moon's back side."

Revelle is perhaps best known to physicists as the builder of one of the country's best physics departments, at the University of California, San Diego. He built up this department in an incredibly short time from 1958 to 1961, fulfilling his goal of creating a great technical research and teaching institution using Scripps as a base. California needed to develop new campuses of the university to satisfy the needs of a growing population. Revelle had the very good sense to identify some of the best, most active physicists in the country, and through his charisma and force of persuasion he rapidly convinced several of them to come to San Diego. This amazing collection formed the nucleus about which crystallized today's department. Roger did equally well with the biology and chemistry departments.

When the search for a chancellor for the new campus at San Diego opened in 1960, the resistance that developed when Roger was named director of Scripps resurfaced. It was perhaps his bitterest disappointment not to be chosen. (The position went to Herbert York.) Roger then went to the University of California, Berkeley, for a very short period to fill a university research deanship that had originally been designed by the university regents for Ernest O. Lawrence. The position did not occupy him adequately, nor did it permit him to concentrate on the kind of problems that interested him the most—those of a global nature that impacted society in a vital way—and so he left the university in the fall of 1964.

He spent the next ten years at Harvard University as head of the Harvard Center for Population Studies. His interest in population issues was stimulated during his stint as science adviser to Secretary of the Interior Stewart L. Udall during President Kennedy's Administration in 1961–63. He also headed a special committee to investigate agricultural practices in Pakistan at that time.

Roger returned to the University of California, San Diego, as a professor of science and public policy in the department of political science, where he taught and continued his research in scientific and policy areas. He was active in the American Association for the Advancement of Science and served as its president in 1974. Roger was president of the First International Oceanographic Congress of the United Nations, was the first chairman of the US national committee for the International Biological Program and was chairman of the US delegation to the Intergovernmental Oceanographic Commission. He was deeply involved in many aspects of UNESCO, having been a member of the US delegation to the UN Atoms for Peace Conference in August 1955 and to the UN Conferences on Science and Technology in 1962 and 1979. He was a Pugwash attendee for 23 years.

Roger received many honors. The honor he cherished the most, however, was his last, the National Medal of Science in 1990.

Roger R. D. Revelle

Roger Revelle was a big man, both in his physical stature and in his accomplishments. In an uncharacteristic bit of modesty he once characterized himself as someone who started things but never saw them through. At least that once Roger missed the point: The challenges he undertook were the important ones, and they can be classified as insoluble in the sense that they are never ending. What Roger Revelle did was to improve our understanding of them and our ability to deal with them to the greatest extent possible in our times.

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Res Jost

Res Jost died on 3 October 1990 in Zurich, Switzerland, at the age of 72, after a long illness. Jost was an influential figure in the development of theoretical physics after World War II.

Jost was born in Bern, Switzerland, and received his elementary and secondary education there. He attended lectures at the University in Bern, and in Zurich at the University and at the ETH. He wrote his thesis under the guidance of Gregor Wentzel on the charge dependence of nuclear forces.

The first work to bring Jost international attention was on the so-called false zeros of the S matrix. During the Second World War, Werner Heisenberg had put forward his S-matrix program, which proposed that quantum field theory as it then existed be abandoned and that the theory of elementary particles be expressed entirely in terms of S matrices. It was regarded as essential, if this program was to work, that the location of the bound states of the theory be obtainable from the S matrix. Hendrik Kramers and Heisenberg had proposed that the zeros of the scattering matrix elements on the negative imaginary energy axis should give the bound states. It was natural to test this proposition in the simplest possible case: Schrödinger potential scattering. However, Shih-Tsun Ma had found examples of potentials having "false" zeros—zeros that do not correspond to bound states. Jost clarified the situation by showing that in the scattering by a central potential the S matrix in a state of given angular momentum is always given by a ratio, $S(k) = \mathrm{f}(k)/\mathrm{f}(-k)$, where k is the asymptotic momentum and f is what is now called the Jost function. Any bound states are given by the zeros of

the numerator, any false zeros by the poles of the denominator.

As the general principles of relativistic S-matrix theory emerged, the original proposal of Kramers and Heisenberg more or less disappeared into a much more sophisticated framework (CDD zeros), but Jost's work was the starting point for a number of fruitful developments in scattering theory. In particular, in the early 1950s Jost and Walter Kohn made an initial attack on what is now called the inverse scattering problem: the determination of a potential from the scattering amplitude and the locations of the bound states. Parallel developments, especially the work of Izrail Gelfand and Boris M. Levitan, led eventually to the extensive theory of integrable systems that we know today.

In the mid-1950s, in collaboration with Hans Lehmann, Jost took up the study of analytic properties of relativistic scattering amplitudes. This work led to the well-known Jost–Lehmann–Dyson representation, which gives an incisive and precise description of such amplitudes. At about the same time, Jost undertook a study of axiomatic quantum field theory. He was the first to recognize that the *CPT* theorem is a very general and simple consequence of the principles of quantum field theory. His deduction of *CPT* invariance from the locality and spectral properties of quantized fields is extraordinary for its simplicity and depth. Jost's mastery of this subject was displayed in his 1965 book *The General Theory of Quantized Fields* (American Mathematical Society, 1965).

In Zurich in the late 1950s and early 1960s, there gathered around Jost a group of young people working on mathematical physics in general in particular on quantum field theory. A partial list includes Sergio Albeverio, Hazichiro Araki, Gian-Fausto Dell'Antonio, Klaus Hepp, Walter Hanziker, Derek Robinson, David Ruelle and Othmar Steinmann. Their work made the ETH one of the most active centers in the field. Jost's scientific judgment and integrity was a powerful influence. He also played an important role in the founding of *Communications in Mathematical Physics*, the leading journal in the field.

After a serious heart attack in 1972, Jost turned his attention to the history of science. He brought to this field his deep understanding of physics and a broad knowledge of history and philosophy. His articles on subjects such as "Zurich and Einstein; Einstein and Zurich" and

Res Jost

"Boltzmann and Planck: The Crisis of Atomism at the Turn of the Century and How Einstein Overcame It" are jewels.

Jost's achievement and acumen were internationally recognized. He spent six years (1949–55) at the Institute for Advanced Study in Princeton, New Jersey, and several shorter periods at the Niels Bohr Institute in Copenhagen before accepting a professorship at the ETH in Zurich. He returned to Princeton on several occasions, and he was associated with the Institut des Hautes Etudes Scientifiques at Bures-sur-Yvette, France, from its inception. He received the Planck Medal of the German Physical Society in 1984.

With Res Jost's death the international community of theoretical physicists has lost a great personality. Throughout his life, Jost remained a "Berner," while at the same time establishing lasting friendships with persons from many parts of the world. His surviving wife Hilde and he enjoyed a very close relationship throughout their long marriage and maintained a warm and hospitable home. Jost was a man of exceptional breadth, not only in physics and mathematics but also in music, history and philosophy. His great personal and scientific integrity and modesty set high standards for others to follow. His many friends will miss his wisdom, his wonderful use of language, his pithy sense of humor, his laughter and his deep humanity.

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Jules W. Sunier

Jules W. Sunier died on 11 October 1990 in Albuquerque, New Mexico, at the age of 55, after a courageous struggle against cancer.

Sunier completed both undergraduate and graduate work at the ETH in Zurich, earning his PhD in physics in 1962. He emigrated to the United States in 1964 when he accepted an assistant professorship in the physics department at the University of California, Los Angeles. In 1972 he became a United States citizen and joined Los Alamos National Laboratory.

Sunier had a very productive career in experimental nuclear physics. During his early years at the ETH and UCLA, he studied β and α spectroscopy of proton-rich short-lived nuclides. From 1972 to 1979 Sunier did experimental low-energy nuclear reaction studies at the Los Alamos Van de Graaff facility. During this period of intensive research, when Sunier was primarily studying two-nucleon transfer and heavy-ion reactions, visitors always sought to enlist him as a collaborator, not only because of his experimental expertise but also because of his physics insight. Sunier led the Los Alamos research effort at CERN's Low Energy Antiproton Ring, studying antiproton reactions. He then joined the HELIOS collaboration, a program of research in relativistic heavy-ion collisions at CERN. Sunier considered the research he accomplished in this field in the subsequent ten years to be the most important of his scientific career. In 1984 Sunier became deputy group leader of the medium-energy physics group at LANL. In 1987 he became group leader, a position he held at the time of his death.

Like many Swiss, Sunier was a linguist. He had an excellent command of English, Italian and German, in addition to his native French. Anyone who had the pleasure of skiing with him could not believe he was not born with skis on. He was a loving husband and father and a loyal, dependable friend. He helped wherever he could in his unassuming way. Those of us who were privileged to know Sunier as a colleague and friend will miss this gentleman of the international nuclear physics community.

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