



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

November 9, 1990

Mr. William L. Woodard  
Office of Energy Research, ER-6  
U.S. Department of Energy  
1000 Independence Avenue, SW  
Washington, D.C. 20585

Dear Mr. Woodard:

It is my pleasure to support the nomination of Joel O. Lubenau for the 1991 Ernest Orlando Lawrence Memorial Award in the field of Life Sciences.

Mr. Lubenau is Senior Project Manager-Health Physics in NRC's State Programs. Prior to his NRC assignment, he was Project Manager with the State of Pennsylvania. Mr. Lubenau has made a number of significant contributions to worker and public radiation safety in his public service career. As a result of his total dedication to radiation protection, we are able to say many of the radiation hazards that are present today are avoided or substantially reduced because of his work as indicated below:

- o Significant reduction in the incidence of worker injuries from accidental exposures to analytical x-ray units. These units produce small but intense x-ray beams. Accidental exposures to the beam can easily result in acute radiation injuries with potential for loss of extremities. In response to repeated accidental exposures of this type in Pennsylvania, he led a State team that reviewed the radiation safety designs and practices for these sources. The safety standards recommended by his team are now nationally adopted State standards and have virtually eliminated this source of accidental radiation exposure.
- o Decreased risk of accidental exposures for accelerator workers. In 1967 he conducted an investigation into a serious accelerator accident (600, 300, and 100 rem whole body doses) and followed up by leading a State review of safety programs at 50 other accelerators. The recommendations that emerged from this effort are now routinely incorporated into State radiation safety regulations. Given the increased use of accelerators in research, industry and especially in medicine, these safety standards have been essential to creating safe work environments and enabling public acceptance of their use.

- o Lessened likelihood of unsafe use of radium and other naturally occurring and accelerator produced radioactive material. These materials are excluded from the Atomic Energy Act. For years these materials, which have radiological hazards comparable to material controlled by NRC, could be used with little or no regulatory oversight. Mr. Lubenau helped shape a pioneering State radium control program. Through publications and by working closely with national professional organizations, he has stimulated other States to develop programs to assure these materials are used safely and are disposed of properly.
- o Reduction of safety hazards in large irradiators. In 1975 a worker entered an irradiator room while a 50,000 Ci Co-60 source was exposed, resulting in a 400 rem whole body dose. Mr. Lubenau conducted the NRC investigation into that incident. In 1984 he organized a regulatory workshop on large irradiator safety problems. The participating States and Federal radiation safety officials identified safety issues needing regulatory attention. In 1988, following leakage of a 50,000 Ci Co-137 source in a pool irradiator in Georgia, he was one of three NRC representatives appointed by the Governor to a Task Force to review the incident. The Task Force also identified a number of significant radiation safety issues needing attention. These issues were incorporated by the Commission into its consideration of proposed rulemaking for irradiator safety and will help make the proposed safety rule more effective.
- o Minimizing the possibility of radioactive material mixed with metal scrap and contaminating metal products and mills. Since 1983 there have been ten instances in the U.S. of radioactive sources accidentally being mixed in metal scrap and smelted. These smeltings caused temporary shutdowns of the affected plants and resulted in significant decontamination costs for the plant operators. Mr. Lubenau arranged for publication of a report on the first of these incidents and has closely followed subsequent domestic and foreign smeltings. He was actively involved in coordinating the national effort to recover contaminated steel products that were imported from Mexico in 1984. In 1986 he arranged publication of a hazardous scrap warning poster and its distribution to U.S. scrap metal handlers and metal mills and foundries. The problem is multifaceted and there is neither a single nor simple solution. His numerous papers have not only stimulated awareness of the problem in the industry, in the health physics community, and in State and Federal radiation control programs, but these groups are now initiating actions on their own and in joint coordination to better assess and control the problem.




William L. Woodard

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In summary, Mr. Lubenau has made significant contributions to Life Sciences by helping to reduce and minimize radiation hazards to the worker and to the public. He has done so in a variety of areas and has used a variety of tools to accomplish this.

I am enclosing Mr. Lubenau's curriculum vitae which provides the details of his significant contributions to protecting the public health and safety of all our citizens.

Sincerely,

A handwritten signature in dark ink, appearing to read "H. R. Denton", written in a cursive style.

Harold R. Denton, Director  
Office of Governmental and  
Public Affairs

Enclosure:  
As stated

Curriculum Vitae - Joel O. Lubenau  
October 1990

Education

Brooklyn Technical High School, 1956  
The Cooper Union, BCE 1961  
Rutgers University, MS (Radiological Health) 1964

Project/Program Development and Management

- o Am directly responsible for managing NRC oversight of 29 Agreement State radiation control programs. These State programs employ over 200 professional staff with budgets totalling over \$10,000,000 for radioactive materials control, including uranium mill tailings and low-level waste regulation. I develop policies and procedural guidance for NRC regional offices who review the State programs for adequacy and compatibility. These reviews cover organization, administration, funding and personnel resources as well as technical aspects. I evaluate the reviews conducted by the NRC regional offices, help the States work out solutions to problems identified in the reviews and to otherwise strengthen their regulatory programs, and have a major share in the planning and development of NRC resources needed for State technical assistance and training. I have a major responsibility for coordinating NRC-State relations. I serve as a consultant on Federal-State relations to various individuals and groups such as the National Governors' Association, to the National Conference of Radiation Control Program Directors, Inc., to Commission staff, and to the State committee. and radiation control programs.

Examples of special projects include management of contracts such as the study of the Agreement State Program by the National Governors' Association, a major role in coordinating State and Federal responses to radioactive contamination incidents and development of workshops on radiation safety for NRC and State regulatory personnel. In 1986 we published a report on radioactive contamination of manufactured products and produced a warning poster on radioactive scrap for U.S. steel mills and other scrap handlers. This is a senior staff, GG-15 position.

1978-Present, Washington, D.C. Immediate Supervisor:  
Vandy L. Miller, Assistant Director for State Agreements Program,  
Office of Governmental and Public Affairs, U.S. NRC, Washington, DC  
20555.

- o Successfully established a new cooperative Federal-State Program for monitoring medical x-ray exposure, (The Nationwide Evaluation of X-Ray Trends or NEXT), starting from zero to 33 States (and now involving over 40 States and several countries). Personal contacts with State Radiation Control Program officials, while initiating and supervising a quality control effort for the technical and data processing programs, helped to "sell" this program. The effort included supervision of development and implementation of computer programs, supervision of supporting laboratory studies, planning and supervising field seminars and serving as executive secretary to a Federal-State Task Force which provided technical review and policy guidance.



1972-1973, Winchester, Massachusetts. Immediate Supervisor:  
Jerome A. Halperin, Deputy Director, Bureau of Drugs, FDA (HFD-2),  
5600 Fishers Lane, Rockville, Maryland 20857.

#### Line Management

- o Directed the radiation control program for the Pennsylvania Department of Environmental Resources. This geographically dispersed program (3 regional offices) utilized 9 full time health physicists in a combined regulatory and educational program. We established a licensing program for 400 previously unaffected radium and accelerator produced isotope users. We were pioneers in the development of radiation safety standards for accelerator and analytical x-ray users. I shared responsibility for working with the Governor's Advisory Committee on Atomic Energy and Radiation Control.

1967-1972, Harrisburg, Pennsylvania. Immediate Supervisor:  
Thomas M. Gerusky, Director, Bureau of Radiation Protection,  
Pennsylvania DER, Box 2351, Harrisburg, Pennsylvania 17120.

#### Other Professional/Technical Experience

- o Reviewed and evaluated individual Agreement State programs to determine their adequacy and compatibility. I routinely met with State cabinet level officials, such as State Health officers, to discuss the results of evaluations and methods of improving State programs. I provided detailed assistance on a regular basis to States on NRC policies, standards and practices and provided direct field assistance. Special assignments included serving on internal NRC task forces which evaluated the Agreement State program and the need for controlling hazards from radioactive materials not currently regulated by NRC.

1975-1978, Washington, D.C. Immediate Supervisor: G. Wayne Kerr,  
Director, Office of State Programs, U.S. NRC, Washington, D.C.  
20555.

- o Conducted radiation health and safety inspections at nuclear power reactors, research reactors, nuclear fuel fabricators and other major licensed facilities for the U.S. AEC/NRC. I also acted as senior investigator for field investigations of serious radiation exposure accidents. I provided training and counseling to health physicist interns and to junior personnel.

1973-1975, King of Prussia, Pennsylvania. Immediate Supervisor:  
Peter J. Knapp, Chief, Materials Facilities Section, U.S. NRC, 631  
Park Avenue, King of Prussia, Pennsylvania 19406.

- o Supervised the regional radiological health program for eastern Pennsylvania. I was responsible for planning inspections, reviewing reports, consulting with users and the public, and coordinating the program with State, local and Federal programs. This was a new entity in the State Health Department regional program. We also carried out several special projects including decontamination of buildings and properties contaminated with radium.

1965-1967, Philadelphia, Pennsylvania. Immediate Supervisor:  
Thomas M. Gerusky.

- o From 1961-1963, I served in an entry level position in the U.S. Public Health Service assigned to the Pennsylvania Department of Health, Occupational Health Division. My early responsibilities were inspections of medical and dental x-ray users. I later helped develop the Iodine-131 milk surveillance program, assumed responsibility for maintaining and calibrating field and laboratory instrumentation and had a major part in formulating a regulatory program for medical radium users.

Harrisburg, Pennsylvania. Immediate Supervisor: Thomas M. Gerusky.

#### Licenses, Certifications and Other Professional Recognitions

- 1969 - Certified, American Board of Health Physics (ABHP), Recertified through 1993.
- 1975 - Member, Panel of Examiners, ABHP.
- 1979 - Chairman, Panel of Examiners, ABHP.
- 1980 - Member, ABHP.
- 1990 - Charter Member, American Academy of Health Physics

#### Short Term Training

U.S. Public Health Service	1961-Basic Radiological Health,
"	1962-Radioactive Pollutants in the Environment,
"	1963-Occupational Radiation Protection
"	1965-Management of Radiation Accidents,
U.S. Atomic Energy Commission	1966-Orientation in Regulatory Practices,
"	1969-Radiation Protection in Industrial Radiography,
U.S. Public Health Service	1970-Fundamentals of Non-Ionizing Radiation Protection,
U.S. Atomic Energy Commission	1974-Boiling Water Reactors,
"	1974-BWR/PWR Rad Waste Systems,
"	1975-Pressurized Water Reactors,
U.S. Nuclear Regulatory Commission	1976-Radiation Control Program Management,
Health Physics Society	1977, 1978, 1979, 1986, 1990: American Board of Health Physics Recertification Refresher Courses,
U.S. Nuclear Regulatory Commission	1978-Industrial Radiography Safety Seminar,
"	1979-In-situ Uranium Mining Seminar,
University of Michigan	1979-Management II,
U.S. Nuclear Regulatory Commission	1980-Capitol Hill Workshop,
"	1980-Radiation Epidemiology,
"	1980-Workshop on Sexual Harassment for Managers and Supervisors,
Harvard University	1982-Biological Effects of Ionizing Radiation,



U.S. Nuclear Regulatory Commission	1985-Large Irradiator Radiation Safety Workshop
University of New Mexico	1985-Advanced Management of Radiation Accidents
U.S. Nuclear Regulatory Commission	1986-Introduction to End-User Computing at NRC for Managers
U.S. Nuclear Regulatory Commission	1988-Introduction to Displaywrite 4
U.S. Nuclear Regulatory Commission	1988-Introduction to Lotus 1-2-3
U.S. Nuclear Regulatory Commission	1990-Probabilistic Risk Analysis Overview

#### Examples of Consultant and Special Activities

- o In 1961-1963, played a major role in formulating one of the earliest State efforts to control medical radium hazards (Pennsylvania). A report on this program was published in Public Health Reports in 1965.
- o In response to repeated incidents in Pennsylvania of accidental injuries to workers from exposures to analytical x-ray units, lead a team which surveyed the hazards for these units and developed recommendations for radioactive protective standards for these units. The recommendations were published in Health Physics in 1969. They are incorporated into the Suggested State Regulations for State programs (SSR) and have become a national regulatory standard.
- o In 1967, three workers in Pennsylvania were accidentally exposed to radiation from an accelerator. Whole body doses were 600, 300, and 100 rem. After investigating the accident, I lead a State onsite review of the safety programs of over 50 accelerators. The review disclosed a need for additional radiation standards which were initially incorporated into Pennsylvania's regulations. They have subsequently become a national standard for State regulations through incorporation into the SSR. An historical note on the review was published in Health Physics in 1976.
- o During the Three Mile Island incident, was assigned to the PA Bureau of Radiation Protection Office in Harrisburg, as NRC liaison to the State for the NRC Three Mile Island Response Team.
- o Currently serve as technical resource for the Conference of Radiation Control Program Directors, Inc. - Committees E-3, Criteria for Adequate Radiation Control Programs; SR-5, charged with developing model State regulations for naturally occurring radioactive materials; and G-33, International Radiation Protection.
- o Additionally, am a member of the State Licensing Committee of the Conference of Radiation Control Program Directors, Inc. The Licensing State concept was conceived as a way to encourage States to develop regulatory radiation safety programs for radioactive materials not covered by the Atomic Energy Act, such as radium and accelerator produced radioisotopes. The Committee established criteria for such State programs and reviews their programs for designation at States meeting the criteria.

- o Have served as editorial reviewer, Health Physics Journal.
- o In 1984, organized a 2 1/2 day workshop on large irradiator safety. The participating State and Federal radiation safety specialists identified safety issues that need regulatory attention. The workshop report was published by NRC (NUREG/CP-0073).
- o In 1984, a teletherapy unit in Mexico was removed from storage for sale as scrap and the Co-60 source was broken into. Extensive contamination occurred in Mexico and some Mexican citizens received significant radiation doses. The steel scrap that became contaminated was used by Mexican metal mills and foundries. Some of the contaminated ferrous products were exported to the U.S. I had a major role in coordinating the National effort to recover the contaminated products. Since then, I have been actively involved in stimulating efforts to minimize recurrences by improving controls of radioactive sources and monitoring of metal scrap for radioactivity.
- o In 1986, designed a hazardous scrap warning poster and arranged its publication and distribution to approximately 6,500 metal mills, foundries and scrap yards in the U.S. (NRC Publication no. NUREG/BR-0108). The poster helps workers identify radioactive sources accidentally mixed with scrap metal.
- o In 1988, was appointed to Georgia Governor Joe Frank Harris' Task Force to review the 1988 Radiation Sterilizers Inc. irradiator incident involving a leaking source. The leaking source was one of 1,500 sources manufactured by the U.S. Department of Energy, each containing approximately 50,000 curies of Cs-137. The leakage contaminated the irradiator facility and had a potential to contaminate irradiated products and workers. The Task Force identified a number of significant licensing and regulatory issues relating to irradiator radiation safety that have been incorporated into NRC's consideration for rulemaking for safety standards for irradiators. The Task Force report was published by NRC in 1990 (NUREG-1392).
- o Member of the American National Standards Committee N43 (Equipment for Non-Medical Radiation Applications) Subcommittee N43-9.

#### Current Professional Memberships

Health Physics Society  
 Delaware Valley Society for Radiation Safety:  
   Sec. Treas. 1965-66  
   President 1966-67  
 Baltimore-Washington Chapter, Health Physics Society  
 Conference of Radiation Control Program Directors, Inc.  
 American Academy of Health Physics  
   Treasurer-Elect 1991

#### Uniformed Service

U.S. Public Health Service (R)  
 Tours of Active Duty: 1/61-8/63 and 3/72-8/73



## Awards and Recognitions

U.S. Public Health Service Special Fellowship  
in Radiological Health 1963-65  
Elected to the Society of the Sigma Xi, 1964  
Special Commendation for Three Mile Island  
Response, US NRC, 1979  
Sustained High Quality Performance Citations  
U.S. Nuclear Regulatory Commission, 1981 and 1986  
Letter of Appreciation, Governor Bruce Babbitt, Arizona  
to NRC Chairman Palladine, April 16, 1984  
Cited in the Biographical Directory of Occupational Health  
and Safety Specialists, 1st ed., 1984  
Special Achievement Award, U.S. Nuclear Regulatory Commission, 1989  
Cited in the 13th Edition of "Men of Achievement," 1989  
Meritorious Service Award for Health Physics Excellence, U.S. Nuclear  
Regulatory Commission, 1990

## Publications (Author, co-author, or editor)

"Survey of Radium Sources in Offices of Private Physicians," Public Health Reports 80:1 (1965).

"Results of the Pennsylvania Department of Health Dental X-Ray Survey Program," Health Physics 14:151-155 (1968).

"Analytical X-Ray Hazards: A Continuing Problem," Health Physics 16:739-746 (1969).

"Radiation Control," Pennsylvania's Health 31:3 (1970).

"Advanced Dosimetry and Exposure Evaluation," Radiation Safety in X-Ray Diffraction and Spectroscopy, DHEW Publication No. (FDA) 72-8009, BRH/DEP 72-3. USGPO (1971).

"Radiation Incidents Registry - Pennsylvania Experience," Health Physics 21:605-607 (1971).

"Nationwide Evaluation of X-Ray Trends," Proceedings of the Session entitled, "Quality Control in Medical X-Ray" APRA Annual Meeting, November, 1973 DHEW Publication (FDA) 74-8002. (1974).

"Nationwide Evaluation of X-Ray Trends (NEXT)," Proceedings of the 3rd International Congress of the International Radiation Protection Association, September 9-14, 1973, USAEC Publication No. CONF-73097-P2 (1974).

"A Survey of Accelerator Radiation Safety Systems," Health Physics 30:306-308 (1976).

"Performance Characteristics of Selected Integrating Ion Chambers," Health Physics, 33:199-203 (1977).

Regulation of Naturally Occurring and Accelerator-Produced Radioactive Materials, U.S. Nuclear Regulatory Commission, Publication No. NUREG-0301. National Technical Information Service, Springfield, Virginia 22161 (1977).

Final Task Force Report on the Agreement States Program, U.S. Nuclear Regulatory Commission, Publication No. NUREG-0388. National Technical Information Service, Springfield, Virginia 22161 (1977).

Impacts of NRC Programs on State and Local Governments, U.S. Nuclear Regulatory Commission, Publication No. NUREG-1041 (Co-editor). National Technical Information Service, Springfield, Virginia 22161 (1983).

"NRC Responses to the NGA Study of the Agreement State Program," Proceedings of the 15th Annual Conference on Radiation Control, May 16-19, 1983. Conference of Radiation Control Program Directors, Inc., Frankfort, Kentucky 40601 (1984).

Regulation of Naturally Occurring and Accelerator-Produced Radioactive Materials - An Update, U.S. Nuclear Regulatory Commission, Publication No. NUREG-0976. National Technical Information Service, Springfield, Virginia 22161 (1984).

Workshop on Large Irradiator Radiation Safety, U.S. Nuclear Regulatory Commission, Publication No. NUREG/CP-0073. National Technical Information Service, Springfield, VA 22161 (1985).

"Radioactive Contamination of Manufactured Products," Health Physics, 51:409-425 (October, 1986).

"Radioactive Contamination of Metal Products: A Continuing Problem," Proceedings of the 10th Annual Conference on Radiation Control, May 15-19, 1988. CRCPD Publication 88-6, Frankfort, KY 40601 (1988).

Funding the NRC Training Program for States, U.S. Nuclear Regulatory Commission, Publication No. NUREG-1311. National Technical Information Service, Springfield, VA 22161 (1988).

"Discoveries of Radioactive Materials in Metal Scrap," Newsletter of the Conference of Radiation Control Program Directors, Inc., Summer, 1990, Frankfort, KY.

#### Recent Papers and Speaking Experience

"Radioactive Contamination of Steel." 7th International Congress of the International Radiation Protection Association, April 15, 1988.

"Accidental Radioactive Contamination of Metal Products," 34th Annual Meeting of the Health Physics Society, June 27, 1989.

"Radioactivity in Metal Scrap: Working Together to Solve a Problem," and What to do When the Alarm Goes Off: A Suggested Procedure for Checking Contaminated Metal Products," 35th Annual Meeting of the Health Physics Society, June, 1990.



"Radioactivity in Metal Scrap - An Overview," Public Seminar on Radioactivity and Scrap Metal sponsored by the Institute of Scrap Recycling Industries, Inc., and five other trade organizations, Washington, DC, September 12, 1990.

Numerous other papers have been presented to a variety of professional and public meetings.

Speaking experience also includes representing NRC at legislative hearings, industry, professional, and public meetings and as chairperson, instructor, course coordinator, and guest speaker at professional training courses and meetings.



**Department of Energy**  
Washington, DC 20585

**E. O. LAWRENCE MEMORIAL AWARD**

September 10, 1990

Dear Colleague:

The U.S. Department of Energy invites you to nominate candidates for the 1991 Ernest Orlando Lawrence Memorial Award.

The Award is granted by the Department in recognition of especially meritorious contributions to the development, use, or control of atomic energy (broadly interpreted) in areas of science related to atomic energy, including medicine and engineering.

Not more than six Awards may be granted in any one year, and each consists of a citation, a gold medal, and \$10,000. The categories or eligible fields are as follows: Chemistry, Life Sciences, Materials Research, National Security, Nuclear Technology, and Physics.

All eligible individuals must be United States citizens, should presently be early in their chosen careers, and show exceptional promise of future development. Nominations for the 1991 Awards should be forwarded not later than 10 November 1990 to:

William L. Woodard  
Office of Energy Research, ER-6  
U.S. Department of Energy  
1000 Independence Avenue, SW  
Washington, D.C. 20585

**Classified Materials to:**  
U.S. Department of Energy  
William L. Woodard, ER-6  
P.O. Box 23865  
Washington, D.C. 20026

The regulations and procedures, background on the award, and a list of past recipients are enclosed for your convenience. Questions concerning the procedures or requests for additional information should be directed to Mr. William Woodard at the above address or by calling him on (202) 586-5767.

Your assistance to the Department in making nominations for the Lawrence Award will be greatly appreciated.

Sincerely,

A handwritten signature in cursive script, reading "James F. Decatur".

James F. Decatur  
Acting Director  
Office of Energy Research

Attachments



## REGULATIONS AND PROCEDURES

### 1. Authority

Section 157b(3) of the Atomic Energy Act of 1954, as amended, states: "The Commission may . . . grant an award for any especially meritorious contributions to the development use, or control of atomic energy."

### 2. Awards

- a. The Lawrence Awards are made for recent work in any of the following scientific fields related to atomic energy (broadly interpreted): 1) Chemistry, 2) Life Sciences (including Medicine), 3) Materials Research, 4) National Security, 5) Physics, and 6) Nuclear Technology.
- b. Nominations are judged primarily on the basis of scientific and technical competence and achievement, with secondary weight being given to managerial ability or innovative talents.
- c. Preference is given to individuals who are relatively early in their chosen careers and show exceptional promise of future development.
- d. The awards are made only to United States citizens.
- e. Not more than six awards are made in any one year. Each recipient receives a citation, signed by the Secretary of Energy, a gold medal, and a \$10,000 award.

### 3. Nominations

- a. Each year nominations of candidates for the awards are invited by public announcement, and by letter to individuals on a list that includes members of the National Academy of Sciences, officers of scientific and technical societies whose interests are related to the fields in which the award is to be granted, research institutions and other individuals of special knowledge and competence. Any individual may submit a nomination.
- b. Nomination is made by a full letter of justification, including the scientific field in which the candidate should be considered. Wherever possible, nominations should be accompanied by a **curriculum vitae** and bibliography, as this will greatly facilitate the review process. One or two supporting letters would also be useful. Nominations including classified materials should be accompanied by an unclassified summary.
- c. Nominations that are not selected are retained for further consideration. If the candidate has not been selected in three consecutive years, the nomination is dropped unless the candidate is renominated.
- d. Only living nominees will be considered.

### 4. Screening

For each Lawrence Award category a Screening Panel of consultants, drawn from the appropriate scientific field, reviews all nominations in closed session, supplemented by its own inquiry where appropriate, and ranks the nominees in order of merit. A nominee for an award may not sit on a Screening Panel.

## REGULATIONS AND PROCEDURES

### 1. Authority

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## BACKGROUND ON LAWRENCE AWARDS

In August, 1958, Chairman John A. McCone of the Atomic Energy Commission (AEC) wrote to President Eisenhower suggesting the establishment of the Ernest O. Lawrence Memorial Award for especially meritorious contributions in the field of atomic energy. Dr. Lawrence had died on August 27. In his reply, the President suggested that the AEC initiate action to establish such an award saying, "Such an award would seem to me to be most fitting, both as a recognition of what he (Dr. Lawrence) has given to our country and to mankind, and as a means of helping to carry forward his work through inspiring others to dedicate their lives and talents to scientific effort." Following approval by the President, the Atomic Energy Commission established the Ernest Orlando Lawrence Memorial Award in November, 1959.

Ernest O. Lawrence was born in Canton, South Dakota on August 8, 1901. He studied at the University of South Dakota and the University of Minnesota, where he became acquainted with W. F. C. Swann, who led him into physics. He followed Swann to the University of Chicago and then went on to Yale for his Ph.D. degree (1925).

Hoping for more opportunities to do research in physics, he went to the University of California in 1928 as an associate professor. Two years later he became the university's youngest professor and in 1936 director of its radiation laboratory.

In 1939 Dr. Lawrence won the Nobel Prize for his invention of the cyclotron and its subsequent development and use in research, especially for the discovery of new elements and new isotopes of known elements. Lawrence originated the underlying principle of the cyclotron in 1929. The first successful machine was built early in 1931 with the help of one of Lawrence's students, M. Stanley Livingston. Lawrence was also interested in the medical applications of the cyclotron. With his brother John, director of the university's medical laboratory, he did much work in this field, including the irradiation of malignant tissues with neutrons. During World War II, he was a leader in the research that developed the atomic bomb. After World War II Lawrence played a major role in the evolution of the Atomic Energy Commission and two major DOE facilities, the Lawrence Berkeley Laboratory and the Lawrence Livermore National Laboratory, which bear his name and are testimony to his many contributions to science and to the nation.

# PAST RECIPIENTS OF THE ERNEST O. LAWRENCE AWARD

- |  |  |  |
|--|--|--|
| 1960: Harvey Brooks<br>John S. Foster<br>Isadore Perlman<br>Norman F. Ramsey<br>Alvin M. Weinberg            | 1970: William J. Barr<br>James W. Cobble<br>Joseph M. Hendrie<br>Michael M. May<br>Andrew M. Sessler     | 1982: George F. Chapline<br>Mitchell J. Feigenbaum<br>Michael I. Lineberry<br>Nicholas J. Turro<br>Raymond E. Wildung                |
| 1961: Leo Brewer<br>Henry Hurwitz<br>Conrad L. Longmire<br>Wolfgang K.H. Panofsky<br>Kenneth E. Wilzbach     | 1971: Thomas B. Cook<br>Robert L. Fleischer<br>Robert L. Hellens<br>P. Buford Price<br>Robert M. Walker  | 1983: James F. Jackson<br>Michael E. Phelps<br>Paul H. Rutherford<br>Mark S. Wrighton<br>George B. Zimmerman                         |
| 1962: Andrew A. Benson<br>Richard P. Feynman<br>Herbert Goldstein<br>Anthony L. Turkevich<br>Herbert F. York | 1972: Charles C. Cremer<br>Sidney D. Drell<br>Marvin Goldman<br>David A. Shirley<br>Paul F. Zweifel      | 1984: Robert W. Conn<br>John J. Dunn<br>Peter L. Hagelstein<br>Siegfried S. Hecker<br>Robert B. Laughlin<br>Kenneth N. Raymond       |
| 1963: Herbert J.C. Kouts<br>L. James Rainwater<br>Louis Rosen<br>James M. Taub<br>Cornelius A. Tobias        | 1973: Louis Baker<br>Seymour Sack<br>Thomas E. Wainwright<br>James R. Weir<br>Sheldon Wolff              | 1985: Anthony P. Malinauskas<br>William H. Miller<br>David R. Nygren<br>Gordon C. Osbourn<br>Betsy M. Sutherland<br>Thomas A. Weaver |
| 1964: Jacob Bigeleisen<br>Albert L. Latter<br>Harvey M. Patt<br>Marshall N. Rosenbluth<br>Theos J. Thompson  | 1974: Joseph Cerry<br>Harold P. Furth<br>Henry C. Honeck<br>Charles A. McDonald<br>Chester R. Richmond   | 1986: James J. Duderstadt<br>Helen T. Edwards<br>Joe W. Gray<br>C. Bradley Moore<br>Gustavus J. Simmons<br>James L. Smith            |
| 1965: George A. Cowan<br>Floyd M. Culler<br>Milton C. Edlund<br>Theodore B. Taylor<br>Arthur C. Utpon        | 1975: Evan H. Appelbaum<br>Charles E. Elderkin<br>William A. Lokke<br>Burton Richter<br>Samuel C.C. Ting | 1987: James W. Gordon<br>Miklos Gyulassy<br>Sung-Hou Kim<br>James L. Kinsey<br>J. Robert Merriman<br>David E. Moncton                |
| 1966: Harold M. Agnew<br>Ernest C. Anderson<br>Murray Gell-Mann<br>John R. Huizenga<br>Paul R. Vanstrum      | 1976: A. Philip Bray<br>James W. Cronin<br>Kaye D. Lathrop<br>Adolphus L. Lotts<br>Edwin D. McClanahan   | 1988: Mary K. Galliard<br>Richard T. Lahey, Jr.<br>Chai T. Liu<br>Gene H. McCall<br>Alexander Pines<br>Joseph S. Wall                |
| 1967: Mortimer M. Elkind<br>John M. Googin<br>Allen F. Henry<br>John O. Rasmussen<br>Robert N. Thorn         | 1977: Dean W. Waters<br>F. William Studier<br>John L. Emmett<br>Gareth Thomas<br>James D. Bjorken        | 1990: John J. Dornig<br>James N. Norris<br>S. Thomas Picraux<br>Wayne J. Shotts<br>Maury Tigner<br>Ward Whicker                      |
| 1968: James R. Arnold<br>E. Richard Cohen<br>Val L. Fitch<br>Richard Latter<br>John B. Storer                | 1980: Donald W. Barr<br>B. Grant Logan<br>Nicholas P. Samios<br>Benno P. Schoenborn<br>Charles D. Scott  |  |
| 1969: Geoffrey F. Chew<br>Don T. Cromer<br>Ely M. Geltard<br>F. Newton Hayes<br>John H. Nuckolls             | 1981: Martin Blume<br>Yuan T. Lee<br>Fred R. Mynatt<br>Paul R. Selby<br>Lowell L. Wood                   |  |



# PAST RECIPIENTS OF THE ERNEST O. LAWRENCE AWARD

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|--|---|---|
| 1960: Harvey Brooks<br>John S. Foster<br>Isadore Perlman<br>Norman F. Ramsey<br>Alvin M. Weinberg            | 1970: William I. Barr<br>James W. Cobble<br>Joseph M. Hendrie<br>Michael M. May<br>Andrew M. Sessler    | 1982: George F. Chapline<br>Mitchell I. Feigenbaum<br>Michael I. Lineberry<br>Nicholas J. Turro<br>Raymond E. Willard                 |
| 1961: Leo Brewer<br>Henry Hurwitz<br>Conrad L. Longmire<br>Wolfgang K.H. Panofsky<br>Kenneth E. Wilzbach     | 1971: Thomas B. Cook<br>Robert L. Fleischer<br>Robert L. Hellens<br>P. Butora Price<br>Robert M. Walker | 1983: James F. Jackson<br>Michael E. Phelps<br>Paul H. Rutherford<br>Mark S. Wrighton<br>George B. Zimmerman                          |
| 1962: Andrew A. Benson<br>Richard P. Feynman<br>Herbert Goldstein<br>Anthony L. Turkevich<br>Herbert F. York | 1972: Charles C. Cremer<br>Sidney D. Drell<br>Marvin Goldman<br>David A. Shirley<br>Paul F. Zweifel     | 1984: Robert W. Conn<br>John I. Dunn<br>Peter L. Hagelstein<br>Siegfried S. Hecker<br>Robert B. Laughlin<br>Kenneth N. Raymond        |
| 1963: Herbert I.C. Kouts<br>L. James Rainwater<br>Louis Rosen<br>James M. Taub<br>Cornelius A. Tobias        | 1973: Louis Baker<br>Seymour Dack<br>Thomas E. Weinwright<br>James R. Weir<br>Sheldon Wolff             | 1985: Anthony P. Malinauskas<br>William H. Miller<br>David R. Nisgren<br>Gordon C. Osbourn<br>Betsy M. Sutherland<br>Thomas A. Weaver |
| 1964: Jacob Bigeleisen<br>Albert L. Latter<br>Harvey M. Pitt<br>Marshall N. Rosenbluth<br>Theos J. Thompson  | 1974: Joseph Cerny<br>Harold P. Furth<br>Henry C. Honeck<br>Charles A. McDonald<br>Chester R. Richmond  | 1986: James I. Duderstadt<br>Helen T. Edwards<br>Joe W. Gray<br>C. Bradley Moore<br>Gustavus J. Simmons<br>James L. Smith             |
| 1965: George A. Cowan<br>Floyd M. Cullen<br>Milton C. Edlund<br>Theodore B. Taylor<br>Arthur C. Upton        | 1975: Evan H. Appelman<br>Charles E. Elderkin<br>William A. Lokke<br>Burton Richter<br>Samuel C.C. Ting | 1987: James W. Gordon<br>Miklos Gyulassy<br>Sung-Hou Kim<br>James L. Kinsey<br>J. Robert Merriman<br>David E. Moncton                 |
| 1966: Harold M. Agnew<br>Ernest C. Anderson<br>Murray Gell-Mann<br>John R. Huizenga<br>Paul R. Vanstrum      | 1976: A. Philip Bray<br>James W. Cronin<br>Kaye D. Lathrop<br>Adolphus L. Lotts<br>Edwin D. McClanahan  | 1988: Mary K. Galliard<br>Richard T. Lahey, Jr.<br>Chien T. Liu<br>Gene H. McCall<br>Alexander Pines<br>Joseph S. Wall                |
| 1967: Mortimer M. Elkind<br>John M. Googin<br>Allen F. Henry<br>John O. Rasmussen<br>Robert N. Thorn         | 1977: Dean W. Waters<br>F. William Studier<br>John L. Emmett<br>Gareth Thomas<br>James D. Bjorken       | 1990: John I. Dornig<br>James N. Norris<br>S. Thomas Picraux<br>Wayne J. Shotts<br>Maurv Tigner<br>F. Ward Whicker                    |
| 1968: James R. Arnold<br>E. Richard Cohen<br>Val L. Fitch<br>Richard Latter<br>John B. Storer                | 1980: Donald W. Barr<br>B. Grant Logan<br>Nicholas P. Samios<br>Benno P. Schoenborn<br>Charles D. Scott |   |
| 1969: Geoffrey F. Chew<br>Don T. Cromer<br>Elv M. Gelbard<br>F. Newton Hayes<br>John H. Nuckolls             | 1981: Martin Blume<br>Yuan T. Lee<br>Fred R. Myriatt<br>Paul R. Selby<br>Lowell L. Wood                 |   |