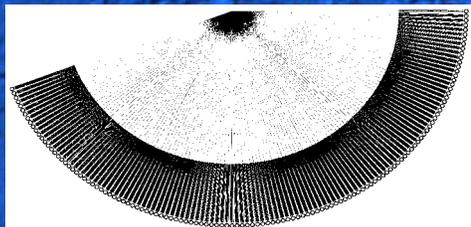


# Super D2B or D Not-to-Be

A high resolution, high intensity diffractometer

Emmanuelle Suard and Alan Hewat, ILL Diffraction Group

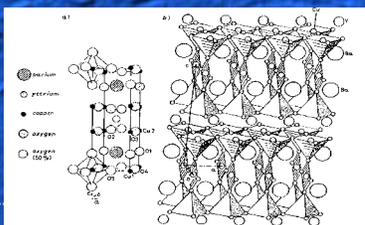


### What do we propose, and what will it cost ?

- A pseudo-2D, very high resolution detector array 3.5 MF
- New monochromator & primary diffractometer 2.5 MF

### What new science will be possible ?

- Intensity x6x2, small samples, new materials, high pressure...
- Highest resolution, subtle transitions, magnetic/elect order...



### Structure of the 90K high Tc superconductor

- Left - by X-rays (Bell labs & others)
- Right - by Neutrons (ILL, CNRS & Bell labs)
- The neutron picture gave a very different idea of the structure - important in the search for similar materials (replace chains by layers)

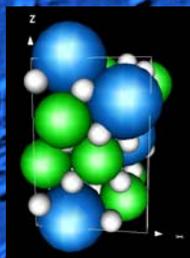
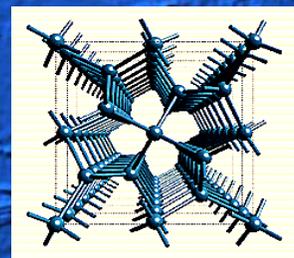
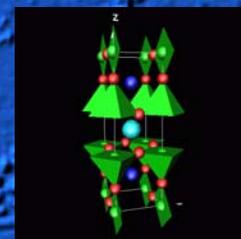
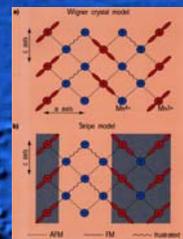
### Why Powders ?

- Phase transitions break up single crystals
- High resolution reveals subtle phase transitions
- New materials are first available only as powders
- Sample environment is easier with NPD, pressure...



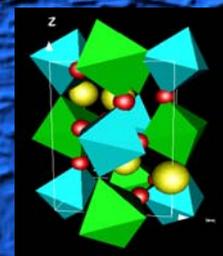
### The Super-D2B High Resolution Diffractometer

- Very high resolution of complex structures
- Charge reservoirs in oxide superconductors
- New phases of ice & hydrogen bonding
- Structure of hydrogen storage in metals
- Location of light molecules in zeolites
- Magnetic structures using long wavelengths
- Charge ordering in mixed valence ceramics
- Transitions & order in CMR materials



### Who supports the super-D2B proposal ?

- ILL Management Board recommendation for 2001 funding
- Alpha+ rating by ILL Instrument Committee (Ch. de Novion)
- 1st priority of ILL Magnetism College (R. Cywinski et al)
- 1st priority of ILL Crystallography College (W. Kuhs et al)
- Recommended by 1999 external review of ILL instruments
- British super-D2B proposal for ~10 MF from EPSRC
- French Ministry funding backed by B. Raveau et al. (Caen)
- German emulation on new Munich reactor (SPODI)

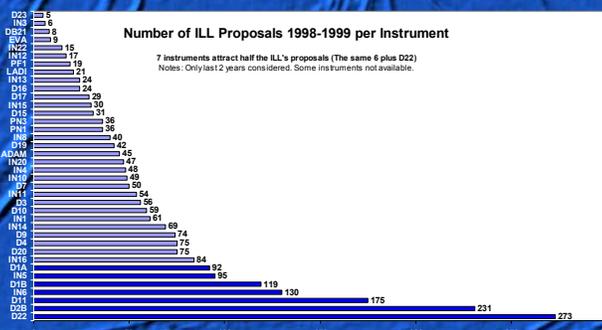
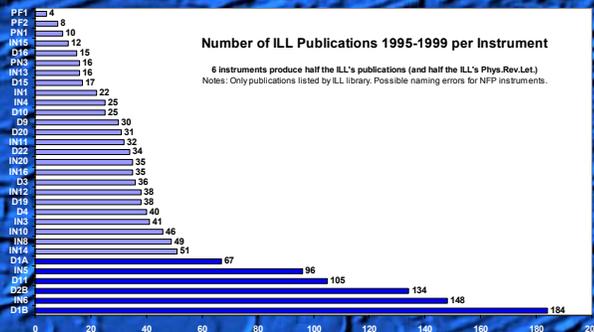


### ● R. Cywinski Magnetism College Chairman

*"The subcommittee expressed its strongest support for the super-D2B high-resolution diffractometer upgrade... the principal advantage of the proposed order of magnitude increase in intensity would not be that more experiments could be performed, but that new science would ensue".*

### ● W. Kuhs Crystallography College Chairman.

*"Over one hour was devoted to the discussion... the highest priority was given ex aequo to Thermal LADI and the D2B upgrade. Both proposals were considered of outstanding quality, both in its scientific case and its technical feasibility".*



### ● Ch. de Novion Science Council Powder Review

*"The super-D2B upgrade project, presented within the new ILL Millennium Programme, was considered as a first priority, in particular the new detector set. This would allow to use routinely the D2B instrument in its highest resolution mode".*

### ● M. Latroche Crystallography College Chairman.

*"Our research group has shown the complementarity between neutron and synchrotron techniques by solving complex structures using joint refinement... from D2B and BM16 at ESRF. These structures cannot be solved from synchrotron data alone, and neutron data were essential..."*

### ● R. Cywinski further wrote in October 1999

*"The subcommittee expressed its strongest and unequivocal support for the super-D2B high resolution diffractometer upgrade". "Several Experiments proposed during this round underlined the need for both high resolution and high count rate".*