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Bibliography of NRL Works on X-Ray Fluorescence Authored by L. S. Birks, D. B. Brown, J. W. Criss, H. Friedman, and J. V. Gilfrich

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The Naval Research Laboratory (NRL) has made significant contributions to the field of X-ray fluorescence (XRF) analysis. The calculational engine of the computer code NRLXRF still powers a significant fraction of commercial XRF analyis systems. The impact of these achievements was highlighted during the celebration of NRL's 75th Anniversary, in preparation for which the top 75 technologies transferred by the Laboratory were selected. Quantitative X-ray Fluorescence Analysis was among the technologies so honored. This report presents a bibliography of the recipients of that award: LaVerne S. Birks, Dennis B. Brown, John W. Criss, John V. Gilfrich, and Herbert Friedman. The extensive collection of publications by Friedman outside the field of XRF is available within the holdings of the NRL Ruth H. Hooker Research Library and Technical Information Center, and is not included in this bibliography.

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Bibliography of NRL Works on X-Ray Fluorescence
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ABSTRACT: The Naval Research Laboratory (NRL) has made significant contributions to the field of X-ray fluorescence (XRF) analysis. The calculational engine of the computer code NRLXRF still powers a significant fraction of commercial XRF analysis systems. The impact of these achievements was highlighted during the celebration of NRL's 75th Anniversary, in preparation for which the top 75 technologies transferred by the Laboratory were selected. Quantitative X-ray Fluorescence Analysis was among the technologies so honored. This report presents a bibliography of the recipients of that award: LaVerne S. Birks, Dennis B. Brown, John W. Criss, John V. Gilfrich, and Herbert Friedman. The extensive collection of publications by Friedman outside the field of XRF is available within the holdings of the NRL Ruth H. Hooker Research Library and Technical Information Center, and is not included in this bibliography.

The contributions of the Naval Research Laboratory to the field of X-ray fluorescence analysis have been documented by Gilfrich.[1] The influence of those contributions is well understood by those who participated in the growth of the field. As the pioneers pass from the scene of active involvement, their contributions are taken for granted by those who build on their foundation. This bibliography was compiled to provide a single view of a facet of that foundation.

This bibliography serves to demonstrate the extent of the body of literature contributed by these authors. Included are their works in the field of X-ray fluorescence analysis, in related fields such as electron probe microanalysis and the quantitation of the X-ray response of photographic film, and in areas of subsequent and ongoing investigation such as the effects of radiation on solid state microelectronics. The works and patents of Herbert Friedman have already been collected in the Hooker Library, and his papers and patents in the present bibliography are limited to the field of X-ray fluorescence.

LaVerne Stanley Birks, Head of the former X-Ray Optics Branch of NRL, was an opinionated and perceptive scientist who posted his work ethic on the wall of his office in a form he called Sooths, including the following:

> *"Successful research comprises 3 essential steps, conception, investigation, and dissemination."*
>
> *"If you work hard, get good results, and discover something new, it's not worth a damn unless you disseminate the information so others can profit from it."*

This bibliography has been assembled so that the already disseminated works by these authors may be more readily apprehended and appreciated for their content, breadth, and impact.

Birks' most cited work, according to the database of the Institute for Scientific Information, is his book Electron Probe Microanalysis (154 hits). The research effort in electron probe microanalysis was closely coupled with the work on x-ray fluorescence. The runner up is a journal article "Versatile X-Ray Analysis Program Combining Fundamental Parameters and Empirical Coefficients" by Criss, Birks, and Gilfrich (88 hits). The citation count does not give sufficient indication of the pervasive influence of this landmark computational work, the

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[1] J V Gilfrich, "X-ray fluorescence analysis at the Naval Research Laboratory," X-Ray Spectrometry **30** (4), 203-211 (2001); and NRL/MR/6685--98-8120, 1998.

calculational engine of which still powers about half of the thousand or so X-ray fluorescence units sold annually worldwide today, according to a knowledgeable leader in the instrumentation industry.

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The editorial comments of, and information provided by, J.V. Gilfrich have been quite helpful. The efforts of summer students Aman Quadri and Omar Yacoubi, who worked on various aspects of the project, are appreciated. Particularly noteworthy is the quality contribution of Paula A. Spaeth, who volunteered her time to launch this project.

The sustained effort that this effort has enjoyed is still insufficient to achieve a compilation free of omissions, questions, and the occasional error. In the words of another of Birks' sooths,

"It doesn't have to be perfect as long as it's excellent."

One of the benefits of electronic databases is the ease with which revisions can be posted. The database from which this bibliography was printed (and which includes other information and filenames of electronic scans of many of the entries) has been supplied to the NRL Ruth H. Hooker Research Library. It is my hope that the bibliography will be of benefit to future researchers, historians, and managers of research, and that any who improve on this work will likewise provide those improvements to the Ruth H. Hooker Research Library.

Robert R. Whitlock
September, 2001

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