

Surface Science at the University of Liverpool



Dr Steve Barrett

**Department of Physics
and
Surface Science Research Centre**



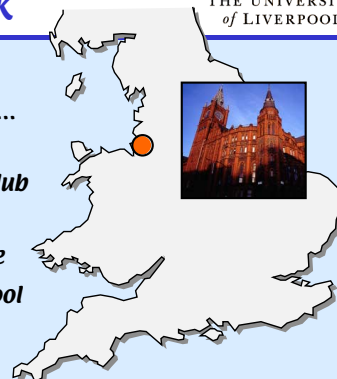
Liverpool, UK

THE UNIVERSITY
of LIVERPOOL

Home of The Beatles...

Liverpool Football Club

*...and since 1878 the
University of Liverpool*



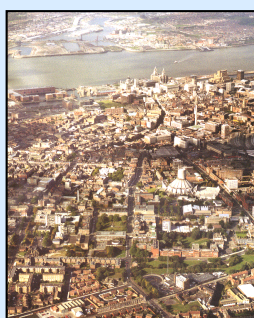
THE UNIVERSITY
of LIVERPOOL

City of Liverpool

**River
Mersey** →

← **City
centre**

**University
campus** [



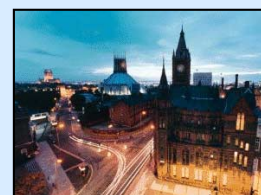
THE UNIVERSITY
of LIVERPOOL

The University

**11,000
undergraduates**

**2,000
postgraduates**

**In Physics, 200 u/g and 70 p/g
30 academic staff**

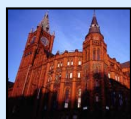


THE UNIVERSITY
of LIVERPOOL

Physics 'League Table'



1	Cambridge	85.6
2	Liverpool	85.4
3	RH & Bedford	85.0
4	Reading	84.7
5	Warwick	83.6
6	Manchester	82.9



From 'The Guardian University Guide' May 2001



THE UNIVERSITY
of LIVERPOOL

Research Groups

	<i>Staff / PhD students</i>
High Energy Physics	30 / 15
Nuclear Structure	20 / 20
Surface Physics	10 / 15
Condensed Matter	10 / 10

Surface Science at the University of Liverpool

Surface Physics



Rare-Earth Metals

Quasicrystals

Surface Alloys

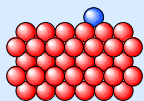
Rare-Earth Metals



Rob Blyth Sarnjeet Dhesi
Adam Patchett Martin Evans
Richard White Myoung-Ho Lee
Nigel Tucker Chris Searle
Orhan Zeybek Nasser Moslemzadeh

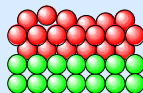


Bulk Crystal or Thin Film?

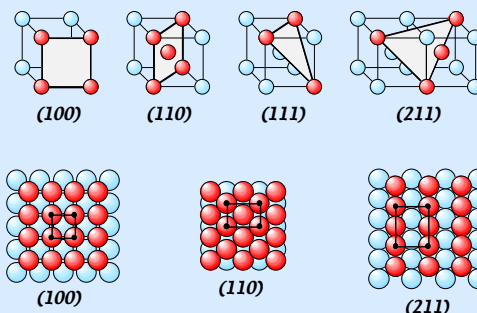


A bulk single crystal has good long-range order, but there is always some surface contamination.

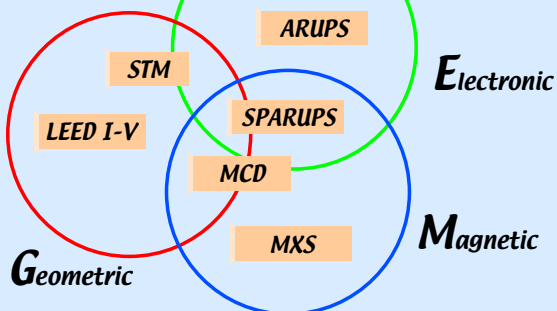
An epitaxial thin film should have less surface contamination, but the long-range order will not be as good.



BCC Substrates



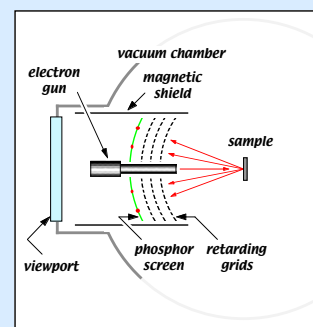
Surface Techniques



LEED

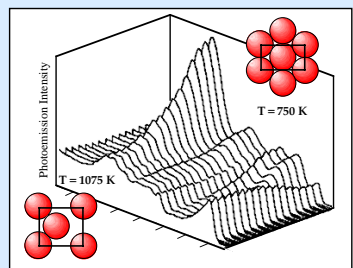
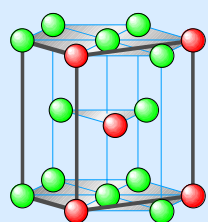


Low-energy electron diffraction is used extensively to determine surface crystallographic order



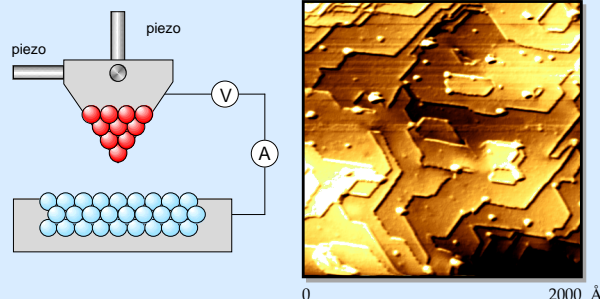
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Surface Reconstructions

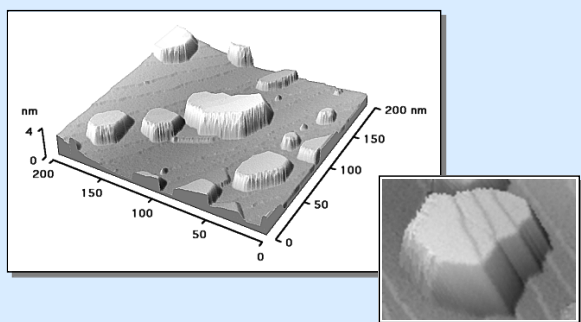


Erbium (1120)

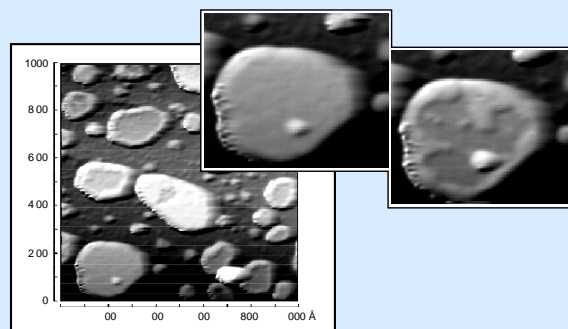
Scanning Microscopy



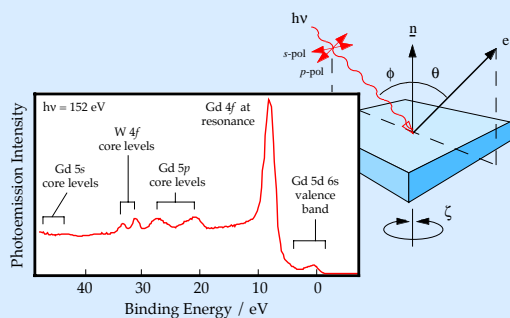
Growth of Gd/W(110)



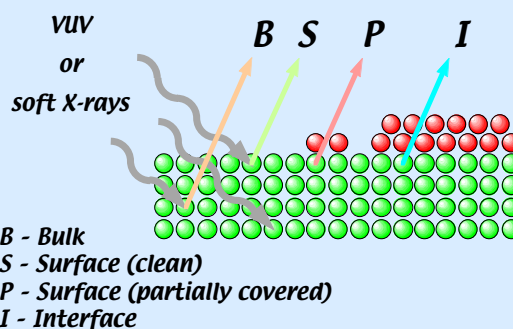
Exposure to H



UV Photoemission



Core-Level Shifts

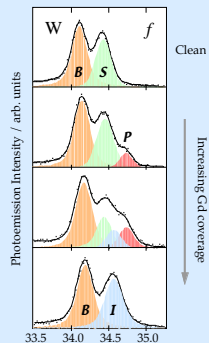


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Core-Level Shifts



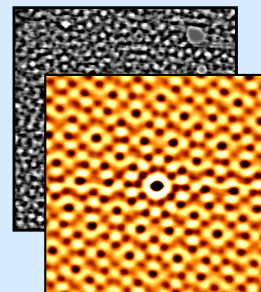
Taking photoemission spectra from the W 4f core levels as Gd is deposited shows the formation of the Gd/W interface.



Quasicrystals



Recognising the presence of quasicrystalline (5-fold or 10-fold) symmetry in an STM image can be very difficult.



Using image processing, the autocorrelation function reveals the 10-fold symmetry.

