

David C. Joy

1943 - 2022



Please see Dale Newbury's excellent account (Newbury, 2022) of David's life in the UK and US, when they worked together. This poster is mostly based on Dale's appreciation.

Born in England, David's first degree was an MA (first-class honors) in 1966 in Natural Sciences at Tripos Trinity College, Cambridge, UK. He was a graduate student under John Jakubovics on contrast of magnetic domains by SEM.

SEM Interest

He received his PhD in the Department of Metallurgy and Materials Science at Oxford. His thesis was "Investigation of Properties of Magnetic Materials by Scanning Electron Microscopy".

He was then invited by Peter Hirsch, Chair of Metallurgy at Oxford, to a Postdoc Research Fellowship at Lincare College, Oxford.

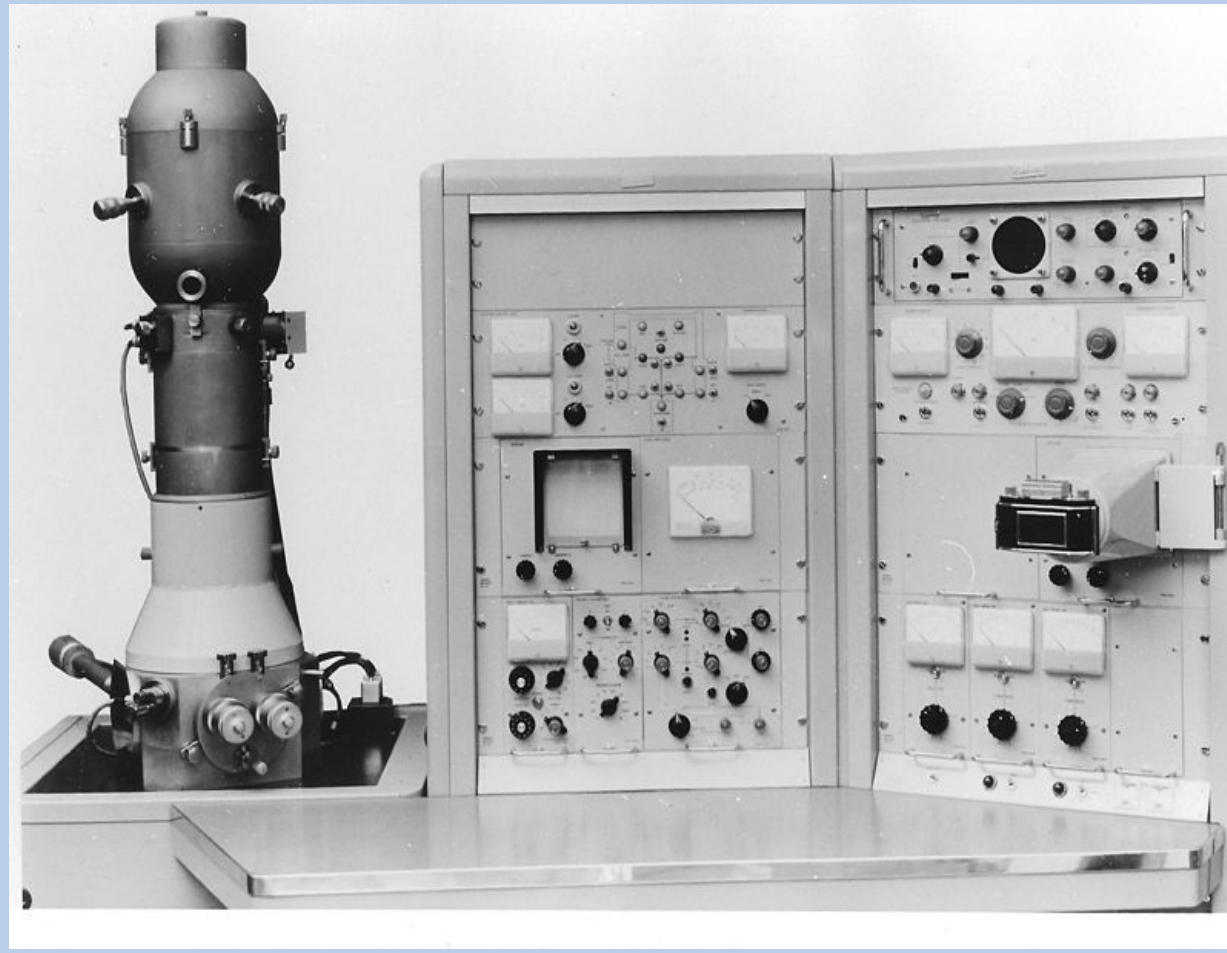


Fig.1. In the Hirsch lab, they got one of the first commercial SEMs, a Stereoscan model 3 or 4, which incited David's main interest in SEM.

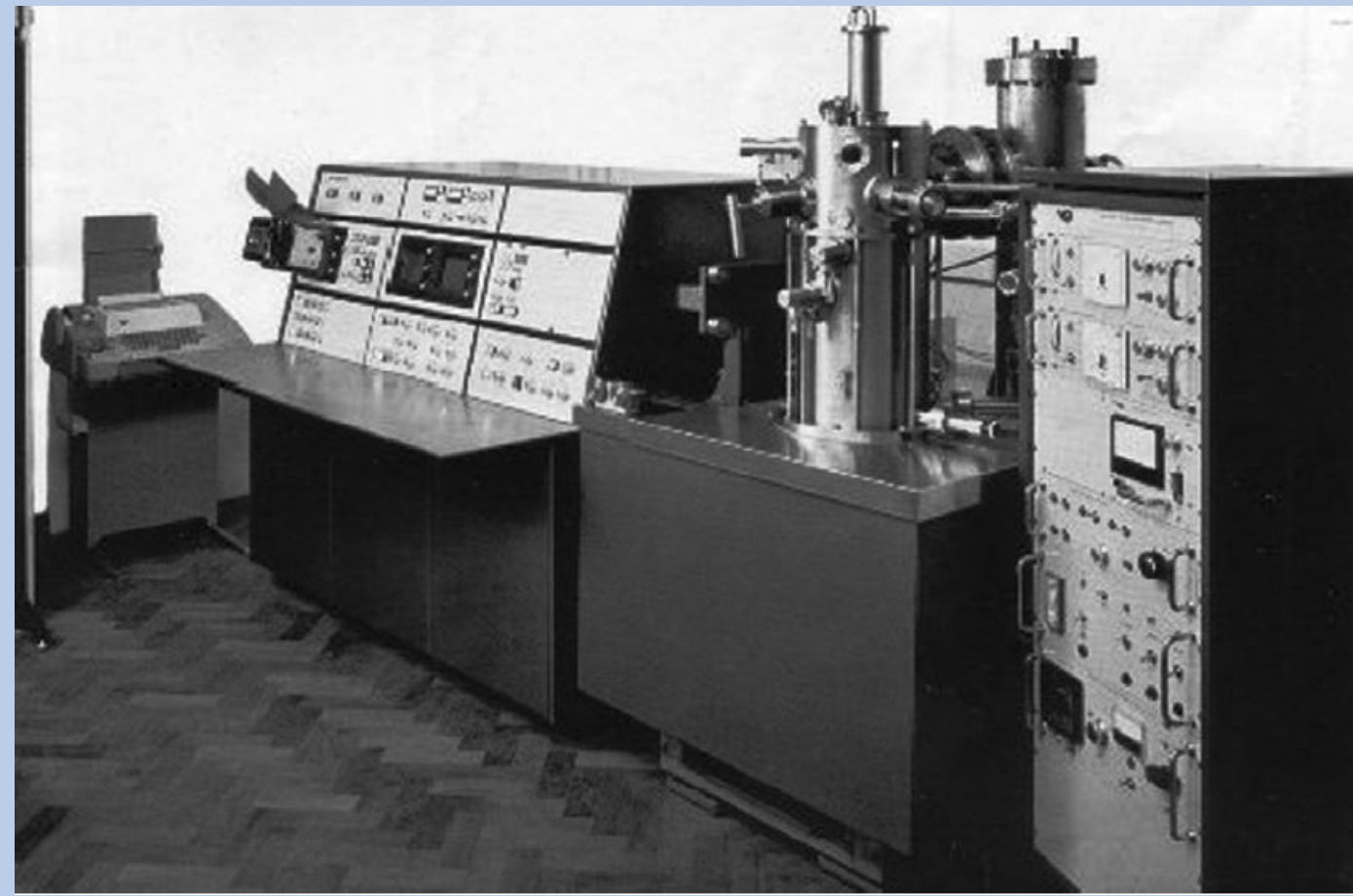


Fig.2. From Newbury's report, he worked with VG to design and build the first FE-STEM outside the USA. Shown is an early VG501 STEM.

Monte-Carlo calculations

Starting in 1978 he worked with Dale Newbury (also from Oxford) at the (US) National Bureau of Standards. He made electron-matter interactions visible using Monte-Carlo calculations on a PC (instead of on a main frame). This was reflected in many publications and books over his long career.

MONTE CARLO MODELING FOR ELECTRON MICROSCOPY AND MICROANALYSIS
David C. Joy

A model for calculating secondary and backscattered electron yields
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KEY WORDS. Monte Carlo model, image simulation, secondary cascade.

Monte Carlo modeling of ion beam induced secondary electrons
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ABSTRACT
Ion induced secondary electrons (ISEs) can produce high-resolution images ranging from a few μm to 100 μm over a wide range of materials. The interpretation of such images requires knowledge of the secondary electron yield (SEY) for each of the elements and material present and as a function of the incident beam energy. Experimental data for various ions are currently limited to 40 elements and ion compounds which electron ions are not well represented. To overcome this limitation, we propose a simple procedure based on the comprehensive work of Berger et al. Here we show that between the energy range of 100 keV the range of all ions for element and compounds can be satisfactorily represented by a single universal curve. The agreement between the fitted experimental data for 100 elements and the procedure is good, and has been found to provide reliable yield data for a wide range of elements and compounds.

MSA/MAS and Lehigh course Activities

In 1980 he was MSA Program Chair. The M&M meeting was supposed to be in San Francisco. At the last moment, it had to be moved to Reno. It was managed without missing a beat, although he found it exciting. At MSA, he was also proud to be Chair of Publications committee. For years, he contributed to the textbook and the Lehigh courses, recruited by Joe Goldstein. He also presented MSA short courses, among many other lectures.

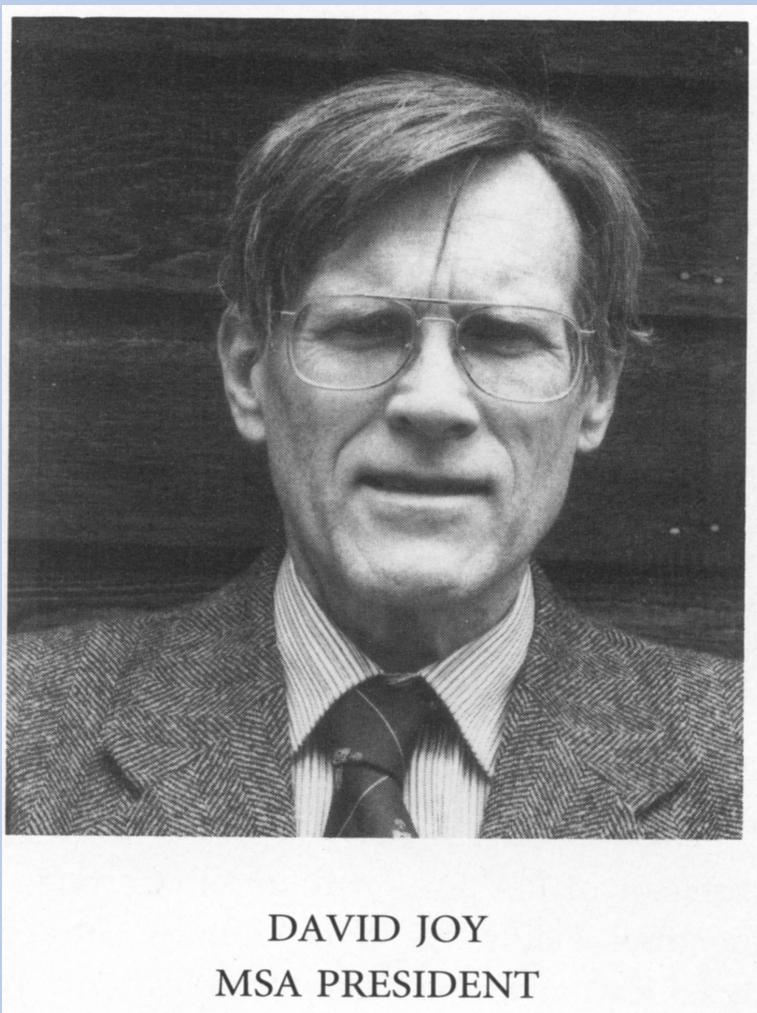


Fig. 3. Famous textbooks for Lehigh courses

ORNL

In 1987 he was appointed Distinguished Scientist at Oak Ridge National Laboratory (ORNL). While there, his interest was high-resolution SEM, in which he was long associated with Hitachi. Later his interest was helium-ion SEM, working with Zeiss 9 (Fig. 4).

Starting in 2005, he was responsible for the EM Facility at Center for Nanomaterials at ORNL.

He published on aberration-corrected SEM, Low-energy SEM, E-beam lithography, ion beam fabrication, analysis and imaging, Monte-Carlo electron-beam interaction calculations, blockface FIB-tomography, Helium-ion imaging and microanalysis, etc., etc.

He played church organ and was a devotee of Gilbert and Sullivan, but with wide-ranging musical interests. As with most of the pioneers in microscopy, he was interested in radio at a young age, and he held the amateur radio callsign AC4FN. He had an interest in CW (Morse code).

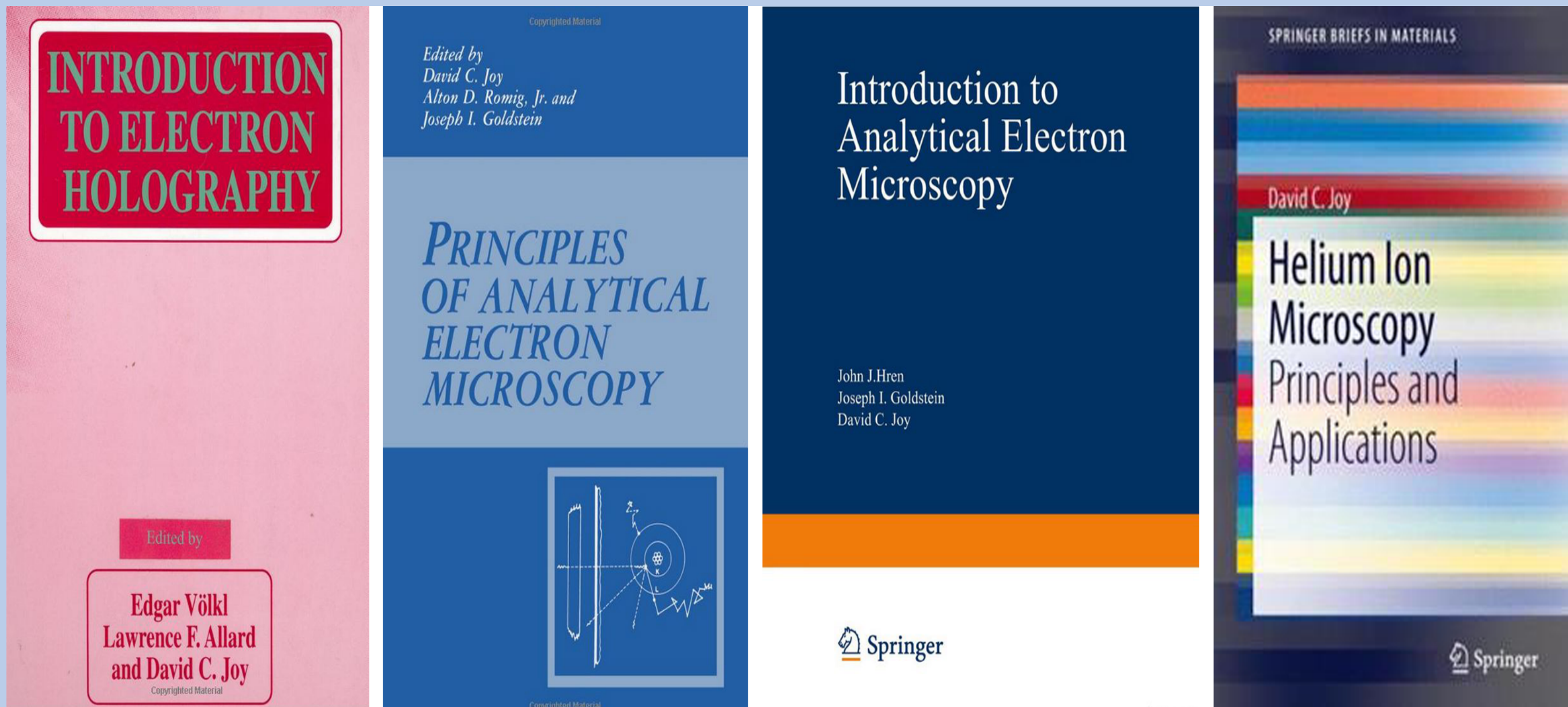


Fig. 4. He contributed several additional books and had 9 patents.

Honors

- Fellow of RMS, MAS, and MSA
- 1999 Semiconductor Research Consortium Researcher of the year
- 2010 MAS Duncumb Medal (MAS)
- 1982 MAS President
- 1999 MSA President

Acknowledgements

There are hundreds of entries in David's bibliography, so only the acknowledgements that led to this poster are listed:

Newbury, D.E. (2022) A Remembrance of David C. Joy, a True Microscopy and Microanalysis Pioneer. (Left-hand picture at top)

Newberry, S. P. (1990) Video Interview of David Joy, Available from the MSA Archivist. (Right-hand picture at top).