



**Australian Institute of Physics
NSW Branch (March Public Talk)**

**“The Problem of Energy States on Metal
Surfaces and How to Solve It”**

Dr Marlene Read

University of New South Wales

Tuesday 25th March 2008 @ 7.00PM

At the

Slade Lecture Theatre, School of Physics, University of Sydney

Public talk arranged by: The Australian Institute of Physics (NSW Branch)

Entrance is FREE

Summary of talk:

Fundamental to understanding all electronic properties of surfaces is knowledge of the quantum electronic energy states. As devices get smaller, surface properties become more important. It has been suggested that systems such as organic molecules or alkali metal atoms adsorbed onto metal surfaces, such as sodium (Na) atomic layers on a copper (Cu) surface, could have possible applications as quantum electronic devices operating at room temperature. A detailed knowledge of the surface and interface states of these systems is needed. As a first step, methods to definitively determine all the surface states of clean metal surfaces must be developed. This includes higher-energy excited unoccupied surface energy states and resonances as well as occupied states for electrons of each spin orientation. Experimental probes include photoemission and inverse photoemission spectroscopy, target current spectroscopy, low energy electron microscopy and diffraction. Interpreting the features of the experimental data also involves the theoretical calculation of these states. Present theoretical methods do not always predict all surface states and those predicted may deviate significantly in energy from measured features. Unoccupied higher-energy states and resonances are particularly difficult. This is, in part, because of the additional complication of substantial electron energy losses due to collisions with other electrons. A promising theoretical method which can potentially account for all surface states over their entire energy range is a scattering approach which builds up the metallic system by stacking a succession of atomic layers parallel to the surface. This method will be described and the recent results of its first application to Cu, aluminium (Al) and palladium (Pd) surfaces will be given. Comparison will be made with the results of other theoretical methods and experiment.





Brief Biography of the Speaker:

Marlene Read has been associated with the School of Physics at the University of New South Wales continuously since 1965. She was most recently a Senior Lecturer in Physics. Undergraduate study at UNSW was combined with full-time employment as a Computer Systems Analyst and Programmer with a number of Sydney companies for 8 years. Full-time doctoral studies and part-time teaching in the School of Physics followed. She was also a visiting postgraduate student at Murdoch University in Perth for part of this period. After gaining her PhD in Physics at UNSW in 1978 she was employed full-time as a Tutor/Senior Tutor in the School of Physics. Appointment as Lecturer and then Senior Lecturer in the Department of Theoretical Physics began in 1989. Her “hobby” areas of interest in physics are electromagnetism, electrodynamics and relativity and she taught in these areas from first to fourth year in the School of Physics as well as in general and solid state physics. She developed a special course on *Einstein’s Relativity* which was designed for students from any Faculty at UNSW. A passing interest in women in physics and women in the academic study and work place is still current. Her research areas in theoretical condensed matter include bulk energy bands in solids, hydrogen in metals, low energy electron and positron diffraction from surfaces and surface energy states of metal systems.

Detailed Schedule for Tuesday, 25th March 2008:

- 5.30-6.30 pm **LECTURE by Dr Mark Butler.**
- 6:35-7.00 pm **REFRESHMENTS, Slade Lecture Theatre.**
- 7.00-8.00 pm **LECTURE by Dr Marlene Read.**
- 8.15 pm **DINNER with the Speakers at Buon Gusto (Italian), 368 Abercrombie Street, Chippendale.**
E-mail Dr Fred Osman (fred_osman@exemail.com.au) if you will be able to join us for dinner.

Travel Directions:

- Train to Redfern station and walk to the **School of Physics**.
- Buses 422, 423, 426, 428, 448, and 450 from Circular Quay to City Road / King, or 412, 435, 438, 470, 483 etc. along Parramatta Road from Circular Quay.
- Drive and park in various parking lots. You will need to pay for parking (**\$6 flat-rate after 4 pm**) and display the ticket in your car. You may also find parking places on public roads outside the Uni.

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