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	Discount (before 7/14)	Regular (after 7/14)
Pre-Meeting Congress (Saturday & Sunday)		
❑ Member or Non-Member	$90	$110
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❑ Full Member Package	$270	$335
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Section 5 Subtotal $ ____________

OR

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	Discount (before 7/14)	Regular (after 7/14)
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Full Meeting (Does NOT Include Proceedings) (M-Th) *Must be a Member of one of the sponsoring Societies*		
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❑ Emeritus*	$105	$140
❑ Special Guest*(See Section 2)	$105	$140

❑ Yes, I will attend the Sunday Reception. Ticket included with my Full Registration. (Must be ✓ to receive ticket.)

Partial Meeting (Does NOT Include Proceedings or Sunday Rec.)		
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Please Specify Day(s) ❑ Mon. ❑ Tues. ❑ Wed. ❑ Thurs.

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Section 7 Subtotal $ ____________

08 HOW TO REGISTER

1. Mail completed registration form (2 pages) with check or credit card (no purchase orders) to: M&M 2000 Meeting Management, 7000 W. Southwest Hwy. Chicago Ridge, IL 60415. Make check payable to Microscopy & Microanalysis.
2. Fax completed registration form (2 pages) with credit card payment information to (708) 361-6166. IF YOU ARE FAXING, DO NOT MAIL THE ORIGINAL REGISTRATION FORM. (Faxed registration forms without credit card information will not be processed.)
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Important Reminders:

- Registrations will only be processed with full payment.
- *Deadline to preregister is August 4. Anyone registering* after that date will not be preregistered. Do NOT send this form to Meeting Management after August 4. Please bring the registration form with you to register On-Site.

CANCELLATION POLICY: Refunds will be honored, less a $40 handling fee, only if received in writing by August 4. All paid registrations include admission to the scientific sessions and commercial exhibits. Full registrations also include a Sunday Evening Reception Ticket. MSA's Federal ID and tax-exempt # is 116-042-333.

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Sections 3+5+6+7

❑ Enclosed is my Check #____________ *(Please write registrant's name on check.)*

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❑ YES ❑ NO M&M Meeting Management is authorized to charge this credit card for the full amount due. Funds over the amount that you indicated in any section will be charged to you only in the event you under calculate your registration fees. Process will be delayed if answered "NO"

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M&M 2000 Registration Page 2 of 2

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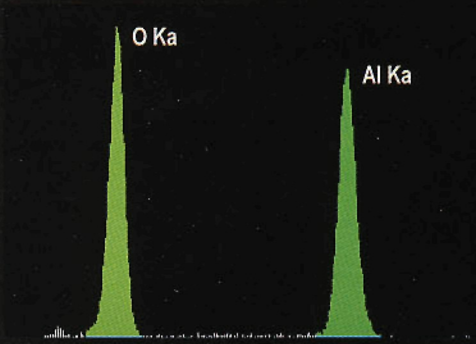

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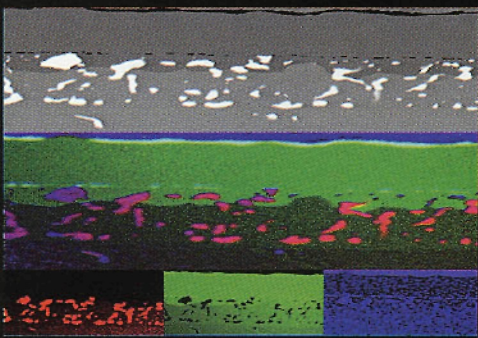

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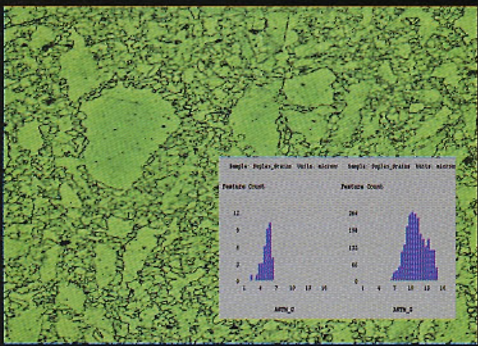

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Spectroscopy with the Photon Scanning-Tunneling Microscope

Continued from page 22

4. ABSOPTION SPECTROSCOPY

In this experiment, gold islands (40 nm thickness) were deposited inside a vacuum evaporator onto a cleaned quartz slide. Surface plasmon excitation can be generated on the gold islands resulting in some absorption of the spectrum of the incident light. The absorption peak of the gold islands is shape dependent and occurs around 535 nm for a round shaped particle. While the sample was scanned using a HeNe (632.8 nm) laser, a white light source was impinging on the gold islands. A PSTM image of the islands is shown in Figure 2 and spectra obtained as the tip was scanned are shown in Figure 3. These results show the ability of the PSTM to realize topographic images of the surfaces while performing absorption spectroscopy. The same technique could be used for studies of biological samples.[5] However, these should exhibit specific regions which display absorption.

5. RAMAN SPECTROSCOPY

In the two previously described applications of the PSTM as a spectroscopic tool, the signals collected by the fiber and induced by a low-power laser were easily detected by the mean of a monochromater and an inexpensive photomultiplier tube. In this experiment, we show the ability of the PSTM to collect sufficient spectroscopic signal intensity even with a less specialized sample having a relatively weak scattering cross section. The experiment was carried out using a standard Raman spectroscopy system with a diode array and an argon-ion laser as the source for engendering the Raman signal. For imaging purposes, a crossed-grating array (made with photolitography) etched in quartz was used. Silver was then deposited at oblique incidence on this sample in a vacuum chamber, and a solution of either cobalt phtalocyanine or benzoic acid was spin-coated onto the substrate. Figure 4 shows the PSTM Raman signal from cobalt phthalocyanine and from benzoic acid, the probe being much closer to the surface in the latter instance.

6. CONCLUSION

In this brief and general article, we have shown how the PSTM functions as a spectroscopic tool. Further work with the PSTM is currently underway to demonstrate infrared spectroscopy for chemical mapping and to study polarization effects. Since the PSTM uses no metal aperture, the possible spectroscopic signals are of a broad variety, but the field is still developmental. A substantial amount of effort needs to be devoted to sample preparation methodologies since resolution improves as roughness is decreased. Future work will include the use of two-photon processes.

1. T.L. Ferrell, F. Meriaudeau, A. Passian, J.P. Goudonnet and A. Wig, "Imaging with the Photon Scanning Tunneling Microscope", *Microscopy Today*, 99-3, 14-16.

2. S.L. Sharp, R.J. Warmack, J.P. Goudonnet, I. Lee and T.L. Ferrell, "Spectroscopy and Imaging using the Photon Scanning Tunneling Microscope", *Acc. Chem. Res.*, 26, 377-382 (1993).

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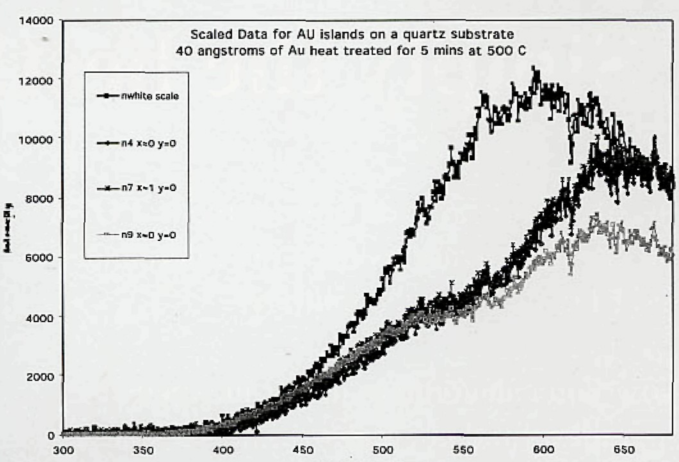

Figure 3: PSTM-acquired absorption spectra of a gold island film as the tip is scanned.

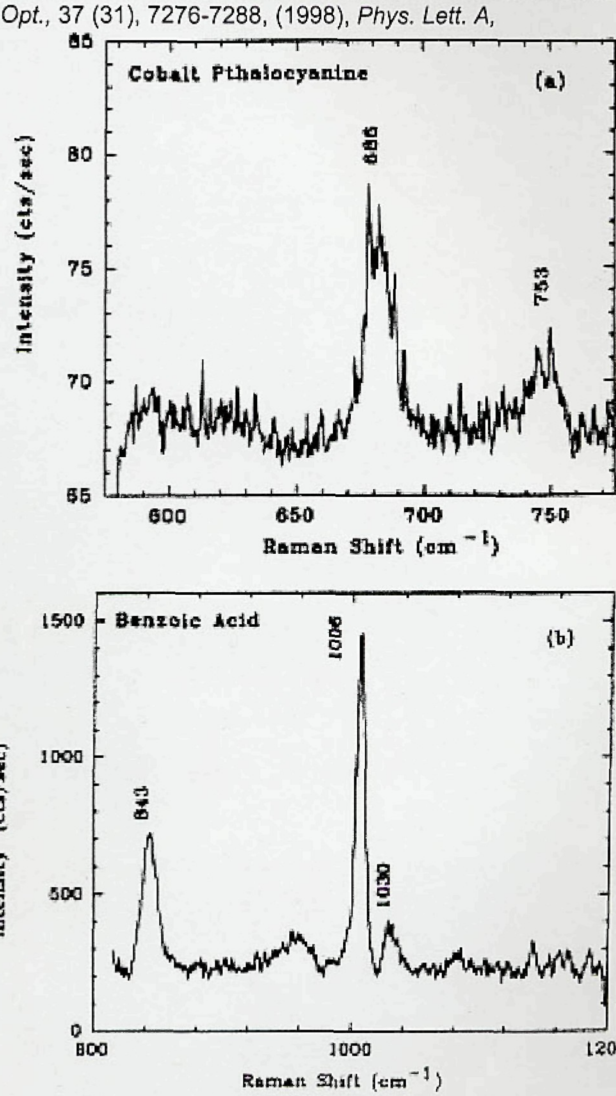

Figure 4: PSTM SERS. *Top*—Cobalt Pthalocyanine, *Bottom*—Benzoic Acid. For very small tunneling gaps the signal is much stronger, as in the case of the benzioc acid spectra. The spectral peaks identify the coupling to particular Raman-active bonds in each molecule and the relative intensities and positions of the peaks permit unambiguous identification in quite complex mixtures. But the data is shown primarily as an example of signal acquisition by a sharp probe for very low signals.

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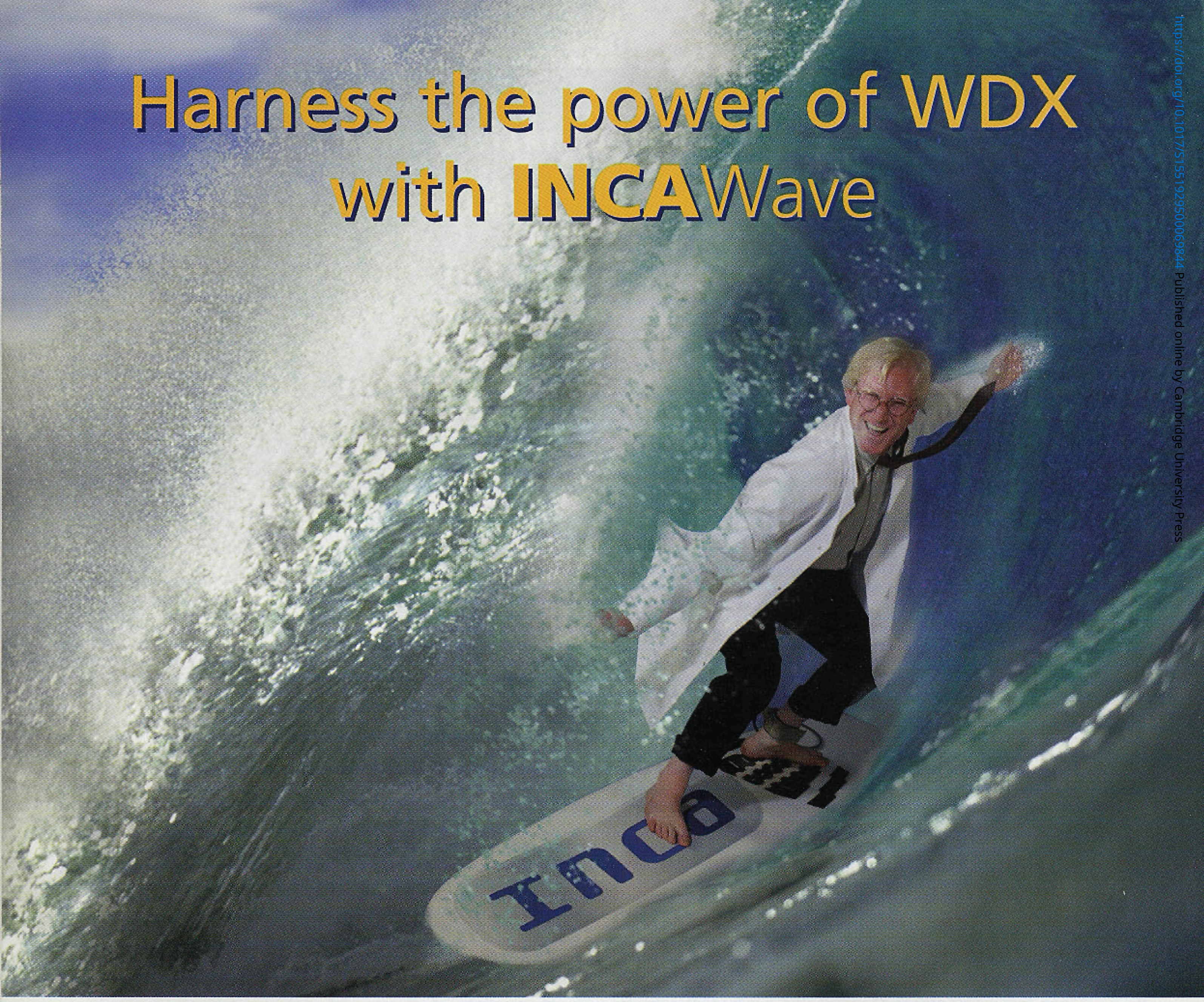

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