The History and Accomplishments of WRC/PVRC and Recognition of William Spraragen, The First Director of WRC

BY K. H. KOOPMAN

I would like to thank the PVRC Executive Committee for inviting me to present the fifth lecture in honor of Bernie Langer.* It was my good fortune to know Bernie for a good many years, and I will always cherish his kind, gentle methods of teaching and explaining pressure vessel design. He was not only a superb engineer but a true gentleman.

At a meeting of the United Engineering Society—now the United Engineering Trustees, Inc.—held on November 19, 1914, a Fund, known as the Engineering Foundation, was established. This action was taken as the result of an offer of $200,000 by Mr. Ambrose Swasey of Cleveland, Ohio, to a fund devoted to the advancement of the engineering arts and sciences in all of their branches to the greatest good of the Engineering Profession and to the benefit of mankind.

Later gifts brought Mr. Swasey's total contributions to over $800,000. The total endowment is currently in excess of $5,000,000. The endowment fund income is administered by representatives of the five major engineering societies and of the United Engineering Trustees, Inc.

The Engineering Foundation, after this early establishment, began in a very conservative fashion as a department of the United Engineering Society, which in turn was supported by the then three principal engineering societies associated with Mining, Mechanical, and Electrical Engineering. The Civil and Chemical engineers joined in support at a later date. The Engineering Foundation worked closely with the newly-formed National Research Council of the National Academy of Sciences. It then began its policy of providing "seed money" to stimulate cooperation by American Industry in supporting engineering research of value to the whole community.

The organized research in the welding field antedates the organization of the American Welding Society in 1919. As a matter of fact, the Society is an outgrowth of the work of the Welding Research Committee of the Emergency Fleet Corporation and the National Council of Defense in World War I, in 1916. When the American Welding Society was organized in 1919, it created a Research Department known as the American Bureau of Welding. William Spraragen was appointed Secretary of the organization, but it could not raise enough funds to succeed. As a result, Mr. Spraragen returned to teaching mathematics at the University of Washington in Seattle for a year.

Dr. Comfort A. Adams became Chairman of the Engineering Division of the National Research Council, and offered Mr. Spraragen a position as Secretary of that Division in July 1920, with an opportunity to revive the American Bureau of Welding. It was reorganized in New York City under the joint auspices of the National Research Council and the American Welding Society, subject to the regulations of the National Research Council.

The many accomplishments of the American Bureau of Welding from 1920 to 1933 are a matter of record. In 1933, the National Research Council suffered loss of income and requested the American Welding Society to take over the American Bureau of Welding and operate it as a Research Department of the Society. The principal officers were Dr. Comfort A. Adams, Chairman, and William Spraragen, Secretary.

In April 1935, recognizing that it would be wasteful in time, talent, and money if each organization endeavored to set up its own research program in the welding field, the American Welding Society and the American Institute of Electrical Engineers requested The Engineering Foundation to organize the WELDING RESEARCH COMMITTEE.

Later in 1935, The Engineering Foundation followed through in creating the Welding Research Committee and contributed $5,000 a year until the Welding Research Committee could establish itself and deserve the support of industry. The Committee was set up under The Engineering Foundation with the joint spon-

*Bernard F. Langer (1905-1977) graduated from Stanford University in 1926, worked for Westinghouse Electric Company until his 1970 retirement, and then consulted for Westinghouse through 1976. He specialized in design and stress analysis and was awarded the Westinghouse Order of Merit and 26 patents. Mr. Langer also authored 25 technical papers, many in the design of nuclear power plants. He was very active in ASME and PVRC for some 35 years.
sponse of AIEE and AWS, and the Bylaws of AWS were amended to provide separate and distinct operation. In the brief period of one year, the Welding Research Committee established itself, and when The Engineering Foundation proposed industrial support late in 1936, it was forthcoming.

The Welding Research Committee flourished and grew steadily. It was reorganized in January 1943 under the name WELDING RESEARCH COUNCIL, and its annual budget grew from $200,000 in 1943 to $1,500,000 at present.

The Welding Research Council continues as a nonprofit research organization under Section 501 (C) (3) of the Internal Revenue Code. WRC was incorporated separately in November 1967. Its objectives are to:

- Conduct needed cooperative research in welding and closely allied fields in various laboratories.
- Disseminate welding research information.
- Promote welding research in universities.
- Cooperate with similar agencies abroad.

The general philosophy behind the selection of problems for study was developed over the first few years and experience showed that the yardsticks which could be used in selecting new problems are:

1. Is the Council the best agency to undertake the work?
2. Is the problem feasible?
3. Will it be possible to secure the necessary funds, talent, and research facilities?
4. Is the problem of broad general interest?

In the selection of problems, there is always the question as to the portion of time, or funds, that should be devoted to purely fundamental research or investigations of an engineering nature. In a general way, this division solves itself. It is more difficult to raise funds for the so-called purely academic research. Nevertheless, even the most practical committees are encouraged to answer the question of 'Why' as well as 'How.'

The Council also conducts important programs for several government agencies.

The Council's way of financing research has many advantages in those areas of research where there is a great community of interest and where the magnitude of the problem and the expense of an appropriate research program would inhibit attention by a single organization which might be reluctant to assume the entire cost of a project from which many might benefit. Through the Welding Research Council, it is possible to develop cooperative research programs from which each contributor gets as much advantage as if he had paid all of the costs of a project.

The results of the research sponsored by the Council, mainly at universities and nonprofit laboratories, are published to give the widest possible circulation. One of the advantages of such cooperative research is its ready acceptance by code-writing bodies. Cooperative research is authoritative by its very nature.

The Welding Research Council currently has some 95 working groups consisting of various project and advisory committees, divisions, subcommittees, and task groups. The largest and most active is our Pressure Vessel Research Committee, which organized mainly by ASME members representing steel mills, contracting engineers, fabricators, users of pressure vessels, and scientists at a conference held for this purpose on March 15, 1945. Since that time, the PVRC budget has grown from a few thousand dollars to our proposed budget of some $600,000. Of course, this budget represents only the value of the research done or in progress in a given year. Much work is done in compa-
Council expose a significant number of the fact that the research projects of the Council are associated with industry.

This information helps to emphasize the fact that the research projects of the Council expose a significant number of more highly trained scientists and engineers to welding problems. Thus, they in turn upon graduation are in a better position to work at a higher level in industry, or to impress upon their students at the universities some of the important aspects of welding problems facing Industry.

I would like to take the liberty of making a few observations and giving a little unsolicited advice as a result of working in industry, government, and WRC for 45 years.

Engineers are normally very concerned with day-to-day problems and "fire-fighting jobs." But, they should also take time to think seriously about participation in various professional engineering societies and in the activities of cooperative research organizations, such as the Welding Research Council.

By actively working as a member of such task forces, subcommittees and committees, the engineer or scientist contributes to the advancement of his profession. He also can learn from the interaction with his fellow engineers. Participation encourages and stimulates creative thought. The result is truly an increase in productivity in solving complex research problems which requires the application of many different disciplines and viewpoints.

Unfortunately, only a small percentage of engineers and scientists develop an interest in research. In turn, only a small percentage of this group has the ambition and dedication to participate actively in the hard work of planning and guiding various projects that are sponsored by research groups.

Research groups develop important advances in engineering data on materials, mathematical design formulas, fabrication techniques, and application of engineering components and structures. In the case of the Welding Research Council, this information is essential for designing welded pressure vessels, welded piping for power plants, welded pipelines for oil and gas transmission, welded beams and girders for bridges and buildings, and, of course, for welded ships of all types. Improvements in materials, design, and fabrication come about only by continual hard work by many scientists and engineers.

Progress in welding research is possible only because people trained in many different disciplines cooperate in solving welding problems involving the use of knowledge in metallurgy, physics, electrical engineering, mechanical engineering, civil engineering, mathematics, and non-destructive testing, as well as other areas.

There is no better way for an engineer to broaden his knowledge and interests, and thereby grow in his profession, than by working with his fellow engineers and scientists of many different talents on solving specific research problems.

It is also important to emphasize that more young engineers should take the examinations required to obtain their Professional Engineering license. This, along with working in research groups, will greatly assist the professional growth of the young engineer. By giving of himself, he will gain far more than he gives, and, just as gratifying, are the many close, lifelong friendships.

The success of WRC and its cooperative research has been based on a solid foundation of the practical and logical objective and operating philosophy outlined by Bill Sparagen 46 years ago and presented in the early portion of this lecture. We have tried to follow Bill's advice and suggestions in clearly defining technical problems and within such a manageable scope that they would be suitable for study as cooperative research projects.

Also just as important, Bill's many comments and suggestions on human reac-

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**WRC Cooperation with Technical Societies and Trade Associations**

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**WRC Cooperation with U. S. Government Agencies**

- Aluminum Alloys committee
- Naval Shipyard, Mare Island
- Portsmouth Naval Shipyard
- U.S. Army Construction Engineering
- Office of Naval Research
- Pitcairn Arsenal
- NASA, Lewis Research Center
- Nuclear Division, Oak Ridge National Laboratory
- Arnold Research Organization
- Naval Research Laboratory
- Energy Research and Development Administration
- NASA, Marshall Flight Research Center
- Redstone Arsenal
- Knolls Atomic Power Laboratory
- Tennessee Valley Authority
- Sandia National Laboratories
- Wright-Patterson Air Force Base Metals and Ceramics Division
- Naval Facilities Engineering Command
- Bureau of Reclamation
- Office of Naval Research
- Bridge Division, Federal Highway Administration
- Department of Transportation
- Cryogenics Division, National Bureau of Standards of Department of Commerce
- Naval Research Laboratories
- U.S. Bureau of Mines
- U.S. Naval Ship Research and Development Center, Annapolis
- U.S. Army Materials and Mechanics Research Center
- Watertown Arsenal
- Office of Systems Engineering – Department of Transportation
Tribute to William Spraragen

William Spraragen was of surprising efficiency. Whatever the source of his amazing energy, Bill overshadowed his contemporaries in a professional career of 45 years. Graduating from Union College in 1916, he began his official career in welding as Assistant Chairman and Research Assistant to the Welding Research Committee of the National Research Council and the Emergency Fleet Corporation in 1918.

Following a brief mathematics teaching assignment at the University of Washington in Seattle, Mr. Spraragen, in 1921, became Secretary of the Engineering Division of the National Research Council operating jointly with the American Welding Society, a post he held until 1935.

During this period, his career branched out to include: the founding in 1922 of the Welding Journal which he served as Editor and Business Manager through 1954; Technical Secretary of the American Welding Society from 1926 to 1942; Director of the Welding Research Council of the Engineering Foundation from 1935 to 1960; from 1948 to 1959, a member of the Governing Council of the International Institute of Welding; and from 1954 to 1959, Secretary of the American Council of that group.

During this same period, he found time, somehow, to write the Handbook of Engineering Mathematics; to compile and edit the first two editions of the Welding Handbook; to participate in the writing and editing of numerous books and articles on industrial research; and he also served as an engineering consultant to numerous industries through the Spraragen Engineering Corporation.

Mr. Spraragen helped to promote with outstanding energy the sound growth of a body of knowledge on many aspects of welding. He would analyze problems with such logic and clarity that he never ceased to amaze me.

In total, Bill Spraragen contributed 45 years of service with AWS and WRC and to the professional side of the Welding Industry. He retired on May 20, 1960, and is now living in St. Petersburg, Florida at the age of 86.

In closing, I would like to record our thanks to Bill Spraragen for his untiring efforts in helping to organize and nurture both WRC and PVRC by publishing this tribute in our WRC and PVRC records.

A Swan Song

By the time this is published, I will be reaching my retirement date of December 31, 1981 after almost 24 years with WRC, 22 years as Executive Director following Bill Spraragen’s term of 25 years as Executive Secretary and Director.

It has been a most interesting job because of the stimulating contacts, discussions, and meetings with thousands of engineers and scientists over the years. I would also like to thank our loyal and capable WRC staff for their continual assistance, especially Miss Ruth Thomas and Chuck Felmley. Miss Thomas has served the Council with great dedication. Thanks are also extended to Chuck Larson for 15 years of superb service as Executive Secretary of our Pressure Vessel Research Committee. I also want to thank the current and past members of our WRC Executive Committee and main Council, particularly Ken Lange and Bob Young, our preceding two WRC Chairmen, and John Gross, our new WRC Chairman.

To my successor, Glenn Oyler, and to Chuck Felmley, Executive Secretary of PVRC, I leave a going organization with the confidence that the Council will grow under their guidance and with the continued assistance of all of our committee members. On December 31, 1981, I will retire with “peace of mind” and many heartfelt thanks to all who helped me. I have many happy memories and friendships to cherish.

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Weldability and Fracture Toughness of 5% Ni Steel

Part 1: Weld Simulation Testing

by A. Dhooge, K. Ostyn, W. Provost, and A. Vinckier

This paper describes an investigation on the weldability of a double normalized and tempered 5% Ni steel using weld simulation to estimate the heat-affected zone (HAZ) ductility at cryogenic temperatures. Charpy-V specimens were subjected to various weld simulation cycles and heat treatments and subsequently broken at a range of cryogenic temperatures.

Part 2: Wide Plate Testing

by A. Dhooge, W. Provost, and A. Vinckier

This paper describes the results of wide plate tensile tests on 25 mm thick welded 5% Ni steel plates in double normalized and tempered condition. The base metal and welded test specimens, containing 6 to 30 mm long through-thickness notches, were tested at temperature ranging from -90°C to -165°C.

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The price of WRC Bulletin 266 is $10.00 per copy, plus $3.00 for postage and handling. Orders should be sent with payment to the Welding Research Council, 345 E. 47th St., Room 801, New York, NY 10017.