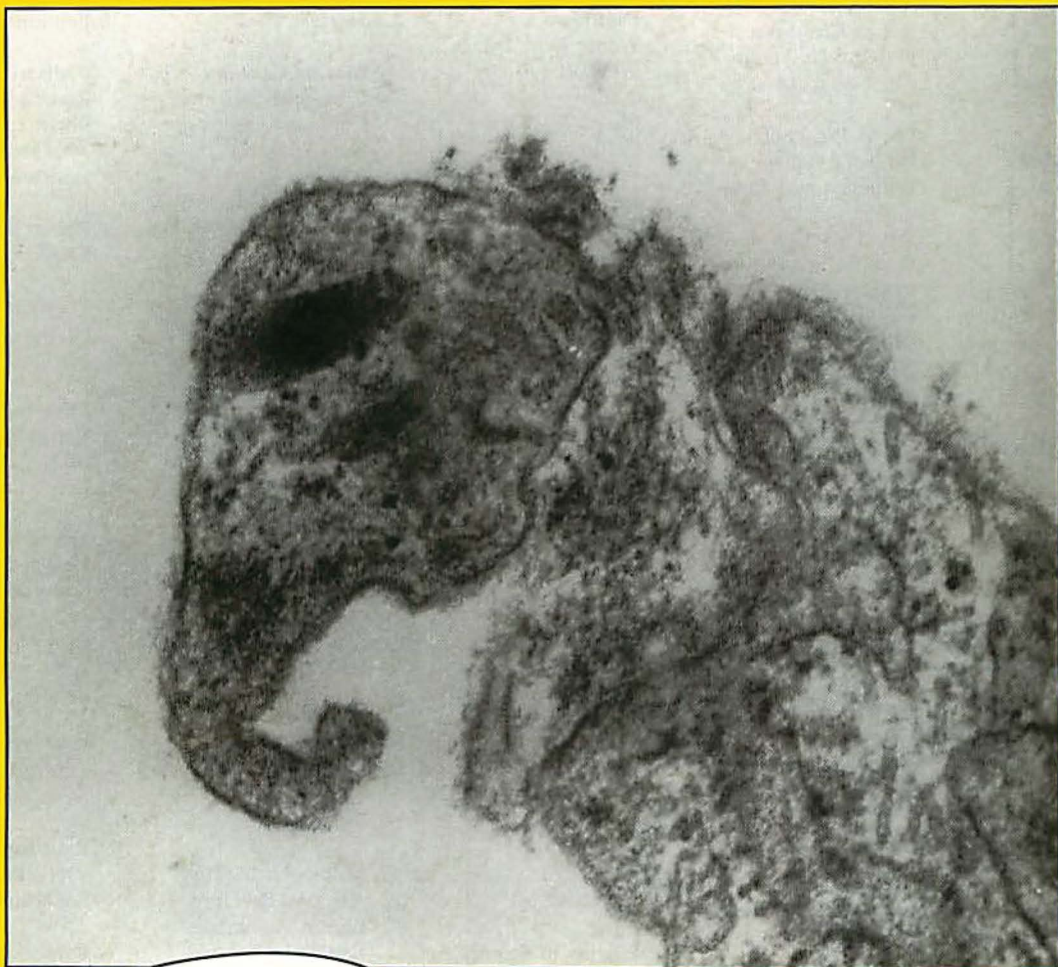
Annals of Improbable Research

The Journal of Record for Inflated Research and Personalities

Vol. I, No. 2 March/April 1995 **$4.95**



SPECIAL TEACHERS' ISSUE!

EFFECTIVENESS OF FORTUNE COOKIES
CINDY CRAWFORD ON CHEMISTRY
THE DEAD IN THE CLASSROOM

and Internet Barbie

Xerox Enlargement Microscopy (XEM)

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A revolutionary new microscopy technique makes it possible to achieve subatomic resolution levels with standard copying machines. In the past, high resolution had been achieved through existing techniques such as transmission electron microscopy (TEM), atomic force microscopy (AFM), etc. A full-scale revolution in thinking was required to break the existing limits set by these archaic methods. The authors present Xerox Enlargement Microscopy (XEM), a technique that will take high resolution microscopy to another new and exciting realm. See Figure 1.

Figure 1. *Technicians perform Xerox Enlargement Microscopy, using standard copying machines.*

Description of the Technique

There are a number of important advantages to this new technique. First and foremost, it is an extremely simple technique. Figure 2 describes the procedure in flow chart form. Since copy machines are already in existence in most laboratories, no new expenses are required. Most machines can be operated at a cost of approximately five cents per page, significantly less than the current rates for operating a TEM or STM.

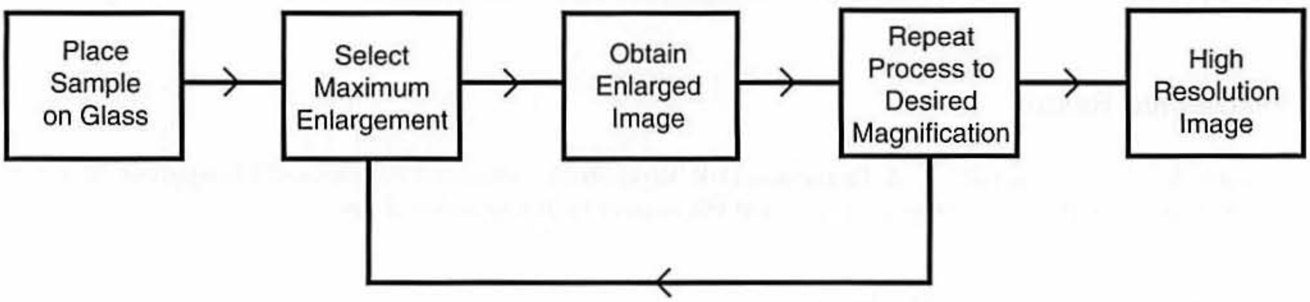

Figure 2. Flow chart depicting the XEM experimental procedure.

No sample preparation is necessary at all. Figure 3 is an XEM micrograph of ferroelectric barium titanate ($BaTiO_3$) magnified 15,392 X. This micrograph was taken using a Xerox 1090 copy machine in collation/stapling mode on BaTiO3 in powder form. For the Xerox 1090, the maximum enlargement is 155%, so that it required 22 enlargement steps to achieve 15,392 (1.55^{22}=15,392).

Collated and Stapled XEM

On the more sophisticated XEM instruments, a collation and/or staple option may be available. This is a powerful tool which, to the knowledge of the authors, has no parallel in the other high resolution imaging techniques.

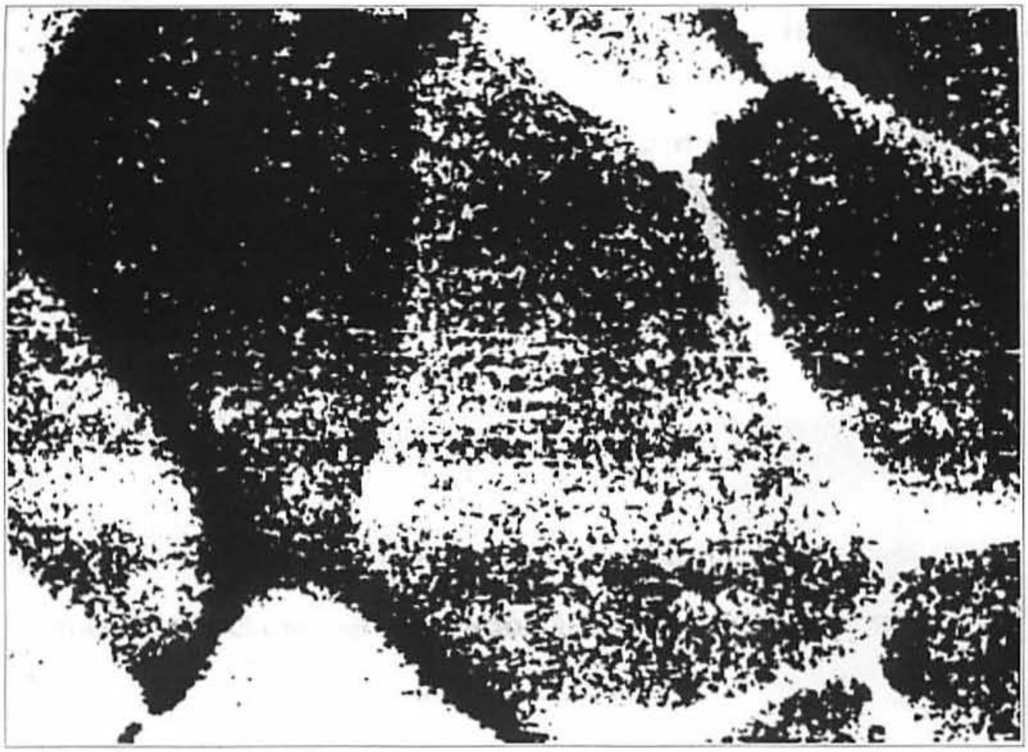

Figure 3. *XEM micrograph of $BaTiO_3$ magnified 15,392 X.*

Ultra High Resolution XEM: Images of Atomic Hydrogen

By enlarging 48 times, an incredible magnification of 1,367,481 X was achieved on samples of deuterated ammonium hydrophosphate ($NH_4H_2PO_4$). For the first time, a single deuterium ion could be imaged, as seen in Figure 4. One can see remarkable evidence for the Heisenberg uncertainty principle as we see the "quantum fuzziness" of the proton-neutron nucleus and orbital electron.

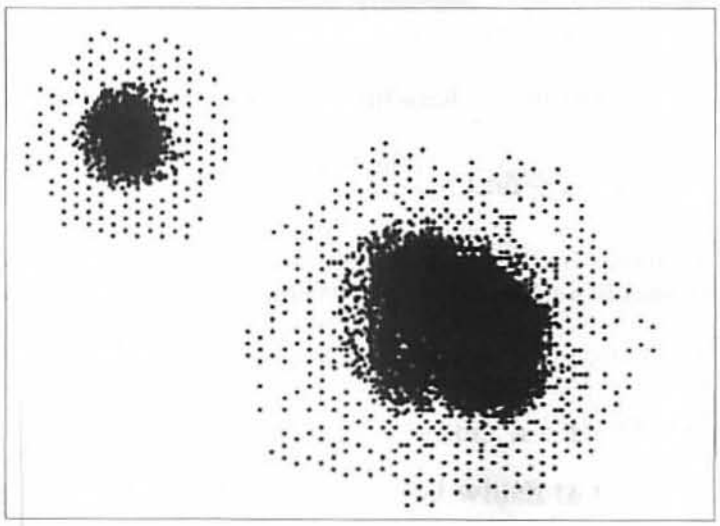

Figure 4. *XEM micrograph of a deuterium atom.*

Conclusions/Future Work:

A simple, cost effective, high resolution technique has been presented. Further work currently under investigation is divided into two main areas. First, the possibility of obtaining diffraction data from the XEM images is being investigated by theoreticians. Secondly, our experimentalists are attempting to probe the nucleus via XEM and verify the existence of quarks.

References

1. *Opticks*, Isaac Newton, 1704.
2. *Xerox 1090 Operation Manual.*
3. Mongolian Patent number 4 (1993).
4. Private communication with Dr. Clive A. Randall.