

William Aaron Nierenberg Biography



William Aaron Nierenberg was born in New York City on February 13, 1919. After graduating from Townsend Harris High School, he received three degrees in physics: the B.S. from City College of New York in 1939, the M.A. and Ph.D. from Columbia University in 1942 and 1947 under the direction of I.I. Rabi. Nierenberg's national reputation as a scientist developed from his experimental and theoretical work in low-energy particle physics during the 1950s at the University of California, Berkeley. Since 1965 when he became director of the Scripps Institution of Oceanography, he has contributed as administrator, consultant, and advisor in the areas of oceanographic research, military defense, and the global environment.

After graduating from Columbia University, where he participated in the Manhattan Project, Nierenberg became an assistant professor at the University of Michigan, 1948-50. In 1950, he joined the University of California, Berkeley physics department where he formed the Atomic Beam Laboratory, concurrently founding

the Atomic Beam Research Group at Berkeley's Lawrence Radiation Laboratory. His research during this period, 1950-65, resulted in over 100 publications relating to many theoretical and experimental areas within low-energy nuclear physics, especially magnetic moments and nuclear spin. It is for this work that he was elected to the National Academy of Sciences in 1971.

While yet primarily a physicist, Nierenberg began work in oceanography and scientific advising while still at UC-Berkeley. On sabbatical from Berkeley in 1953-54, he served as project director of Columbia's Hudson Laboratories, where he worked on underwater sound studies, his first research related to oceanography. In 1958, he began his first national consulting and advising when he acted for two years as consultant to the National Security Agency and as a member of the President's Science Advisory Panel on Antisubmarine Warfare. He promptly moved on to the international arena, developing his career as statesman of science to be NATO's Secretary General for Scientific Affairs in Paris, serving concurrently as Professeur Associate of the University of Paris (1960-62). Nierenberg had become fluent in French during a year at the University of Paris as an undergraduate in 1937-1938. In 1962, he joined JASON, an independent group that advises the Department of Defense on scientific matters related to national security. This has been his "longest continuous service." He served as chairman during the early 1980s.



Nierenberg was appointed S.I.O.'s seventh director on July 1, 1965. Nierenberg was also vice chancellor of marine science, professor of physics and geophysics, and dean of S.I.O.'s graduate program. He came to Scripps Institution of Oceanography at a time of increasing public interest in the oceans. For oceanography to develop fully as a field, however, Nierenberg felt it was necessary to improve funding and to invest in engineering, equipment, buildings, ships, and personnel. While director, he supervised a five-fold increase in S.I.O.'s budget, obtaining funding from federal, state, and private sources. He expanded the graduate education program and started an applied ocean sciences program, which stressed both engineering and oceanography. Among the first to recognize the value of satellites and computers in oceanography, Nierenberg started the first use of large-scale computers aboard research vessels at S.I.O., obtained remote access to the CRAY Supercomputer at UCSD, and established the first remote sensing satellite facility at an oceanographic research center.

"I try to start one new project each year," he said. Among these were the JOIDES Deep Sea Drilling Project, which was operated by S.I.O., and NORPAX, or North Pacific Experiment, which studied the impact of the air-ocean interface on short-term climatic changes. Many new research vessels and buildings were added during Nierenberg's administration. Notable among these was R/V Melville, the first in a series of research vessels designed specifically for oceanographic work. Nierenberg increased cooperative programs with other institutions and strengthened ties with outside organizations and agencies at local, state, national, and international levels. His awareness of the scientific political climate helped keep S.I.O. at the forefront of scientific advances.



Nierenberg, however, described his own primary role as that of advocate for the S.I.O. faculty and staff. He believed S.I.O. owed its success to its "hundreds of varied research programs, its bright, young, hard-working students, and its mission-oriented laboratories." According to his successor, Edward A. Frieman, Nierenberg "brought the institution to the forefront of modern science by spearheading innovative programs, initiating new technologies for oceanography, and recruiting outstanding faculty and staff."

Nierenberg retired in 1986, and was appointed director emeritus and professor emeritus. Edward Allen Frieman was next appointed director of S.I.O., a position he held ten years until his retirement in 1996. During his 21 years as director of an ever-growing research institute, Nierenberg was extremely active in science policy, serving extensively on committees and panels for the National Academy of Science's National Research Council (NRC) and the National Science Foundation's National Science Board (NSB), as well as on NASA's Space Advisory Board and the President's National Advisory Committee on Oceans

and Atmosphere (NACOA).

Bill Nierenberg died of cancer at his home in La Jolla, California, on September 10, 2000.

WILLIAM AARON NIERENBERG

BIBLIOGRAPHY

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1945

Separation of Gas Mixtures Flowing Through Porous Media. *Phys. Rev.* 69, 259.

1946

With C. Williams. Microgas Analysis *U.S.A.E.C.* No. MDDC-529.

With N.F. Ramsey and S.B. Brody. Measurements of Nuclear Quadrupole Moment Interactions. *Phys. Rev.* 70, 773.

1947

With N.F. Ramsey and S.B. Brody. Measurements of Nuclear Quadrupole Interactions. *Phys. Rev.* 71, 466.

With S.B. Brody and N.F. Ramsey. Nuclear Moments of the Bromine Isotopes. *Phys. Rev.* 72, 258.

With N.F. Ramsey. The Radiofrequency Spectra of the Sodium Halides. Thesis/Columbia University. *Phys. Rev.* 72, No. 11, 1075-1089.

1948

With I.I. Rabi and M. Slotnick. A Note on the Stark Effect in Diatomic Molecules. *Phys. Rev.* 73, 1430.

With I.I. Rabi and M. Slotnick. A Note on the Stark Effect in Diatomic Molecules. *Phys. Rev.* 74, 1246.

Book Review of Sears and Zemansky, Mechanics, Heat and Sound. College Physics Series (pub. Addison-Wesley) *Science* 107, No. 2768, 73.

1949

Nuclear Pile Design. *University of Michigan Res. Inst. SIO Archives.*

1950

Story of the Synchrotron. *University of Michigan. SIO Archives.*

With G.B. Beard, J.L. Levy and R.W. Pidd. Design of Magnet Ends and Straight Sections of a Racetrack Synchrotron. *Phys. Rev.* 79, 209.

The Intermediate Cosine Coupling in Molecular Beams. *Phys. Rev.* 80, 1102.

1951

- The Spin-Orbit Spectrum in Molecular Beams. *Phys. Rev.* 82, 323.
The Intermediate Spin-Orbit Coupling for Large Rotational Quantum Number. *Phys. Rev.* 82, 932.
A New Viewpoint in Computing Crystal Frequencies. *J. Chem. Phys.* 19, 659.
Racetrack Synchrotron. *University of Michigan. USAEC M922. SIO Archives.*

1952

- Another Fluid Paradox. *Am. J. Phys.* 20, 379.
The Octupole Moment Interaction. *Phys. Rev.* 87, 225.
The Motion of Geophones of Special Geometries in Fluids. *Project Michael, Columbia U. SIO Archives.*

1953

- With H.B. Silsbee. A Possible Explanation of the Discrepancies in the Measurement of the Rotational Magnetic Field in Diatomic Molecules. *SIO Archives.*
With J.P. Hobson. The Statistics of a Two-Dimensional, Hexagonal Net. *Phys. Rev.* 89, 662.
Treating the Atomic Nucleus More Gently, Idea and Experiment. *U. of Calif Press, Berkeley. SIO Archives.*

1954

- With G. Bemski and H.B. Silsbee. Spin-Orbit Interactions in RbF and CsF. *Phys. Rev.* 94, 767.
With J.P. Hobson, J.C. Hubbs, and H.B. Silsbee. Spin, Magnetic Moment and Hyperfine Structure of Rb⁸¹. *Phys. Rev.* 96, 1450.

1955

- With J.P. Hobson, J.C. Hubbs and H.B. Silsbee. Nuclear Spin of Rb⁸¹--Method of Measurement. *Phys. Rev.* 99, 612.
With J.P. Hobson, J.C. Hubbs and H.B. Silsbee. Spin and Magnetic Moment of (4.7-hr) Rb⁸¹. *Phys. Rev.* 99, 612.
With G. Bemski and H.B. Silsbee. Cosine Interaction in CsF and RbF. *Phys. Rev.* 98, 470.

1956

- With R. Sunderland, J.C. Hubbs and H.B. Silsbee. Spins of Rubidium Isotopes of Mass 81, 82, 83, 84. *B.A.P.S. II*, 1, 252. UCRL-3392.
With G.O. Brink, J.C. Hubbs and J.L. Worcester. Spin of Thallium Isotopes 198m, 199, and 204. *B.A.P.S. II*, 1, 343.

- With J.C. Hubbs, H.A. Shugart and H.B. Silsbee, P.O. Strom. Spin of 7.1-Day Cs¹³². *B.A.P.S.* II, 1, 343.
- With H.Shugart, J.C. Hubbs, E. Lipworth and H.B. Silsbee. Spin of Rubidium-81-m. *B.A.P.S.* II, 1, 253. UCRL-3393.
- With J.C. Hubbs. Scintillation Detection of Very Low Energy Gamma Rays. *UCRL*-3434.
- With H.B. Silsbee, H.A. Shugart and P.O. Strom. Spin of 40-Day Ag¹⁰⁵. *B.A.P.S.* II, 1, 389. UCRL-3561.
- With J.P. Hobson, J.C. Hubbs, H.B. Silsbee, R.J.. Sunderland. Spins of Rubidium Isotopes of masses 81, 82, 83 and 84. *Phys. Rev.* 104, 101.
- With J.C. Hubbs, H.A. Shugart, and H.B. Silsbee. Spin of Rubidium-81m. *Phys. Rev.* 104, 757.
- With H.A. Shugart, H.B. Silsbee and R.J. Sunderland. Spins of Cesium-127, 129, and 130. *Phys. Rev.* 104, 1380.
- With J.C. Hubbs, E. Pipworth and H.B. Silsbee. The Spin of Rubidium-81. *B.A.P.S.* II, I, 253. UCRL-3393.

1957

- With J.C. Hubbs and J.L. Worcester. The Dipole and Quadruple Moments of Ga⁶⁷. *B.A.P.S.* II, 2, 316. UCRL-3861.
- With J.B. Reynolds, R.L. Christensen, W.M. Hooke, D.R. Hamilton, H.H. Stroke, W.B. Ewbank, H.A. Shugart and H.B. Silsbee. The Nuclear Spin of Au¹⁹⁴. *B.A.P.S.* 2, 317. UCRL-3865.
- With T.M. Green, H.L. Garvin and E. Lipworth. The Nuclear Moments of Br⁸². *B.A.P.S.* II, 2, 383. UCRL-3976.
- With J.L. Worcester, R. Marrus and J.C. Hubbs. New Upper Limit for the magnetic moment of Ga⁶⁶. *B.A.P.S.* II, 2, 383. UCRL-3974.
- With L.L. Marino, W.B. Ewbank, H.A. Shugart and H.B. Silsbee. Nuclear Spin of Bi206. *B.A.P.S.* II, 2, 383. UCRL-3979.
- The Measurement of the Nuclear Spins and Static Moments of Radioactive Isotopes. *Ann. Rev. of Nuclear Sci.* 7, 349-406.
- A Method for Minimizing a Function of n Variables. *UCRL*-3816.
- Machine Computations of hfs Lines. *3rd Brookhaven*, 35. *B.A.P.S.* II, 2, 30. UCRL-3615.
- With H.G. Silsbee, H.A. Shugart and R.J. Sunderland. The Atomic Hyperfine Structure of Cs¹²⁷ (6.2-hr) and Cs¹²⁹ (31-hr). *3rd Brookhaven*, 35. *B.A.P.S.* II, 2, 30. UCRL-3615.
- With H.A. Shugart and H.B. Silsbee. The Nuclear Spin of Cu⁶¹ (3.3-hr). *B.A.P.S.* II, 2, 200. UCRL-3673.
- With G.O. Brink, J.C. Hubbs, J.L. Worcester. Hyperfine Structure of Tl-204. *B.A.P.S.* II, 2, 200.
- With J.C. Hubbs, H.A. Shugart and J.L. Worcester. Odd-Odd Isotope Having Zero Spin. *Phys. Rev.* 105, 1928. UCRL-3645.
- Moments and Spins of Radioactive Nuclei. *Proc. University of Pittsburgh, Conf. on Nuclear Structure, June, 1957.*

- With G.O. Brink, J.C. Hubbs, J.L. Worcester. Spins of Thallium-197, 198m, 199 and 204 and the Hyperfine-Structure Splitting of Tl-204. *Phys. Rev.* 107, 189. UCRL-3643.
- With J.C. Hubbs., R. Marrus and J.L. Worcester. Hyperfine Structure of Pu²³⁹. *B.A.P.S.* II, 2, 316. UCRL-3856.
- With W.B. Ewbank, H.A. Shugart and H.B. Silsbee. The Nuclear Spins of Ag¹⁰⁶ and Ag^{110m}. *B.A.P.S.* II, 2, 317. UCRL-3864.
- With J.C. Hubbs, H.A. Shugart, H.B. Silsbee and R.J. Sunderland. Hyperfine-Structure Separations and Magnetic Moments of Rubidium-81, 82, 83 and 84. *Phys. Rev.* 107, 723.
- Atomic Beams with Radioactive Species. *Proc. Conf. on Microwave Spectroscopy., Duke University.* Felix Block Presiding. *ONR Symposium Report ACR-31.*

1958

- With W.B. Ewbank, L.L. Marino, H.A. Shugart and H.B. Silsbee. Magnetic Dipole Moment of Au¹⁹². *B.A.P.S.* II, 3, 185 UCRL-8316.
- With E. Lipworth, H.L. Garvin and T.M. Green. The Nuclear Spin of Astatine 211. *B.A.P.S.* II, 3, 319 UCRL-8338.
- With W.B. Ewbank, L.L. Marino, H.A. Shugart and H.B. Silsbee. Nuclear Spin of Silver 103. *B.A.P.S.* II, 3, 370 UCRL-8474.
- With J.C. Hubbs, R. Marrus and J.L. Worcester. Hyperfine Structure Measurements on Pu²³⁹. *Phys. Rev.* 109, 390 UCRL-3884.
- With W.B. Ewbank, H.A. Shugart and H.B. Silsbee. Spins of Silver-105, 106 and 110m. *Phys. Rev.* 110, 595.
- With L.L. Marino, W.B. Ewbank, H.A. Shugart, H.B. Silsbee. Spins. of Indium-109, 110m and 111. *Phys. Rev.* 111, 286 UCRL-8187.
- With H.L. Garvin, T.M. Green and E. Lipworth. Nuclear Spin of Astatine-211. *Phys. Rev. Letters* 1, 74 UCRL-8338.
- With H.A. Shugart, H.B. Silsbee, R.J. Sunderland. Hyperfine-Structure Separations and Magnetic Moments of Cesium-127, 129, 130 and 132. *Phys. Rev.* 112, 186 UCRL-8264.
- With H.L. Garvin, T.M. Green and E. Lipworth. Level Inversion in the Hyperfine Structure of Br⁷⁶. *Phys. Rev. Letters* 1, 293. UCRL-8445.
- With G.O. Brink. Experience de Double Resonance Dans Un Jet Atomique. *Le Journal de Physique et le Radium.* Vol. 19, 816-818.
- Underlying Causes of Change from Natural Sciences--Science, Agriculture and the Future. *J. Farm Econ. XL*, No 5 and *Canadian Agricu. Econo. Soc.* VI, No 2.

1959

- With J. Winocur and R. Marrus. The Nuclear Spin of 16-hr Am²⁴². *B.A.P.S.* II, 4, 451 UCRL-8945.
- With H. L. Garvin and E. Lipworth Nuclear Spin of 2.3-hr Iodine-132. *B.A.P.S.* 4, 353 UCRL-8832.

- With R. Marrus. Atomic Beam Research on the Transuranic and Heavy Elements. *4th Brookhaven Conf. on Molecular Beams. SIO Archives*
Molecular and Atomic Beams at Berkeley. *Recent Research in Molecular Beams*,
A Collection of Papers Dedicated to OTTO STERN on the Occasion of his Seventieth Birthday. Academic Press, NH, 9-42.
A Method for Minimizing Functions of n Variables. UCRL-3816.
Atomic Beam Research on Radioactive Atoms. *The First Ernest O. Lawrence Memorial Lecture, Nov. 7, 1958, Proc. Nat's Acad. of Sciences* 45, 429-450 UCRL-8553.
With W.B. Ewbank, L.L. Marino, H.A. Shugart and H.B. Silsbee. Nuclear Spins of Silver-104 and Silver 106. *Phys. Rev.* 115, 614 UCRL-8663.
With H.L. Garvin, T.M. Green and E. Lipworth. Hyperfine Structure and Nuclear Moments of Bromine-82. *Phys. Rev.* 116, 393 UCRL-8680.
With V.J. Ehlers. Hyperfine Structure of Ga^{67} and Ga^{68} . *B.A.P.S.* II, 4, 452 UCRL-8942.
With J.C. Hubbs. The investigation of short-lived Radionuclei by Atomic Beam Methods. *Methods of Experimental Physics, Academic Press.* UCRL 8724.

1960

- With I. Lindgren and A. Cabezas. Nuclear Spin and Hyperfine Structure of Tm170. *B.A.P.S.* II, 5, 273 UCRL-9064.
With R. Marrus and V.J. Winocur. Hyperfine Structure of Am^{241} . *B.A.P.S.*, II, 5, 274 UCRL-9070.
With E. Lipworth, T.M. Green and H.L. Garvin. The Hyperfine Structure and Nuclear Moments of 17-hr Bromine-76. *Phys. Rev.* 119, 1053 UCRL-9013.
With R. Marrus and J. Winocur. Hyperfine Structure of Am^{241} . *Phys. Rev.* 120, 1429 UCRL-9207.
With W.B. Ewbank, L.L. Marino, H.A. Shugart and H.B. Silsbee. Nuclear Spins of Six Neutron-deficient gold isotopes. *Phys. Rev.* 120, 1406 UCRL-9211.
With Y.W. Chan, W.E. Ewbank and H.A. Shugart. Nuclear Spin of Ag^{133} . *B.A.P.S.* II, 5, 503 UCRL-9484.
With R. Marrus and J. Winocur. Some Measurements Pertaining to the Electronic Structure of the Actinide Elements. *5th Brookhaven Conf. on Molecular Beams*, 28.
With V.J. Ehlers, W.B. Ewbank, F.R. Petersen and H.A. Shugart. The Nuclear Spin of Ga^{70} . *B.A.P.S.* II, 5, 343 UCRL-9161.
Nuclear Moments. *Encyclopedia of Science & Technology, McGraw Hill Book, NY*, 2343-2348.
Deuteron. *Encyclopedic Dictionary of Physics (Pergamon Press, London vol 2 p. 312).*

1961

- With R. Marrus and J. Winocur. Hyperfine Structure and Nuclear Moments of Pa^{233} . *Nuclear Physics* 23, 90 UCRL-9315.
With Y.W. Chan, W.B. Ewbank and H.A. Shugart. Nuclear Spin of 9.5-Hr $\text{Au}^{196\text{m}}$. *B.A.P.S.* 6, 513.
Beyond Space. *June 1961 NATO Letter.*, Vol. 9, No. 6.

With L. N. Ridenour et al. Modern Physics for the Engineer. *University of California Engineering Extension Series*. 383 pp.

1962

With V.J. Ehlers and H.A. Shugart. Nuclear Spin of Gallium-70. *Phys. Rev.* 125, 2008. UCRL-9879.

With R. Marrus. On Atomic Beams. *Topics in Radiofrequency Spectroscopy*. Academic Press, NY., 118-156.

With R. Marrus, A. Cabezas and I. Lindgren. Hyperfine Structure and Nuclear Moments of Praseodymium-142. *B.A.P.S.* 7, 25.

With Burdick, Doyle and R. Marrus. Nuclear Spins of Neodymium 149, Praseodymium-143 and Erbium-165. *B.A.P.S.* II, 7, 476.

With A. Cabezas, I. Lindgren and R. Marrus. Hyperfine Structure of Praseodymium-142. *Phys. Rev.* 126, 1004.

With Y.W. Chan, W.B. Ewbank and H.A. Shugart. Nuclear Spin of 9.5-hr Au-196m. *Phys. Rev.* 127, 572.

Nuclear Moments. *Encyclopedic Dictionary of Physics* (Pergamon Press, London 76-79).

Nuclear Statistics. *Encyclopedic Dictionary of Physics*, (Pergamon Press, London, vol. 5, 161.)

1963

With J. C. Hubbs. The Investigation of Short-Lived Radionuclei by Atomic Beam Methods. *Methods of Experimental Physics* UCRL-8724.

With T. Hadeishi and S. Alpert. Measurements of Lifetimes, Excitation Functions, Densities, Total Cross Sections, and Polarization Ratios of the Metastable State of the Neon Atom Under Electronic Impact. *B.A.P.S.* 8, 362.

With I. Lindgren. Measurements of Spins and Moments of Ground States of Radioactive Nuclei, Chapter IX. *Alpha, Beta and Gamma Ray Spectroscopy* (North-Holland Publ. Co., Amst.)

With Y.W. Chan and V.J. Ehlers. The Nuclear Spin of 39-Min Au¹⁹⁰. *B.A.P.S.* 9. Address (Le 3e Congres d'Electronique Quantique. *L'Onde Electrique*, No. 436-437, Juillet-Aout 1963.

Les Hamiltoniens de Breit-Rati et d'Abragam-Pryce. *Annales de la Faculte des Sciences de l'universite de Clermont, Numero 21, Physique 14. Fascicule Clermont-Ferrand*.

1964

With T. Hadeishi, O. McHarris. Radiofrequency Resonance of the Metastable State ($a^2P_{3/2} \rightarrow 3^2S_{1/2}$) of Neon Produced and Aligned by Electron Impact. *B.A.P.S.* 9, 625. UCRL-11825.

With J. Yellin and R. Marrus. Study of Optical-Pumping Transients in Rubidium and Cesium Vapors. UCRL-11351, abstract of paper for Denver APS meeting June 25-27,

1964.

- With P.A. Vanden Bout and V.J. Ehlers. Hyperfine Structure of Au¹⁹⁸ and Au¹⁹⁹. C-12. Abstracts. *7th Brookhaven Molecular Beam Conference, Uppsala, Sweden, June 22-July 2, 1964.*
- With H.A. Shugart. Hyperfine Structure Computations and the Reduction of Data by Least Squares. Abstracts, *7th Brookhaven Molecular Beam Conference, Uppsala, Sweden, June 22-July 2, 1964.*
- With Y.W. Chan, W.B. Ewbank, and H.A. Shugart. Hyperfine Structure Separation and Magnetic Moments of Gold-194, 195, and 196. *Phys. Rev.*, 137, 5B, B1129-33.
- With J. Yellin and R. Marrus. Study of Optical-Pumping in Rubidium and Cesium Vapors. UCRL-11636, UC-34 Physics.
- With Y.W. Chan, W.B. Ewbank and H.A. Shugart. Nuclear Spins and Hyperfine-Structure Separations of Silver-112 and Silver-113. *Phys. Rev.* 133, No. 5B, B1139-B1144.

1965

- With T. Hadeishi and C.H. Liu. Orientation of the Metastable State of Ar by "Exchange" Collision with Optically-Pumped Cs Atmos. *UCRL-16145 abstract.*
- With T. Hadeishi, V.W. Cohen. Radiofrequency Resonance of the $^2P_{3/2} \rightarrow ^2P_{1/2}$ State of Neon Aligned by Electron Impact. *Abstract for Kansas City APS Meeting.* B.A.P.S. 10, 383. UCRL-11874.
- With R.D. Worley, V.J. Ehlers, H.A. Shugart. Hyperfine Structure Separation, Nuclear Magnetic Moment and Hyperfine Structure Anomaly of Cesium-131. *Washington APS Meeting.* UCRL-12365-T. B.A.P.S. 10, 444. *Phys. Rev.* 140B, 1483-7.
- With J. Faust, R. Marrus. Direct Measurement of the Magnetic Moment of Plutonium-239. *Phys. Letters* 16, No. 1, 71-2. UCRL-16005. (Netherlands)
- The NATO Science Program. *Bulletin of the Atomic Scientists XXI.*, No. 5, May. Physics and Cyrano de Bergerac. *SIO/Inaugural Lecture*, 19 pp. *SIO Archives.* Fall 1965.
- With T. Hadeishi, C.H. Liu. Orientation of the 3P_2 Metastable state of Ar by "Exchange" Collision with Optically-Pumped Cs Atoms. *Abstract for Hawaii APS Meeting.* UCRL-16145.
- With P.A. Vanden Bout, V.J. Ehlers. Hyperfine-Structure Anomaly of Au¹⁹⁹. *Abstract for Hawaii APS Meeting.* UCRL-16116.
- Navigation. *IBM Westchester*, 16 pp. *SIO Archives.*
- Direct Observations of Quantum Beats due to Coherent Excitation of Non-degenerate Excited States by Pulsed Electron Impact. *UCRL-16048.* *Physics Rev. Letters*, Vol 14, No. 22, 891-2.
- With Y.W. Chan and V.J. Ehlers. The Nuclear Spin and Magnetic-Dipole Moment of 39-Min Gold-190. UCRL-16248. *Physics Rev.* Vol. 144, No. 3, 1020-1.
- With I. Lindgren. Measurements of Spins and Moments of Ground States of Radioactive Nuclei. *Alpha-Beta and Gamma Ray Spectroscopy*, Ed. Kai Siegbahn, 1263-1280. North Holland Pub. Co.
- With T. Hadeishi, O. McHarris. Radiofrequency Resonance of the Metastable State ($a^2P_{3/2} \rightarrow 3^2S_{1/2}$) of Neon Produced and Aligned by Electron Impact. *Phys. Rev.*

138A, 983-6.

1966

- Statement to Capital Outlay Review Board, Washington, D.C., March 31, 1966.
Statement of William A. Nierenberg before Special Subcommittee of the House of Representatives on Sea Grant Colleges. (S.2439)W. A public hearing, Wednesday, May 4, 1966. 26 pp.
With P.A. Vanden Bout, V.J. Ehlers and H.A. Shugart. The Hyperfine-Structure Anomalies of Au¹⁹⁸ and Au¹⁹⁹. UCRL-16675. Abstract.
Studying the Sea. *Industrial Research Magazine*. March. 5 pp.
With Y.W. Chan and V.J. Ehlers. The Nuclear Spin and Magnetic-Dipole Moment of 39-Min Gold-190. *Phys. Rev.*, Vol. 144, No. 3, 1920-1.

1967

- Deep Sea Drilling-The Beginning. *SIO Archives*.
Atomic Beam Magnetic Resonance. *Physica* 3, Vol 1, No. 1. *Zeeman Centennial Conf. Amsterdam*, September 6-11, 1965, 18-28.
With P.A. Vanden Bout, V.J. Ehlers and H.A. Shugart. Hyperfine-Structure Separations, Nuclear Magnetic Moments and Hyperfine-Structure Anomalies of Au¹⁹⁸ and Au¹⁹⁹. *Phys. Rev.* Vol. 185, No. 4, 1078-1084.
Oceanography Tomorrow. Tutorial Lecture Series, Annual Technical Meeting, Washington DC. *Proceedings of Inst. of Environmental Sciences*, 63-68; *SIO Contributions*, Vol. 37, 2012-2017.

1968

- Undersea Warfare/Militarized Oceans. Chapter "Militarized Oceans". *Unless Peace Comes*, The Penguin Press, 109-119. London. Edited by Nigel Calder, Allen Lane.
What's Behind our Manpower Shortage. *Ocean Industry Digest*. Vol. 3, No. 5.
Toward a Future Navy. *Science and Technology*. October 1968. pp 72-82.

1969

- DCPG-The Genesis of the Concept. *IDA Journal of Defense, Series B, Tactical Warfare*. 6 pp. *SIO Archives*.
Oceanography. *Britannica Book of the Year, Encyclopedia Britannica*.
Technical and Political Problems of the Ocean Floor. *The Colorado Quarterly, Letters to the Editor*. Vol. XVIII, No. 2, Autumn, 167-78.
With W.H. Munk. High Frequency Radar Sea Return and the Phillips Saturation Constant. *Nature*, Vol. 224, *Letters to the Editor*.

1970

- Space Quantization and the Breit-Rabi Formula. *A Tribute to I.I. Rabi on the Occasion*

of his Retirement from Columbia University. Delivered on 23 May, 1967, printed in 1970, pp 64-76. *SIO Archives.*

1971

DCPG-The Genesis of the Concept. *Research/Tactical Warfare.* Declassified for use letter, 6 pp. *SIO Archives.*

1972

With W.H. Munk. Sea Spectra and Radar Scattering. *Institute for Defense Analyses, Note N-817, Contract DAHC15 67 C 0011.* *SIO Archives.*

1973

Sea, Land and Man. *Cry California, Summer 1973, Vol. 8, No. 3.*

1978

The Deep Sea Drilling Project after Ten Years. *American Scientist*, vol. 66, No. 1, 20-29. Don't let politics proscribe climatic research. *Ceres* , 23-30.

1979

Thirty-Eighth Richtmyer Memorial Lecture of the AAPT. *Bulletin of the American Physical Society.* Series II, Vol. 24, No. 1, Jan. 1979, pp 38. *SIO Archives, Nierenberg Papers, MC13, Box 168, f. 14*

1980

With R. Revelle. E.C. Bullard Memorial, 5 pp.
Cyrano, Physics, and Possibly Aristotle. *Phi Beta Kappa Lecture, San Francisco, SIO Ref. No. 81-23.*

1981

The U.S. Navy and Satellite Oceanography. *C.H. Davis Lecture Series.* Fall Lecture, 11-32. *SIO Archives.*

1982

On the Maximum Height of Internal Waves. *SIO Reference No. 82-30*, 15 pp.
With G. J. Macdonald et al. The Long-Term Impacts of Increasing Atmospheric Carbon Dioxide Levels. *Ballinger Publishing Company*, 252 pp.

1983

With P. Brewer et al. Changing Climate. Report on the Carbon Dioxide Assessment

Committee. *National Academy Press*. 496 pp.
Science and Society-Youth to Maturity. *University of Southern California, Los Angeles* Speech. U.S. Centennial lecture. *SIO Archives*.
With F. Spiess, V. C. Anderson and F. Fisher. Philip Rudnick. Obituary. *Physics Today*.
July 1983, pp 78-79.

1984

Mid-Ocean Floating Airfield-A Summary. *SIO Archives*.
Mid-Ocean Bases. Draft, 5 pp. *SIO Archives*.
Report of the Acid Rain Peer Review Panel. *Acid Rain Panel Report, Executive Office of the President*. 92 pp. *SIO Archives*.

1986

Cyrano Physicist. *American Philosophical Society*. Vol. 130, No. 3, 354-361.
Interview with Professor W. Nierenberg, by Dr. F. Asserud. 26 pp. *SIO Archives*.
Acid rain. Draft. 19 pp. 7/23/86, *SIO Archives*.
Innovation and Education Sigma XI. Centenary/UCLA. 5 pp. *SIO Archives*.
CO₂ Briefer, 10 p. *SIO Archives*.

1987

Some Statistics of ADI. 11 pp. *SIO Archives*.
DOE/Ecological Research Meeting. *Speech*. *SIO Archives*.
Scripps Pier Groundbreaking. *Speech*. *SIO Archives*.
CCNY/Research & Scholarship Day. *Speech*. *SIO Archives*.

1988

The Oceans. *National Geographic Society*., *Earth '88, Changing Geographic Perspectives*, 284-299.
Dedication of WAN Hall. Thank You address. *SIO Archives*.
The Oceans. *Committee for Research and Exploration Centennial Symposium*. National Geographic Society, Washington DC, 38 pp. *SIO Archives*.
Eulogy-I.I. Rabi. *Columbia University*. *SIO Archives*.
Atmospheric CO₂: Causes, Effects and Option. *The Bridge*. Vol. 18, No. 3, 4-11.
Adaptation to Carbon Dioxide Effect said Likely. *Pace Synthetic Fuels Report*, 1-27/30. *SIO Archives*.

1989

Atmospheric CO₂: Causes, Effects & Options. *Chemical Engineering Progress*. Vo. 85, No.8, 27-36.
SBAM Groundbreaking Ceremony. *Speech*. *SIO Archives*.

1990

Scientific Perspectives on the Greenhouse Problem. *The Marshall Institute*, 36 pp. *SIO Archives*.

Exaggerated Global Warming Scenarios Impede Urgent Climate Research. *The Scientist*, 18.
Committee on Science, Space & Technology before the Subcommittee on Intr. Science Co. *Congress*, 207-212.
House Committee on Science, Space & Technology. Statement. SIO Archives.
Global Storming, Article, *London Evening Standard*, 27.
Science and Public Policy. *Wright Science Colloquium Geneva*. 9 pp. SIO Archives.
Global Warming. *Wright Science Colloquium Geneva*. 7 pp. SIO Archives.
Geophysics Speech at Symposium on Global Warming. *Institute de la Vie, France*. 4 pp. SIO Archives.
New Leadership for Space Exploration. *Issues in Science and Technology*. Winter 90-91, 82-86.

1991

Global Warming: Look Before We Leap. *New Scientist*, 10.
Altering Climate. *Talking Point, New Scientist*.
Altering Climate. *San Paolo Institute*. Turin. Speech, 5 pp. SIO Archives.
Roger R.D. Revelle. Biography. *Proceedings of the American Philosophical Society*. Vol. 136, No. 4.
Deep Sea Drilling-Lessons Learned. Draft. *Speech 8/21/91*. 13 pp. SIO Archives.
Climate Change. Congress in Buenos Aires. *World Petroleum Congress Session 33*. Environment & Health Matters, 10/22/91.

1992

The 1992 EPRI/SIO Conference on Global Warming. SIO, 5 pp.
Science, Policy & International Affairs: How Wrong the Great Can Be. *Geneva Environmental Meeting*. SIO Archives.
SBAM Dedication. Speech. SIO Archives.
Roger R.D. Revelle. Biography. *Physics Today*. February 1992, 119-120.
Encyclopedia of Earth System Science, Editor-in-Chief. *Harcourt Brace*.

1993

Cambodia Talk. Speech/SIO. SIO Archives.
Introduction to the 1992 EPRI/SIO Symposium on Global Warming. *Energy*. SIO Archives.
Deep Sea Drilling-Lessons Learned. *La Jolla 5th Congress the History of Oceanography*.
Opening Remarks, Jim Arnold Fest. Speech. SIO Archives.
Science, Policy and International Affairs: How Wrong the Great Can Be. *Environmental Conservation*. Vo.. 20, Nr. 3, 195-197.
Looking Back Ten Years. *IIASA, Vienna*. 10/13/93 Meeting, 7 pp.

1994

Policy and Science Flow. *Workshop in Atlanta, GA*. 3/9-10/94, 6 pp. SIO Archives.

1995

Global Warming. *International Seminar, Banaras Hindu University, India.*
Environment, Sustainable Development and Human Health, 2/15/95. SIO Archives.
Global Warming II, *Draft for Bridge.*
Progress and Problems: A Decade of Research on Global Warming. *The Bridge*, Vo. 25,
No. 2, 4-9.
Looking back 10 years. *Energy Policy* . Vol. 23, No. 4/5, 283-288.
Encyclopedia of Environmental Biology, Editor-in-Chief. *Harcourt Brace.*
Deep Sea Drilling- Lessons Learned. *Proceeding of the Symposium on Future
Challenges in Science,. Ocean Drill, SIO Ref 95-15.,5-12.*
Statement presented at the Hearing before the Subcommittee on Energy and
Environment of the Committee on Science, U.S. House of Representatives One
Hundred Fourth Congress, First Session November 16, 1995, No. 35. 111-129,
Questions submitted by the Honorable George E. Brown, Jr., Ranking Democratic
Member, Committee on Science. 1128-1136.

1996

Harald Ulrik Sverdrup 1888-1957. A biographical memoir. *The National Academy
Press, Vol. 69. 38 pp.*
Climate change for Engineers. Special Seminar Series on Energy Technology,
Conservation, Environment Impact and Policies. *UCSD/CECR.* SIO Archives.

1997

Science and Engineering Policy and Who Cares? Speech, *New York Academy of
Sciences, 2/27/97.*
Let's Not Rush Global Warming Pact, Article, *Arizona Republic, 9/21/97.*

1998

Global Warming: In Search of Good Science, Good Policy, 2/9/98
John Dove Isaacs, Speech, Dedication of John Dove Isaacs Building, SIO, 9/10/98

1999

Diversity of Fishes, Article, *Oceanography Magazine, Vol 12, 3/99.*
Global Warming, Speech, *Doctors for Disaster Preparedness, Seattle, 6/4/99.*

2000

ONR and Science: Building of Institutions, Speech, *Oceanography: The Making of a Science, Colloquium*,
UCSD, 2/8-9, 2000

NATO Science, Speech, *Futuribles International Conference, Paris/France* , 2/24-26, 2000.

The League of Constant Concern, Article, *George C. Marshall Institute News*, Vol. 2, #3,
Winter 2000

Athelstan Spilhaus. A biographical memoir. *American Philosophical Society*.

If You Can't Trust the New York Times - Whom Can You Trust? Speech. *Doctors for Disaster Preparedness, San Francisco*, 7/1/00.

APPENDIX
WARTIME & MANHATTAN PROJECT PAPERS

W.A. NIERENBERG REPORTS AT THE OAK RIDGE GASEOUS DIFFUSION PLANT

- A-1259 With L. Davidson and C. Williams. High-cut Barrier Testing. March 20, 1946. *CONFIDENTIAL (1C-R196)*.
- A-1260 Et al. Process Gas Fore Pressure Curve for Norris-Adler Type "A" Barriers. March 16, 1944. *CONFIDENTIAL (1C-R195)*.
- A-1265 With I. Kaplan. Entrance Phenomenon in Barrier Channels. March 27, 1944. *CONFIDENTIAL (4M-155)*.
- A-1279 With I. Kaplan. Small Square Diffusion Cascades Operated with Production. July 27, 1944. *CONFIDENTIAL. (3R-74)*.
- A-2109 With C. Williams, D. Trager and S. Visner. Investigation of Turbulent Mixing. June 15, 1944. *CONFIDENTIAL. (1C-R421)*.
- A-2174 Separation in Homogeneous Barriers. December 12, 1944. *CONFIDENTIAL. (1C-R439)*.
- A-2186 With I. Kaplan and E.M. Corson. A Program of Experiments on the Hydrodynamic Behavior of the 54-Stage Pilot Plant (Building K-303-2X) January 15, 1945. *CONFIDENTIAL. (4-M-213)*.
- A-3213 With I. Kaplan. Enrichment in Case I Operation. March 2, 1945. *CONFIDENTIAL. (AB-R-4)*.
- A-3214 A Diffusive Mixing Efficiency in Circular Channels. March 5, 1945. *CONFIDENTIAL. (ab-45)*.
- A-3221 C-616 Test on DA Barriers. March 10, 1945. *CONFIDENTIAL. (BC-R-6)*.
- A-3232 With I. Kaplan. On the Theory of Cascades. March 26, 1945. *CONFIDENTIAL. (AB-R-11)*.
- A-3272 C-616 Performance of Building K-303-8. June 29, 1945. *CONFIDENTIAL (BA-R-223)*.

APPENDIX

WARTIME & MANHATTAN PROJECT PAPERS

- A-3272 Correction to A-3272, "C-616 Performance of Building K-303-8." August 7, corr.1945. *CONFIDENTIAL*. (BC-M-14).
- A-3283 Et al. Micro-Orsat Apparatus. August 4, 1945 *DECLASSIFIED*. (B-CM-15).
- A-3285 With S. Cromer, M. Inghram, E.T. Booth and C. Williams. C-616 Performance of Building 301-3. August 10, 1945. *CONFIDENTIAL*.
- A-3800 Et al. High-cut time recycle machine. September 11, 1945. *CONFIDENTIAL* (BA-R-45).
- A-3811 With H. Levi. The Ideal Cascade. November 5, 1945. *CONFIDENTIAL*.
- BA-M-41 With C. Williams, I. Kaplan and J.B. Menke. Memo to H.C. Urey: Brief Review of the Productivity and Estimated Costs of the Diffusion Method. September 7, 1945. *CONFIDENTIAL*.
- BA-M-209 With C. Williams. Cut Corrections. October 10, 1942. *CONFIDENTIAL*..
- BA-M-223 With E.T. Booth, S. Cromer, M. Inghram and C. A. Williams. NO TITLE (From abstract: The separation performance of Building K-303-8...). *CONFIDENTIAL*. (BB-M-223).
- BA-M-263 With C. Williams, J.R. Menke. Memorandum on Proposed Pilot Plant for Isotope Separation Diffusion Cascade. July 28, 1945. *CONFIDENTIAL*.
- BC-M-8 Proposed Empirical He-CO₂-P.G. Correlation. March 19, 1945. *CONFIDENTIAL*.
- KZ-488 With C. Williams. Preliminary Report on Maximum f Testing. April 15, 1943? *CONFIDENTIAL*.
- KZ-2751 A New Method of Measuring the Diffusion Coefficient of Gases. no date. *DECLASSIFIED*.
- M-2239 With I. Kaplan. Further Calculations on Case I Operation. March 26, 1945. *CONFIDENTIAL*. (AB-R-10).
- M-2241 Minimizing a Square Cascade. March 30, 1945. *CONFIDENTIAL*. (AB-M-14).

APPENDIX
WARTIME & MANHATTAN PROJECT PAPERS

- M-2296 Minutes of Meeting on He-CO₂-P.G. Separation Data. May 18, 1945.
CONFIDENTIAL. (BA-M-176).
- MDDC-529 With C. Williams. Micro-Gas Analysis. no date, *DECLASSIFIED NOVEMBER 4, 1946.*
- 1C-M-478 Memo to Williams re WB-014-D-15-32 Ta. January 26, 1945. *CONFIDENTIAL.*
- 1C-R-123 Theory of High-cut Holders. January 17, 1944. SECRET.
- 1C-R-124 Process Gas Flow Measurements. December 30, 1943. SECRET.
- M-2204 With I. Kaplan, R. Present, H. Levi, H. Lefkowitz, B. Schwartz. February 5, 1945.
CONFIDENTIAL. (4-M-217).