

SCIENCE HISTORY INSTITUTE

**ISABELLA KARLE and JEROME KARLE**

Transcript of an Interview  
Conducted by

James J. Bohning and David K. Van Keuren

at

Naval Research Laboratory  
Washington, District of Columbia

on

26 February, 15 June and 9 September 1987

(With Subsequent Corrections and Additions)

THE NAVAL RESEARCH LABORATORY ORAL HISTORY PROGRAM

On 26 February, 15 June, and I Isabella L. Karle, the interviewee,  
9 September 1987  
voluntarily participated in a taped interview with David K. van Keuren  
representing the Naval Research Laboratory. The interview was made in  
connection with the NRL Oral History Program.

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Witness

Interviewee\*

March 14, 1989  
Date

Accepted for the Naval Research Laboratory by \_\_\_\_\_

14 March 1989  
Date

\*This and other signatures must be identical with the name of the interviewee as it appears in the first paragraph, page 1.

(Page 2 of 2)

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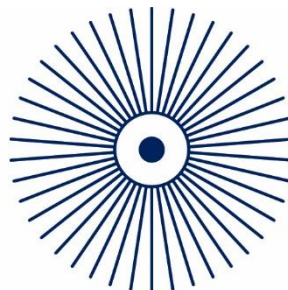
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Upon Isabella Karle's death in 2017, this oral history was designated **Free Access**.

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## **ISABELLA KARLE**

1921 Born in Detroit, Michigan, on 2 December

### Education

1941 BS, University of Michigan, chemistry  
1942 MS, University of Michigan, physical chemistry  
1944 PhD, University of Michigan, physical chemistry

### Professional Experience

1944 University of Chicago  
Associate Chemist

1944-1946 University of Michigan  
Instructor

1946-2009 Naval Research Laboratory  
Head, X-Ray Diffraction Section of the Laboratory for the  
Structure of Matter

### Honors

1965 Superior Civilian Service, Navy Department  
1968 Annual Achievement Award, Society of Women Engineers  
1970 Hillebrand Award, American Chemical Society  
1973 Federal Woman's Award  
1976 Garvan Medal, American Chemical Society  
1980 Dexter Conrad Award, Office of Naval Research  
1984 Chemical Pioneer Award, American Institute of Chemists  
1986 Lifetime Achievement Award, Women in Science and Engineering  
(WISE)  
1988 Gregori Aminoff Prize, Royal Swedish Academy of Sciences  
1988 Rear Admiral William S. Parsons Award of the Navy League

## **JEROME KARLE**

1918 Born in New York, New York, on 18 June

### Education

1937 BS, City College of New York, chemistry and biology  
1938 MA, Harvard University, biology  
1942 MS, University of Michigan, physical chemistry  
1943 PhD, University of Michigan, physical chemistry

### Professional Experience

1939-1940 New York State Department of Health, Albany, New York  
Laboratory Assistant

1943-1944 Manhattan Project, Chicago, Illinois  
Research Associate

1944-1946 United States Navy Project, Michigan  
Research Associate

1946-1958 Navy Research Laboratory  
Head, Electron Diffraction Section

1958-1967 Navy Research Laboratory  
Head, Diffraction Branch

1967-2009 Navy Research Laboratory  
Chair of Science and Chief Scientist of the Laboratory for the  
Structure of Matter

### Honors

1959 Research Society of America Award in Pure Science  
1961 Elected Fellow, American Physical Society  
1968 Navy Distinguished Civilian Service Award  
1970 Hillebrand Award, Washington Section of American Chemical Society  
1972 President of American Crystallographic Association  
1976 Navy Robert Dexter Conrad Award



1976 Elected to National Academy of Sciences  
1981 President of International Union of Crystallography  
1985 Nobel Prize in Chemistry  
1986 Sigma Xi Centennial Lecturer  
1986 Thomas A. Edison Memorial Lecturer  
1986 Distinguished Lecturer in Chemistry, University of Michigan  
1986 Karl Herzfeld Memorial Lecturer, Catholic University of America  
1986 Albert A. Michelson Award, Museum of Science and Industry, Chicago,  
Illinois  
1986 Honorary Member, International Academy of Science  
1986 Golden Plate Award of the Academy of Achievement  
1986 Rear Admiral William S. Parsons Award of the Navy League  
1986 Townsend Harris Award, Alumni Association of City College of New  
York  
1986 Secretary of the Navy Award for Distinguished Achievement in Science  
1986 Paul Harteck Series Lecturer, Rensselaer Polytechnic Institute  
1986 President's Award for Distinguished Federal Civilian Service  
1986 National Library of Medicine Medal

## ABSTRACT

**Isabella and Jerome Karle** met while both were pursuing doctorates in physical chemistry under Professor Lawrence Brockway at the University of Michigan. After earning their degrees (and marrying), they worked on the Manhattan Project at the University of Chicago's Metallurgical Laboratory. After a brief return to the University of Michigan, the Karles moved to the United States Naval Research Laboratory, where they focused on the development of X-ray crystallography. They worked together to develop a direct method for determining crystal structures, work for which Jerome Karle, with their colleague Herbert Hauptman, was awarded the Nobel Prize in Chemistry in 1985.

In the first of three interview sessions, the discussion focuses on Isabella and Jerome's family backgrounds, their education in the public schools of Detroit and New York, respectively, their undergraduate careers, and their meeting and graduate work at the University of Michigan under Professor Brockway. The second interview session covers the Karles' work on the Manhattan Project at the Metallurgical Laboratory at the University of Chicago, their subsequent return to the University of Michigan, the growth of the field of electron diffraction, the challenges of pursuing dual research careers, and their move to the Naval Research Laboratory. This second session concludes with a look at their early years at NRL, during which they designed a new apparatus for gas electron diffraction and developed theoretical and experimental approaches to solving the crystal structure problem. The third and final interview session begins with a discussion about the early opposition to the Karles' theoretical work on the crystal structure problem, and the process by which that work gained acceptance through Isabella Karle's X-ray diffraction work beginning in the mid-fifties, through which she was able to solve the structures of spurrite, p,p'-dimethoxybenzophenone, and arginine, among others. Discussion then turns to the nature of the Karles' working partnership in research and in their family life, their children's interests and eventual careers in science, their collaboration with Herb Hauptman, and the effect of the 1985 Nobel Prize in Chemistry on their lives and work. The interview concludes with Jerome Karle's thoughts on the present state of science education and training in the United States, and his concerns for a global future marked by overpopulation, pollution and natural resource depletion.

## INTERVIEWERS

**James J. Bohning** was professor emeritus of chemistry at Wilkes University, where he had been a faculty member from 1959 to 1990. He served there as chemistry department chair from 1970 to 1986 and environmental science department chair from 1987 to 1990. Bohning was chair of the American Chemical Society's Division of the History of Chemistry in 1986; he received the division's Outstanding Paper Award in 1989 and presented more than forty papers at national meetings of the society. Bohning was on the advisory committee of the society's National Historic Chemical Landmarks Program from its inception in 1992 through 2001 and is currently a consultant to the committee. He developed the oral history program of the Chemical Heritage Foundation, and he was CHF's director of oral history from 1990 to 1995. From 1995 to 1998, Bohning was a science writer for the News Service group of the American Chemical

Society. In May 2005, he received the Joseph Priestley Service Award from the Susquehanna Valley Section of the American Chemical Society. Bohning passed away in September 2011.

**David van Keuren** earned a PhD in history and sociology of science from the University of Pennsylvania in 1982, following a master's degree from the University of Wisconsin at Madison (1975) and a bachelor's from the University of Wisconsin at Eau Claire (1972). His graduate studies were concentrated on scientific thought in Europe and America from the Middle Ages to the present. In 1986, he joined the staff of the Naval Research Laboratory as its historian, documenting the agency's significant research and development achievements past and present, and contributing to national awareness of the broad impact of military scientific research on civil society. He died in a hit-and-run bicycle accident in March 2004, in southwest Washington.

### **ABOUT THIS TRANSCRIPT**

The Center for Oral History, Science History Institute, is committed both to preserving the recording of each oral history interview in our collection and to enhancing research use of the interviews by preparing carefully edited transcripts of those recordings. The preparation of interview transcripts begins with the creation of a verbatim typescript of the recording and proceeds through review and editing by staff of the Center; interviewees also review the typescript and can request additions, deletions, or that sections be sealed for specified periods of time. We have established guidelines to help us maintain fidelity to the language and meaning of each recorded interview while making minor editorial adjustments for clarity and readability. Wherever possible, we supply the full names of people, organizations, or geographical locations mentioned during the interview. We add footnotes to the transcript to provide full citations for any publications that are discussed, to point to extant oral history interviews, and to clear up misstatements or provide context for ambiguous references in the transcript. We use brackets to indicate the addition of material that was not in the audio, and bracketed ellipses to indicate the deletion of recorded material. The transcript also includes time stamps at five-minute intervals. We omit without noting most instances of verbal crutches and all instances of nonlexical utterances. We also make small grammatical corrections where necessary to communicate interview participants' meaning. Finally, staff of the Center create the abstract, chronology, table of contents and index.

This interview was conducted in collaboration with the Naval Research Laboratory Oral History Program. A prior edition of this transcript, which included edits requested by the interviewees, was kept under seal during the interviewees' lifetimes, in accordance with the terms of the signed release agreement. This new edition of the transcript was prepared following the death of Isabella Karle in 2017; it retains the edits made to the original edition. A full audit-edit of the interview and transcript was performed, so that deviations from the recording could be noted typographically. The recordings, particularly of the first session of the interview, were noticeably poor in quality with some of the interviewer questions nearly inaudible.

Changes in this edition of the transcript include: reformatting to adhere to current Center for Oral History standards, and the preparation of chronologies, an abstract, table of contents and index, none of which were included in the previous, sealed version of the transcript.

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