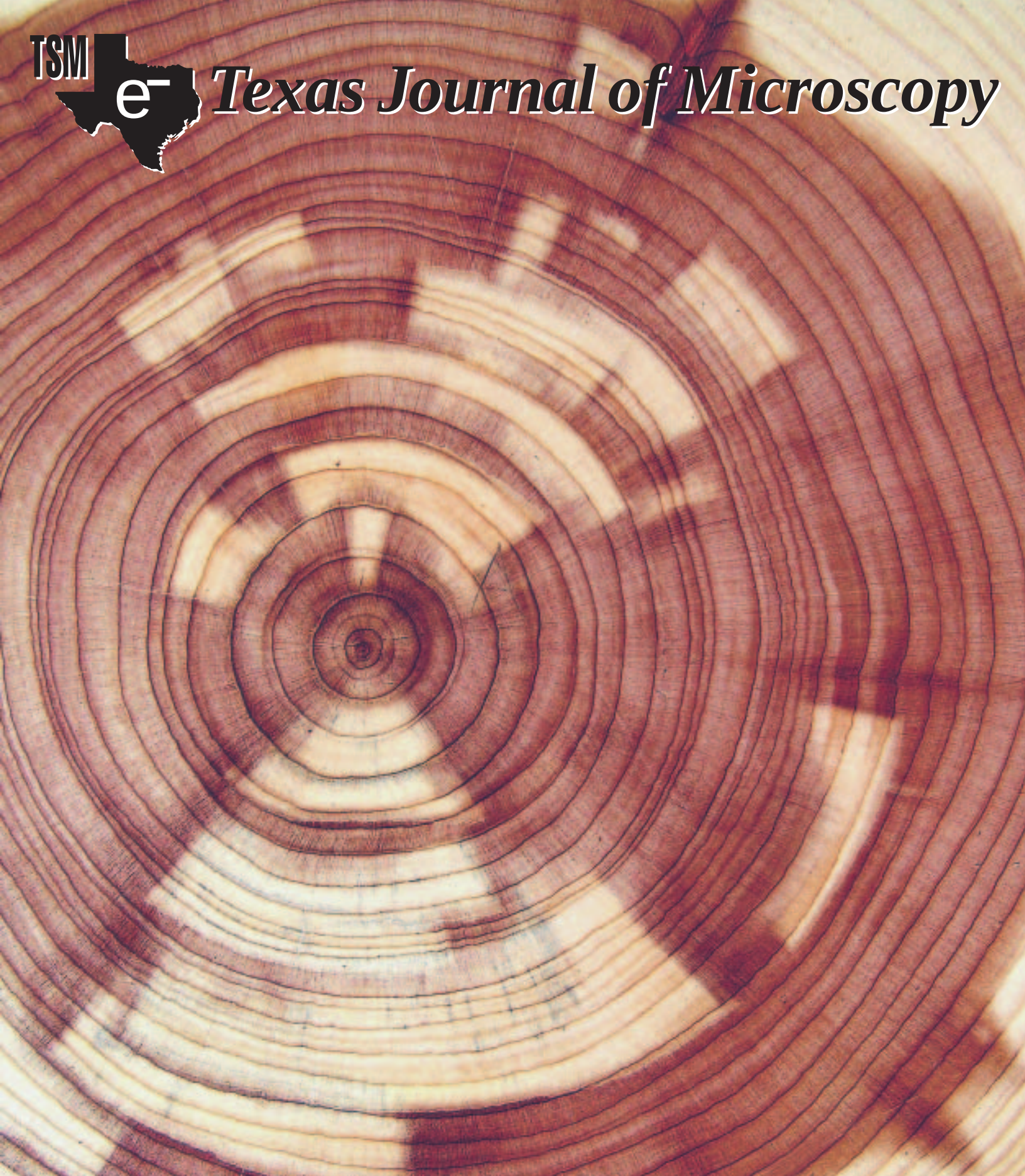
Texas Journal of Microscopy



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Rocky Mountain Juniper — H. Arnott

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ON THE COVER
Cross section of *Juniperus scopulorum* showing heartwood with peripheral sapwood. Within the heartwood there are areas of wood which are uncolored. These areas are separated by fissures (white lines), which appear to play a role in the inhibition of color change. This wood is from the collection of the Laboratory for Tree-Ring Research, University of Arizona, Tucson. See also current abstract entitled: "Significance of the 'White Line' in the Wood of Rocky Mountain Juniper (*Juniperus scopulorum*)", by Howard Arnott, The Department of Biology and The Center for Electron Microscopy, The University of Texas at Arlington, Arlington, Texas 76019.

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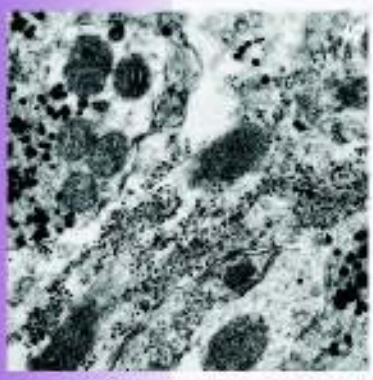

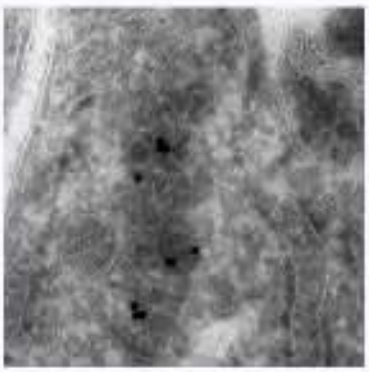

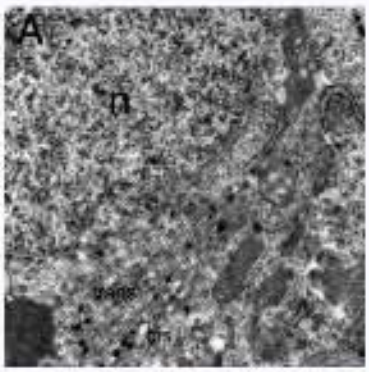

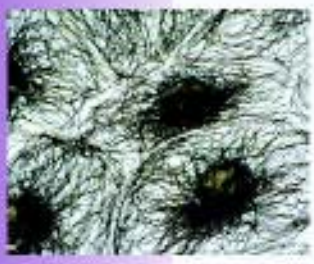

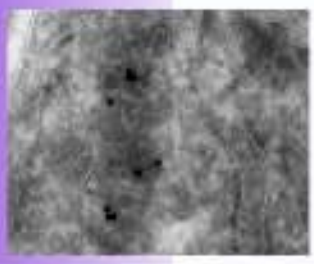

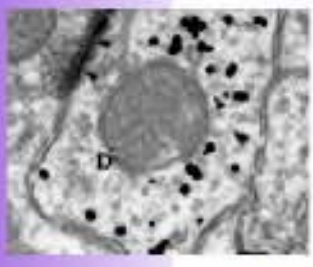

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President's Message

This has been an exiting year for the Texas Society for Microscopy! Following the very successful 40th Anniversary celebration in the spring of 2005, the Society met in San Antonio for the Fall 2005 meeting. The environment at the Sheraton Gunter Hotel was wonderful, which facilitated the sharing of science and fellowship among attendees. Pam Neill earned my respect when she managed to make reservations for over 20 people at a San Antonio Riverwalk restaurant on a Friday night on a one-hour notice! (I think we could give Pam any job and consider it done!) A new addition to our meeting program was the introduction of three Howard Arnott Student Presentation Awards with cash prizes. Our Society has been an incubator for student talent from its very beginnings. We continue to encourage students to attend our meetings and present their research. Our students provide a vital link to our future as a Society.

The Oklahoma Microscopy Society will be joining us for the Spring 2006 meeting, which is held at the Alcon Research Laboratories. We look forward to sharing discussions of microscopy with our Oklahoma colleagues and finding new research collaborators.

I would like to express thanks to the officers of TSM who have worked diligently to make this year a success for the Society. **Robert Champaign** has performed excellent service for the Society as secretary for the past two years, organizing membership information and chairing the nominating committee for new officers. **Pam Neill**, past president, has provided program chair support during Jodi's recent leave of absence. We also appreciate Pam for acting as host for our spring 2006 meeting at the Alcon Research Laboratories. **Jodi Roepsch** has continued to perform the duties of program chairman, planning our fall 2006 meeting in Dallas. **Bob Droleskey** has attended to the duties as interim appointed treasurer, putting his talents to excellent use for our Society. Bob has also been the chairman of the committee appointed to review the TSM by-laws, which were finalized last fall. We appreciate the efforts of **Becky Holdford** who, as webmaster, has facilitated our rapid and reliable communication. **Camelia Maier** has served the Society by continuing to produce and update the *Texas Journal of Journal*. We welcome **German Neal**, our new corporate member representative, who will be offering his ideas from the corporate perspective to enhance our Society's activities. We also appreciate the willingness to assume future responsibilities by incoming President **Joanne Ellzey** and Secretary **Tina Halupnik**.

Our direction for the future of the Texas Society for Microscopy must be to continue embracing the changes that will come to challenge us. We should continue to value our Society as one that is multidisciplinary. We also need to encourage and appreciate our corporate members and vendors, who present new technology workshops and displays to our members. Finally, we need to do more in encouraging our members to attend the meetings and present their microscopy research, and in recruiting new members. This way, the TSM Society will thrive in future years! It has been an honor to serve as President during the past year.

Sandra L. Westmoreland
TSM President 2005-2006

Call For Papers

Manuscripts are needed for the next edition of the Texas Journal of Microscopy. Please send your work as short communications, full articles or review articles in biological sciences, material sciences or education to:

Camelia G.-A. Maier, TSM Journal Editor
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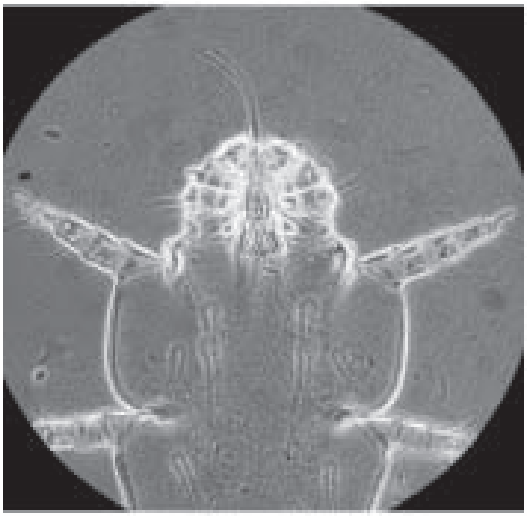
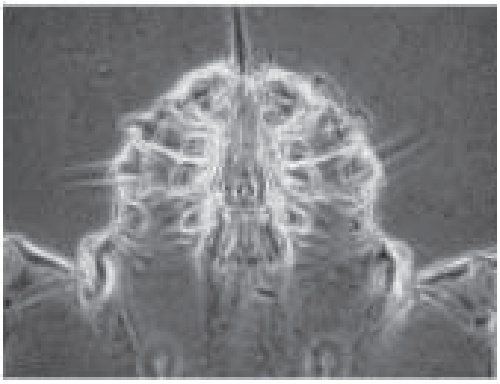
Manuscript deadline is July 5, 2006

Answer to "What Is It?"

from Texas Journal of Microscopy 36:2

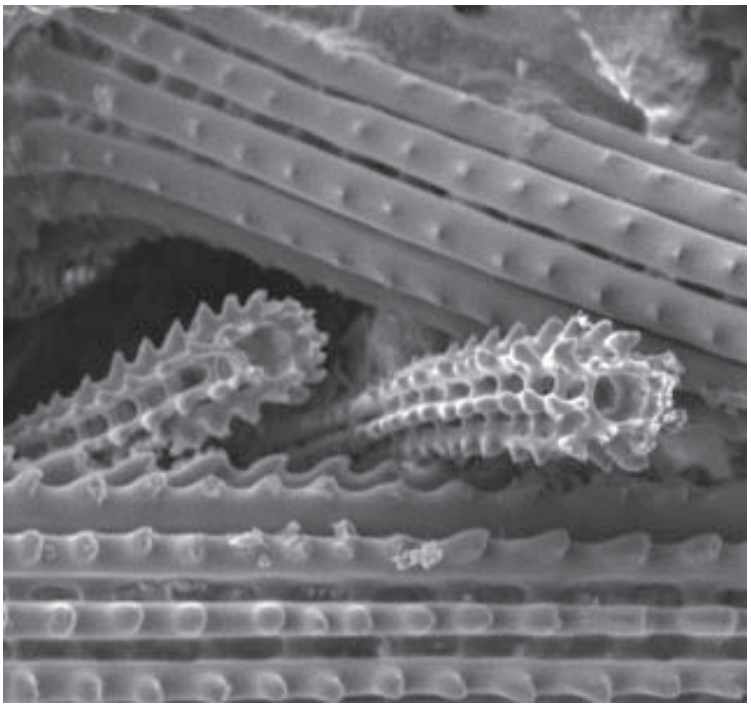




The phase contrast images of whole mounts of a mite were taken with a point-and-shoot digital camera (Nikon CoolPix 990) on a microscope with the eyepiece left in place. The lens of the camera was put in direct contact with the eyepiece, the camera was maneuver until a good image was obtained on the in-camera monitor and the picture was shot. Since the light paths in the camera and the microscope were aligned, there was enough light coming through the lens such that the shutter speed was less than 1/60. The photograph to the right shows that the zoom feature on the camera can be used to get a detailed view of the specimen's area of interest. These types of pictures are mainly for record keeping and consequently do not have the scale bar to indicate magnification.

Andrew Chen, Research Entomologist, USDA-ARS, Knipling-Bushland US Livestock Insects Research Laboratory, Kerrville, Texas 78028-9184.

What Is It? *Answer in Next Edition*



SEM by **Shawn Prapta**, **Sandra Westmoreland**'s student at The University of Texas at Arlington.

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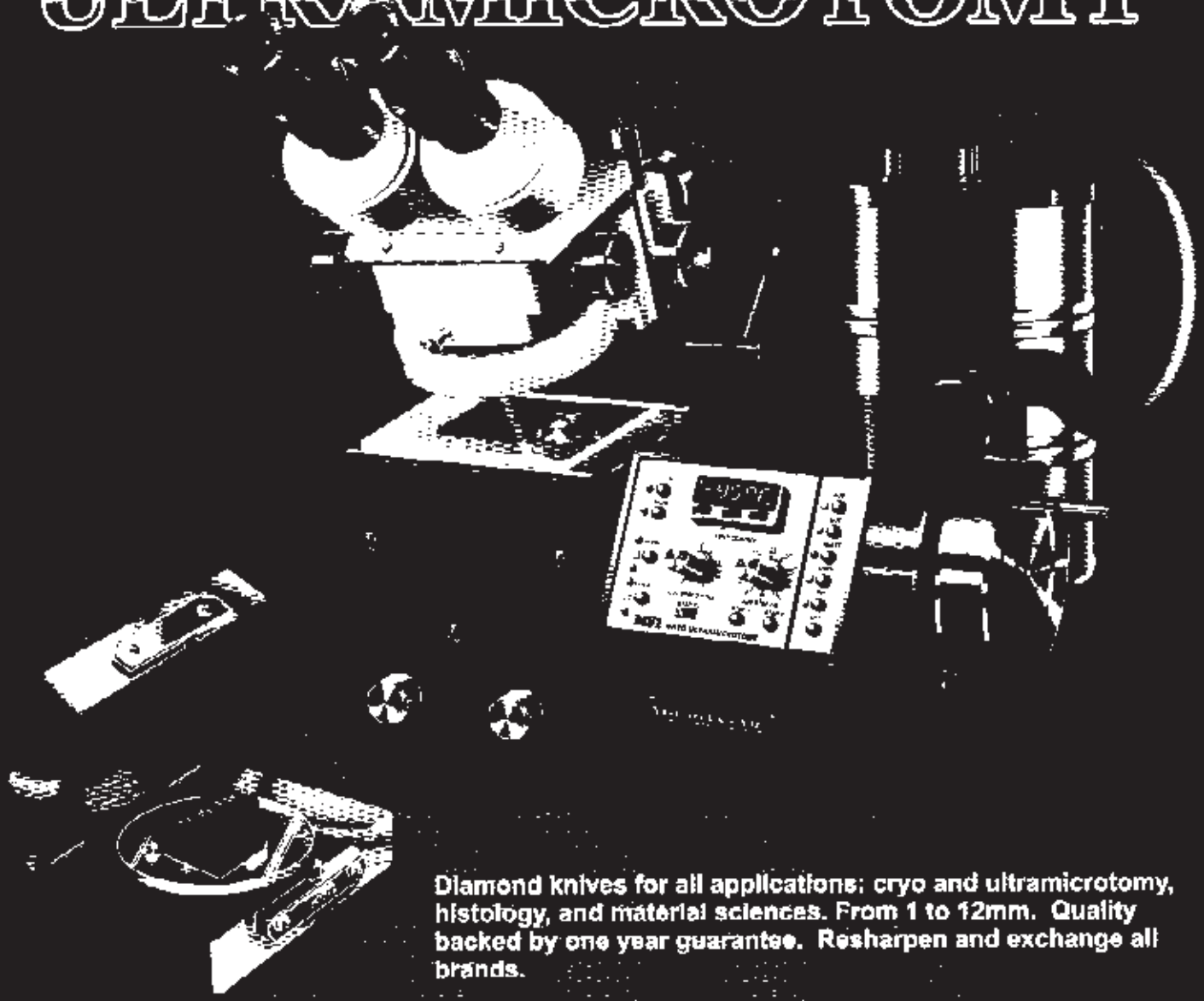

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Abstracts

BIOLOGICAL SCIENCES
SPRING 2006

VISUALIZATION OF NS5A ACTIVITY VIA FLUORESCENCE MICROSCOPY. ALEJANDRO D'BROT, GIRIDHAR AKKARAJU. Department of Biology, Texas Christian University, Fort Worth, Texas 76129.

Our research goal is to identify potential inhibitors of NS5A, a Hepatitis C virus (HCV) protein that inhibits the antiviral response in cells. If NS5A can be inhibited, the antiviral response can be restored in infected patients, and with the use of HCV specific drugs, HCV can be eliminated from the patients system. An IFNb-eGFP + NS5A reporter cell was constructed to assay NS5A inhibition. IFNb is one of the many genes inhibited by NS5A, so by using an IFNb promoter attached to an eGFP gene we can test whether or not the IFNb promoter is being turned on during viral infection, and consequently, whether or not NS5A is inhibiting it. If NS5A is active, it will inhibit the IFNb promoter and prevent the cells from expressing eGFP (and consequently from glowing green under a fluorescent microscope). If NS5A is inhibited, the cells will express eGFP and glow green. A stable cell line that exhibits correct gene expression has been created, and the cells were treated with plant extracts (provided by Dr. Manfred Reinecke, TCU), which had been shown to possess antiviral properties. Therefore, there is a chance that the compounds in plant extracts might also inhibit NS5A.

CYPSELAR EPIDERMAL MORPHOLOGY OF PSEUDOGNAPHALIUM AND RELATED GENERA (ASTERACEAE). ANDREW WALTKE and GUY NESOM, Department of Biology, Texas Christian University, Fort Worth, TX 76109; Botanical Research Institute of Texas, Fort Worth, TX 76102.

Several primary types of cypselar (fruit) epidermal morphology are found among six putatively closely related genera, as seen under SEM of 25 Asteraceae species. The primarily New World genera *Pseudognaphalium*, *Achyrocline*, and *Stenophalium* have elongate, imbricate epidermal cells (distal end overlapping the base of the adjacent cell). Variation occurs among species in the degree that the distal ends are raised, and the surface may appear (1) smooth (distal ends appressed), (2) roughened by imbricate papillae (distal ends slightly raised above the base of the adjacent cell), or (3) distinctly imbricate-papillate (distal ends greatly raised above the base of the adjacent cell). Among the Old World genera, species of *Laphangium* and *Homognaphalium* have cypselar surfaces with rectangular epidermal cells producing irregularly scattered, 3-celled, elongate, glandular papillae. The large genus *Helichrysum* (*ca.* 500+ species, restricted to the Old World) is polymorphic, with some species (including the type of the genus) producing glandular papillate surfaces, other species producing smooth or imbricate-papillate surfaces. *Laphangium luteoalbum*, which has glandular achenes, occurs in North America but probably is native to Eurasia, where its closest relatives are found. The taxonomic implication of these morphologies is that continued recognition of the New World genera may necessitate recognition of segregate genera among the species of *Helichrysum*. Alternatively, the New World genera might be included within *Helichrysum*.

SEED VARIATION IN *GAILLARDIA PULCHELLA* FOUG. OF CENTRAL TEXAS. BRITT LEIGH BENEDICT*, ANN E. RUSHING, and DARRELL S. VODOPICH, Department of Biology, Baylor University, Waco, TX 76798-7388.

Seeds of 20 field-collected *Gaillardia pulchella* populations were evaluated to determine if significant variation of seed characteristics existed either among or within populations and to detect relationships between those characteristics. Seeds were examined using both light and scanning electron microscopy. Seed characteristics studied were: total length, base length, base width, hair length, wing length, wing width, and wing number. The characteristics with the most within-populations variation were base length, base width, wing length, and hair length. Among populations, no evident north-south or east-west trends were found in the traits that showed the most variation within populations. No significant correlations were found between seed characteristics.

TECHNIQUE FOR RETAINING THE MORPHOLOGY OF CELLS GROWN ON A POLYCAPROLACTONE SCAFFOLD. DONGMEI FAN, GIRIDHAR AKKARAJU, JEFFERY L COFFER, ERNEST F. COUCH, Dept. of Chemistry and Dept. of Biology, Texas Christian University, Fort Worth, TX 76129.

There is great interest in tissue engineering for the production of bone and other products. To this end cells can be grown on scaffolds in order to create a matrix similar to that found in nature. The goal is to induce cells to not only grow, but to differentiate; in the case of bone, into osteocytes that and produce an extracellular matrix. In this study mouse stromal cell were seeded on microfibers made in our laboratory from polycaprolactone, a nontoxic biodegradable polymer. After allowing the cells to proliferate they were fixed in a mixture of glutaraldehyde and paraformaldehyde in a phosphate buffer. They were then washed in buffer and post-fixed in OsO_4. The scaffold and cells were then dehydrated through increasing concentrations of ethanol. This was followed by three changes of propylene oxide. This was a critical step because the propylene oxide removed the scaffold but left the cells in their original elongated shape. Also, the cells clung together forming a thin mat. A portion of the cells were flat embedded in Araldite 502 for TEM and some of the cells were returned to ethanol and dried with HMDS for SEM. A whole mount was made from some of the remaining cells. The whole mount was then observed and photographed with phase-contrast optics. Both light and electron microscopy showed well-preserved cells, which retained their original shape. This technique will be very useful in following cellular changes over time and their response to growth factors.

DETERMINATION OF EGGSHELL MICROSTRUCTURAL CHARACTERSICTS AND ASSOCIATED PHYSIOLOGICAL PROFILES IN MG-VACCINATED EGG-LAYING CHICKENS. SARAH B. MAY and SANDRA L. WESTMORELAND. The Center for Electron Microscopy, University of Texas at Arlington, Arlington, Texas 76019.

This experiment determined the effect of vaccination of commercial layers with F-strain *Mycoplasma gallisepticum* on eggshell thickness. The experiment involved multiple variables in addition to the vaccination, including three different diets and two ages of lay. Cross-section micrographs were taken on each eggshell and thickness measurements were made. These data were sta-

tistically analyzed using SAS statistical software to determine the effects of the variables on shell thickness. For treatment effects, both sham-inoculated and vaccinated data were examined for age-treatment interactions. It was found that for sham-inoculated shells, layers fed diet 1 had thinner shells in young versus old birds; however, in layers fed diets 2 and 3, young birds had thicker shells. Only in diet 3 was this difference significant (P = 0.006). For vaccinated shells, it was found that young birds produced thinner shells in layers fed all three diets. Again, only in diet 3 was this difference significant (P = 0.0011). For diet effects, shells from birds fed each of the three diets were examined for age-treatment interactions. For diet 1, sham-inoculated birds had thinner shells than vaccinated birds at both ages (24 and 50 weeks). For diets 2 and 3, sham-inoculated had thicker shells at age 24 weeks, but thinner shells at age 50 weeks that vaccinated birds. None of these results were significant. For age effects, shells taken from layers at both ages were examined for diet-treatment interactions. At age 24 weeks, sham-inoculated birds fed diet 1 had thinner shells than vaccinated birds, but the reverse was true for diets 2 and 3. At age 50 weeks, sham-inoculated birds fed all three diets had thinner shells. None of these results were significant.

DIFFERENTIATING FUNGAL SPECIES WITHIN THE FAMILY XYLARIACEAE (*ASCOMYCOTINA*: FUNGI) FROM THE PERUVIAN AMAZON. ROMINA O. GAZIS and ERNEST COUCH, Department of Biology and Environmental Science, Texas Christian University, Fort Worth, Texas 76129.

Xylariaceae (*Ascomycotin*a) are the most common decay macrofungi present in the tropics, with at least 40 genera worldwide distributed, 75% of which is found in the tropics. Samples were collected in the southeast of Peru, within "Los Amigos" Conservation Area located in the Amazon basin, place where the highest biodiversity has been reported. Fifthteen species were analyzed, presumably belonging to six different genera. Morphological characters like sporocarp, peritheci, asci, and spore size and shape are important taxonomical characters as well as some chemical reactions. *Xylariaceae* is a taxonomically complex family due to the polimorhpisms within members of the same species, therefore deep observations must to be carried out. For instance, some members of the genus *Xylaria* can have very similar macroscopical characters but looking at the spore ornamentation can reveled that they belong to different species. One of the objectives of the following project is segregating samples first into morphospecies and then classifying these samples using dichotomous keys. Scanning Electron Microscopy is a technique widely used in fungi classification because some species - such as *Daldinea concentrica* and *Daldinea eschscholzii* - can only be differentiated by their spore ornamentation. This project showed the value of the SEM technique as a reliable tool for developing further studies on fungal taxonomic treatment and biodiversity.

ELEMENTAL ANALYSIS IN MYCORRHIZAL POST OAK LEAVES. B.C. Boling[a], F.U. Naab[b], D. Smith[a], J.L. Duggan[b], and F.D. McDaniel[b]. [a] Department of Biology, P.O. Box 305220, University of North Texas, Denton, TX 76203-5220, USA. [b] Ion Beam Modification and Analysis Laboratory, Department of Physics, P.O. Box 311427, University of North Texas, Denton, TX 76203-1427, USA.

Particle Induced X-ray Emission Spectrometry (PIXE) was used to determine elemental concentrations in the leaves of ectomycorrhizal post oak seedlings exposed to four different treatment combinations of fertilization and ectomycorrhizal inoculation. Mean concentration of Mg, P, S, Cl, K, Ca, Mn, Fe, Cu, and Zn (representing 10 of the 13 essential macro and micronutrients) were significantly different across the treatment groups. Al, Si, and Sr were also significantly different. A follow up study was conducted with a 3 MeV microbeam using a 3 MV NEC 9SDH-2 Pelletron® tandem accelerator with a resolution of 10 microns. An 850 square micron area was scanned on a post oak leaf and topographical maps were generated for 11 elements.

AN ANALYSIS OF A COMPLETE FROST RING IN THE WOOD OF A ROCKY MOUNTAIN JUNIPER (*Juniperus scopulorum)*. HOWARD J. ARNOTT. The Department of Biology and The Center for Electron Microscopy, The University of Texas at Arlington, Arlington, TX 76019.

A specimen of the Rocky Mountain Juniper (*Juniperus scopulorum*) obtained from the Laboratory of Tree-Ring Research at the University of Arizona, Tucson, AZ, was studied using direct optical and Scanning Electron Microscopy. The cross section of this tree, ZMT 13U, collected by Rex Adams in the Zuni Mts. of New Mexico, contained a complete frost ring. A complete frost ring is one in which a 360 degree view of the ring can be observed and analyzed. The frost ring under consideration is in the ninth annual ring of this tree, and cross dates to 1950 (personal communication from Rex Adams); the tree began its growth in 1942. The 1950 frost ring occurs in the first one fifth of the annual ring and is therefore classified as an early frost ring. Using direct microscopy a large montage was made which showed the entire frost ring. Analysis of "complete frost rings" is rare in the literature. This case provides a unique opportunity to look at many features of the frost ring that can't be assessed from examination of frost rings in cores or stem fragments, which only show a small part of an entire frost ring. In this case, even though the annual ring shows almost double the growth on opposite sides, it is possible to see that the 1950 frost ring is symmetrical; the portion of the ring, which was damage by the frost conditions, is equal on all sides of the stem. An adventurous scientist might take this symmetry as evidence that the frost conditions were equal on all sides of the tree, i.e. no wind effect. This frost ring is unlike many early frost rings in that both the early and later parts of this annual ring consist of normal secondary xylem. The area showing frost damaged begins after 6 to 8 normal xylem cells had been derived from the vascular cambium. This indicates that a period of normal spring growth had begun before the frost event occurred. Perhaps as much as two or three weeks of normal growth happened before the frost event. The 1950 frost ring is characterized by considerable damage in the ray cells; however, many tracheid files are only slightly altered from their normal morphology. Quantitative information about the damage will be presented.

Biological Sciences continued on page 12

SIGNIFICANCE OF THE "WHITE LINE" IN THE WOOD OF ROCKY MOUNTAIN JUNIPER *(Juniperus scopulorum)*

HOWARD J. ARNOTT

The Department of Biology and The Center for Electron Microscopy,
The University of Texas at Arlington, Arlington, TX, 76019

The stems of several Rocky Mountain Juniper (*Juniperus scopulorum*) trees were examined by light and scanning electron microscopy. The wood of these trees is of interest because it shows many light colored "pie-shaped" segments within the heart wood. The material was obtained from Rex Adams of the Laboratory for Tree-Ring Research, University of Arizona, Tucson, AZ. The stem sections are from trees that grew in the Zuni Mountains, Cibola National Forest in New Mexico; like other cedars they show a clear distinction between heartwood and sapwood. For example, in one tree with 60 or more rings, showing frost rings in 1950 and 1952, the first forty annual rings are a part of the deeply purple-red colored heart wood, the remainder is a part of the light colored sap wood which in turn is covered by the bark. These light segments are similar in color to the sapwood; they are defined by two radial borders and two tangential lines which surround the sapwood-colored areas.

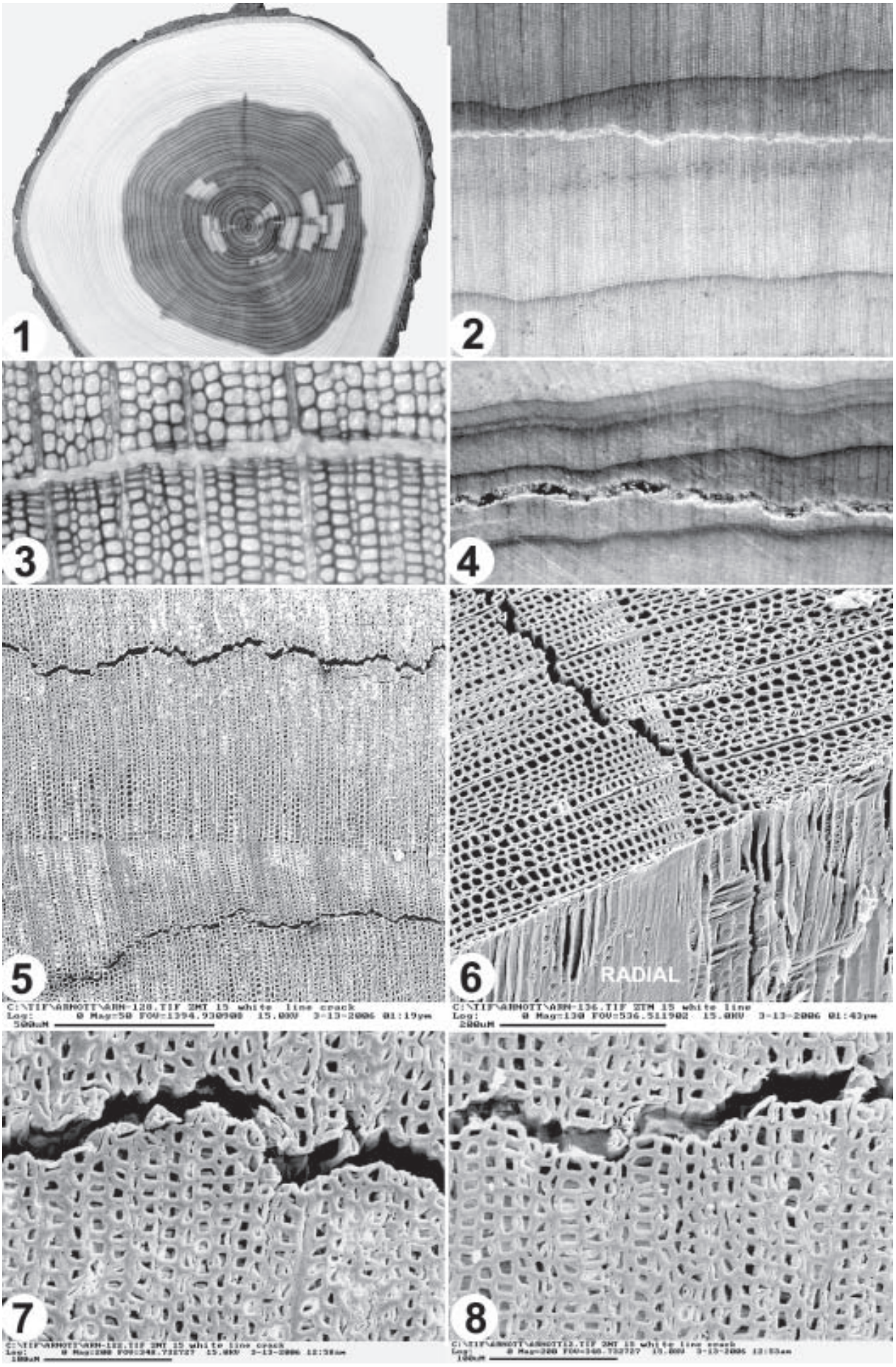
Examination of the pie shaped segments using direct light microscopy shows the following features: Each segment has a white line along its most external tangential portion. In some cases the white line can easily be seen by eye but it usually requires some degree of magnification. The white line may be a part of a single annual ring or may extend through 2 or more annual rings. The two side borders of each pie segment are oriented along radii in the same fashion as rays. Thus each pie segment has two radial borders and two tangential borders, the inner tangential border is shorter than the outer and the outer border consists of the "white line."

Investigation of a serial set of cross sections, about ¾ inch thick, of a single stem showed that the pie segments have limited vertical extent. Individual pie segments may be present at one level and absent one or two inches below or above; associated pie segments show differences in their vertical extent. This pattern of variation is currently unexplained. In this investigation a blue mold has been seen, however, there is no direct evidence of insect or microbial infection associated with the sapwood-like areas.

When the "white line" is viewed with SEM it appears to be a tangential fissure which cuts through both the rays and the tracheids breaking the wood continuity. The thickness of this fissure (or crack) is about 15 µm, or about the same as the diameter of an early wood tracheid. Whether passing through a field of tracheids or a ray, the crack is relatively uniform in radial thickness. The boundary formed by the fissure is not smooth and it does not follow a straight line; over a short distance the white line varies as much as 100 µm in the radial plane. This break may pass from the early wood of one ring through the late wood of another ring. In other words the tangential course of the fissure which causes the white line is does not seem to follow a plan dictated by the structure of the wood. As wood dries out this crack may expand. The fissure causing the white line does not seem to be derived in a straight forward way from the vascular cambium.

Why does a fissure appear white when a sanded piece of wood is observed with a hand lens or by direct view in the light microscope? The answer is simple; the process of sanding produces cell wall debris, fragments of this debris are deposited in the fissure by the sanding process. The process of sanding fills the fissure with material having a haphazard orientation. When light is shined on the deposited the bits and pieces what appears to be white light is "refracted." The diffracted light produces the white line. The white line is an artifact resulting from sanding, however, the fissure is a real and important "structural feature" of this wood. Exactly what the roll the fissure plays in the physiology of heart wood formation is not understood. One obvious explanation is that the fissure restricts the passage of tannins and (other heartwood forming materials) from their origin in the stem periphery.

FIGURES. All figures of *J. scopulorum* (Rocky Mountain Juniper). **Fig. 1.** Cross section of a stem showing heartwood with sapwood-like areas contained within. **Fig. 2.** Direct view of wood showing a typical white line; note dark wood above (outside) the sapwood-like area. **Fig. 3.** Direct view of a white line showing breaks between the tracheid files and the rays at the white line. **Fig. 4.** "Crack" along white line in very old stem of archeological origin. **Fig.5.** Two white line fissures in separate annual rings of this wood. **Fig. 6.** Tilted view of fissure seen in both transverse and radial section; Note that there are no broken cells along the fissure. **Fig. 7.** Views of white line fissures; note cell surfaces in the fissure. **Fig 8.** Similar white like fissure showing its irregularity.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MATERIALS SCIENCE
SPRING 2006

TCBED MEASUREMENTS OF LATTICE STRAIN IN STRAINED SILICON – RELAXATION, HOLZ LINE SPLITTING AND INCORPORATION INTO STRAIN DETERMINATION. DAVID R DIERCKS and MICHAEL KAUFMAN, University of North Texas, Department of Materials Science and Engineering, Denton, Texas, 76203.

The role of lattice strain is important in next-generation CMOS devices. Convergent beam electron diffraction is potentially well suited for such analyses. By comparing the higher order Laue zone lines in a strained region to those from unstrained material, the nature of the strain can be determined. In this study it is shown that for the SiGe/Si structures analyzed certain HOLZ lines split near the SiGe/Si interface; from this, it is concluded that considerable relaxation occurs during the preparation of TEM specimens resulting in strain behavior not indicative of the bulk strain. The variation in splitting as a function of distance from the interface, sample thickness and specimen geometry is described and related to a physical model of the relaxation. From this, an approach for incorporating the measured relaxation into the strain determination is described.

METAL OXIDE "NANOBASKETS": A NOVEL 3-D NANOARCHITECTURE. PAIGE JOHNSON and DALE TEETERS, Department of Chemistry and Biochemistry, The University of Tulsa, 600 S. College Ave. Tulsa, OK 74105.

We have observed the formation of short, capped nanotubes, termed nanobaskets, upon RF magnetron sputtering of metallic oxides onto porous anodized alumina templates. The metallic oxide preferentially clings to the boundaries of the alumina pores, leading to the self-assembly of a basket-like structure which caps over with continued sputtering. Nanobasket formation has been observed in a variety of inorganic materials including SnO_2, $LiCoO_2$, TiO_2, SiO_2, and hydroxyapatite. The nanobaskets have been found to have two levels of nanostructure: the basket itself, and the nanograins of which the basket is composed. The size of the nanobasket itself is tunable based upon the pore sizes of the alumina, and nanobaskets have so far been created with diameters ranging from 20 to 200 nm. Nanograins composing the basket are approximately 8 nm in size. The nanobaskets have been characterized by SEM TEM, EDS, XRD, Raman spectroscopy and AC Impedance spectroscopy.

ANALYSIS OF NANOPARTICLES IN STEM MODE USING ULTRAHIGH RESOLUTION SEM/EDS: PART I. JOHN KONOPKA and BILL ROTH, Thermo Electron Corporation, 5225 Verona Rd, Madison, WI 53711; Hitachi High Technologies America, Inc., 5100 Franklin Dr., Pleasanton, CA 94588.

Bulk sample analysis by SEM/EDS suffers from a relatively large interaction volume between the incident electron beam and the sample. Reducing the voltage of the incident beam can reduce the size of this interaction volume making it easier to differentiate particles or films from substrates, but this restricts the emission lines that can be used for analysis. This study employs an ultra high resolution SEM/EDS equipped with STEM sample holders and electron detectors to view and analyze small particles supported on carbon films. Since the beam is extremely fine and since there is no substrate it is possible to analyze very small particles. At the same time the incident beam voltage is high enough to generate K-lines, which are easier to observe and process. The sample analyzed consisted of Ni particles as small as about 10nm in diameter held inside carbon nanotubes. The samples are supported on carbon film on TEM grids. Results illustrate that it is possible to not only identify the composition of the particles but to detect structure in particles of this size at intermediate voltages using this equipment. In part one of this work the equipment is in an "as received" condition. In part two we will test modifications meant to reduce artifacts in the x-ray spectrum.

CHARACTERIZATION OF ORDERED ARRAYS OF NANOMETER-SIZED DOTS, HOLE, AND RINGS. P. R. LARSON, K.L. HOBBS, J. C. KEAY, M. E. CURTIS, O. K. AWITOR and M.B. JOHNSON, Homer L. Dodge Department of Physics and Astronomy, University of Oklahoma, Norman, Oklahoma.

Previously, a combination of bottom-up and top-down approaches have been explored to fabricate ordered arrays of nanostructures. The bottom-up approach involves the growth of self-organized porous anodic aluminum oxide (AAO) films which consist of well ordered hexagonal arrays of close-packed pores with diameters and spacings ranging from around 5 to 500 nm. Using a top-down approach, these AAO films are then used as masks or templates to fabricate ordered arrays of nanostructures (*i.e.* dots, holes, meshes, pillars, rings, *etc.*) of various materials using conventional deposition and/or etching techniques. The resulting structures provide a unique opportunity to study the single and collective properties of nanostructure arrays. An overview of results on the frictional, magnetic, and superconducting properties of ordered arrays of nanostructures fabricated from various materials will be presented. Particular emphasis will be placed on: the tribological properties of Ni nano-dots arrays, spin waves in Ni nano-rings, Si nano-hole arrays, and flux pinning in ordered arrays of artificial pinning centers in superconducting Nb thin films. Possible applications of these structures include nano-tribological coatings for surfaces, data storage, light emitting or sensing devices, bio-sensors, filters, and enhancement of superconducting devices.

FORMATION AND CHARACTERIZATION OF NOVEL ZINC OXIDE NANOSTRUCTURES. NICOLA WHY and DALE TEETERS, The University of Tulsa, Department of Chemistry, Tulsa, Oklahoma.

Zinc oxide (ZnO) is a novel compound of technological importance that demonstrates the properties of being a semiconductor, a piezoelectric material, and a pyroelectric material. Recent studies show that zinc oxide probably has the widest known variety of nanostructures among all studied materials. The uniqueness of the compound is only enhanced by the wide variety of applications it has the potential to be used for; from sensors, to transducers, to biomedical practices. The initial purpose of studying zinc oxide was to evaluate its potential in serving as a template in creating nanoporous membranes, which are currently being used in creating nanobatteries at The University of Tulsa. There are several methods for growing the zinc oxide nanostructures, but the simplest involves placing tin oxide (SnO_2) coated glass slides in a solution of zinc nitrate and methenamine and heating to 90° C for a period of time (1). It was decided to change part of the method and try using alumina oxide nanoporous membranes without SnO_2 as a template instead of the glass slides. The results were surprising, producing ZnO nanorods with what appears to be a honeycomb structure inside. The nanorods grown on the SnO_2 coated slides are typically solid all the way through. The optical confirmation of the structures is done using a scanning electron microscope. These new structures have the potential to be applied in many new nanotechnology applications.

(1) Vayssieres, L.; K. Keis; S. Lindquist; and A. Hagfeldt, *J. Phys. Chem. B*, 2001, 105, 3350-3352.

TECHNIQUES
SPRING 2006

VAPOR FIXATION USING OSMIUM TEYTROXIDE AND ACROLEIN FOR SEM AND TEM SPECIMEN PREPARATION. E. ANN ELLIS and MICHAEL W. PENDLETON, Microscopy and Imaging Center, Texas A&M University, College Station, TX 77843-2257.

Vapor fixation is a simple, reliable methodology for specimen preparation for both SEM and TEM. Exposure of specimens in a closed container in a properly functioning fume hood to vapors of osmium tetroxide or acrolein is an old, often overlooked method for breaking permeability barriers with difficult specimens like naturally waterproofed cuticles of insects, seed coats and spores. In addition, vapor fixation can be employed in anhydrous preparations where aqueous fixation would wash away diffusable substances. Osmium vapor fixation has been used for SEM specimen preparation with polymers as well as biological specimens with many small cracks and crevices where sputter coating alone is not sufficient to eliminate charging. Specimens on stubs are first exposed to vapors from 4% aqueous osmium tetroxide or osmium tetroxide crystals in a closed petri dish. The process can be speeded up by placing a beaker of hot water on top of the petri dish. Specimens can then be dried in an embedding oven at 55-60 °C to reduce moisture levels followed by a reduced level of sputter coating. Acrolein vapor fixation can be used for anhydrous specimen preparation where aqueous fixatives would dissolve and alter the elemental analysis in the case of diffusable substances. Specimens for TEM can be further dehydrated using ethylene glycol prior to infiltration with epoxy resins. These procedures have been used successfully with biological as well as materials samples. All vapor fixation protocols must be done in a properly functioning fume hood with a minimum flow rate of 100 ft/min.

THE VCT 100 HIGH-VACUUM CRYO TRANSFER SYSTEM ALLOWS EASY, FAST AND CONTAMINATION FREE SAMPLE PREPARATION FOR CRYO-SEM INVESTIGATIONS. ALEX VOGT, Bal-tec AG, Neugruet 7, 9496 Balzers, Principality of Liechtenstein.

The VCT 100 high-vacuum cryo transfer system connects sample loading, fracturing/etching, coating, and cryo-SEM. The frozen specimen is loaded onto a specimen stage either under liquid nitrogen or in a cold nitrogen atmosphere. Transfer of the specimen from the liquid nitrogen to high vacuum conditions is performed in cold nitrogen gas using the VCT100 transfer shuttle equipped with a cold trap. The specimen is thereafter transferred to the cold stage of the fracturing/etching/coating device for sample preparation and subsequently to the cold stage of the cryo-SEM. Once under high vacuum, the specimen is kept under high vacuum conditions, controlled temperature and protected by a cold trap, thus avoiding contamination of the specimen during loading, preparation, investigation, and transfer of the specimen. The specimen is never exposed to ambient conditions. The versatility of such a system (e.g. specimen stages) allows easy processing of various types of specimens frozen by plunge, propane jet or high-pressure freezing.

RES120, THE SEM CONTROLLED BROAD BEAM ION MILLIN FOR SEM AND TEM SAMPLE PREPARATION. ALEX VOGT, Bal-tec AG, Neugruet 7, 9496 Balzers, Principality of Liechtenstein.

Most features of ion milling technology have improved in recent years. Nevertheless today's ion milling systems are still limited in the specimen observation system used during the milling process. Conventional devices use light microscopes with magnification in the range of multiple hundreds. Under these conditions an evaluation of the thinning process and termination of the milling process at a precise stage are impossible. The combination of a standard ion milling system with a scanning electron microscope allows precise and reliable sample preparation for electron microscopy. Sample imaging occurs via three detectors, SE, BSE and TE. The SE detector is positioned to allow high-resolution investigation. TE and BSE detectors enable sample observation during the milling process. It is possible to move the sample into the optimum working distance of the SEM for *in situ* evaluation of the preparation results in high resolution (15 nm). This enables a site-specific sample preparation of very small structures down to nanostructures. Direct observation of the sample during the milling process is very important for both SEM and TEM samples. Because the surface modification of SEM samples can be followed by live imaging the milling process can be terminated at a precise stage. This is very useful for applications such as contrast enhancement, slope cutting and surface cleaning. In the case of TEM samples the milling process can be terminated when the target is in the electron transparent area. A TE detector is used for both STEM imaging and termination of the milling process. The main advantage of SEM controlled ion milling is the permanent monitoring of the ion milling process under optimum conditions. Thanks to the optimized sample observation, time saving sample preparation with almost 100 % sample yield is possible.

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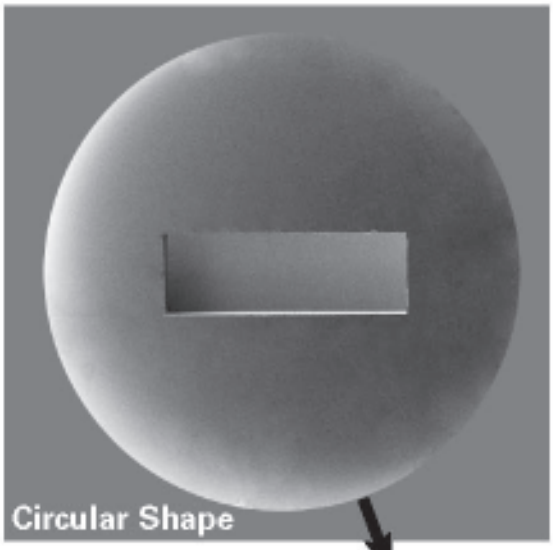

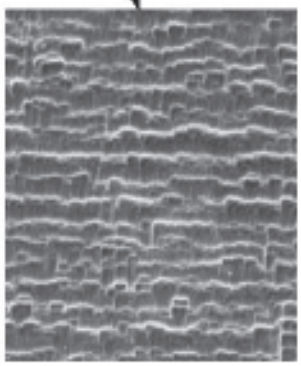

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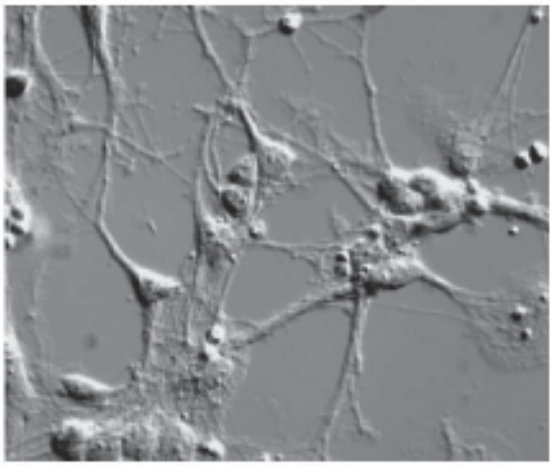

DIC image of hippocampus neurons grown on a silicon nitride substrate by Prof. M. Stowell, et. al., MCDB, CU-Boulder, Colorado

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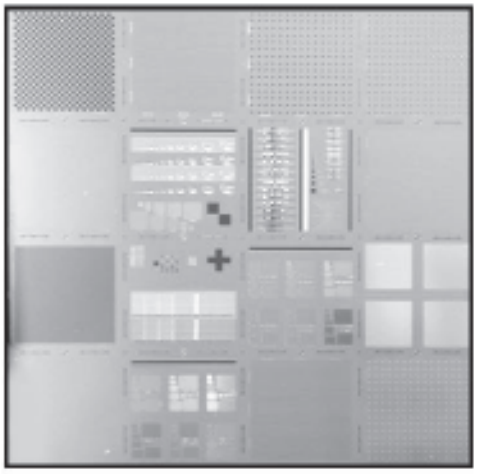

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HOWARD J. ARNOTT

Autobiography-Part Two-
Administration

Life in Middle Management. Writing the second part of my autobiography began in a Las Cruces, NM motel. That day I traveled by car across a large part of Texas on my way to a FSAEB conference on calcium oxalate. The next day I traveled through New Mexico and part of Arizona before arriving at Tucson where the conference was held. It was exactly one week after my son John and I returned from a successful 10 day hunting trip to South Africa. The day after the FSAEB conference I met my daughter Catherine in Los Angeles, We spent some time on family business and then about 10 days investigating bristlecone pines in the White Mountains of California and the Charleston Mountains of Nevada. I am staying active in my 77th year by continuing teaching and research at University of Texas at Arlington.

My explicit experience in administration comes from two summers as Acting Chairman of the Department of Botany, University of Texas at Austin, two years as Chairman of Biology Department at University of South Florida and 16 years as Dean of Science at University of Texas at Arlington. However, like everyone in academic life, my overall experience began on my first day at the University of Southern California. In a general sense, my story will follow a chronological order, however, sometimes flashbacks and/or "leaps into the future" or commentaries will occur. I now am in a good position to write about the administrative part of my life since it is 15 years since I returned to the teaching and research activities of an "ordinary" faculty member. In writing this I have given the facts as I remember them; mostly I've tried to be cautious in what I've said, since I have strong opinions.

The mundane activities of university administration, like life in general, are interspersed with highs and lows. The workload, interactions between me and my supervisors and the needs of the faculty varied over time. In general, I liked being Dean. I feel that my overall performance was at least above average. I chose to continue doing both teaching and research during my administration. It was a conscious decision on my part, one that I am still very satisfied with. Naturally, the quantity of teaching and research I did during my administration was reduced; but for my own sense of well being, the continuation of both teaching and research was necessary. I have seen many university administrators, both competent and incompetent, that gave up teaching and research with no apparent regret about leaving them behind.

"To each his own"

"Versions of this maxim appeared in the late 1500s
But the modern wording was first recorded in 1713."
Answers.com

How and why did I become an administrator? Why is simple! More money, more prestige and more free time are three reasons. How, is more complicated. In general there are only two roads to administration, the *local route* and the *external route.* Both work and I have been involved with each. From a personal point of view I found the external route to be more effective. This is probably true because there is no sure way to program local opportunities. They come about through changes which are difficult to predict. A new President almost always causes major changes. The death of a key official, an administrative scandal, severe financial problems and a variety of other things can contribute to change. Good teaching, quality research, hard work on committees, careful advice to students and respecting your associates are things that may help you toward an administrative goal, but a term as Associate Chairman can give you a real push.

John Silber, Dean of Arts and Sciences, and I crossed swords when he temporarily held up my promotion to full professor because he thought that I had not undergone teaching evaluation. Dean Silber was excessively enthusiastic about teaching evaluations, having introduced them in UT Austin. Eventually, he found that an error was made by his office, he apologized and I was promoted. The real struggle, however, was between Dean John Silber and the Graduate Dean, Gordon Whaley. Since I was a "Whaley protégé" my promotion became a convenient "test of power." In my experience such tests are more common that you might imagine.

My first local attempt at administration involved the same Dean Silber; I asked him if he would help me gain some administrative experience. He was encouraging and said he would find something for me in his office, probably student advising. Such experience could lead to something more substantial and I was pleased by his offer of help. Unfortunately, soon after our meeting, Silber was fired as Dean of Arts and Science. Soon after his exit, the College of Arts and Sciences was split up. In 1971 Silber became the President of Boston University.

ACTING CHAIRMAN

My opportunity to become "Acting Chairman" came from some innocent comments I made to a colleague. I was appointed Acting Chair because the Chair was leaving town for the summer. The chair left, and on my first day as Acting Chairman, one of the senior faculty members died. The circumstances of that death were somewhat unclear and I soon found myself outflanked by other faculty who wished to act in my stead.

***Administrative lesson one*, "You are either in charge or you're not, there is no middle ground."**

The case of the "fallen faculty member" was my first experience with death in the faculty. It was also my first (but not my last) experience with explicit interference in my job by other faculty. Of course the deceased's wife had concerns about the books, papers, and equipment that belonged to her husband and that had to be taken care of. Luckily, it was summer and the deceased faculty member had no classes. His graduate students had to choose a new mentor. These things were relatively easy to sort out but others wanted to do it.

In my next summer as Acting Chairman, however, a different problem occurred. A new Physics building was being built and this generated a squabble for old Physics Building space. A committee of chairs and faculty was set up to solve the use of the new space. The committee activity gave me a new view of the power struggle that space engenders. After money, **space** reigns supreme in academic circles.

FACULTY RAISES

In that second summer I was given the job of establishing the raises Botany faculty would receive in the next year. Like the "death" in the summer before, this was definitely not a normal activity for an Acting Chairman! By that summer the Botany Department was in the College of Natural Science and a geologist was Dean. The Dean called me to his office and explained that he had allotted an amount for raises in Botany, and that only six could receive raises. I was to decide which six of the 15 faculty would share the allotment and how much each would receive. During my interview (this is important) the Dean assured me that **he** would take care of my raise.

Ok, that's not much of a problem—determine which faculty are most meritorious and how much each should receive. We had plenty of meritorious people and some would obviously be at the top of anyone's list. Of course all this had to be done in "three days," but still time was not a big problem. I made a selection and "division of the spoils." My recommendations went to the Dean's office. You can well appreciate my discontentment when later in the year I received no raise. When I contacted the Dean he could not remember "*that **he** would take care of my raise*." If he had not assured me otherwise, you can be sure the list of six would have included me!

***Administration lesson two*, "You have to look out for yourself."**

All in all, even considering the raise fiasco, my two summers as acting chair were useful learning experiences. The Chair workload was light in summer and I spent my usual time doing research. In seeking external administrative positions, I used this experience in a positive way both on my CV and in interviews. I should also mention that during this time I served as Graduate Advisor in the Department of Botany. The most innovative thing I did there was to devise a curve which associated grade point average and GRE scores. If a student's combined position was above the curve they were admitted. This had the advantage of allowing good grades to make up for a low GRE score and visa versa. The Department accepted that plan.

APPLICATIONS AND INTERVIEWS

Of course job applications, interviews and position offers were a part of my life. A simple letter and CV got me an interview at Northwestern University The interview was preceded by an all day flight from San Francisco through horrendous thunderstorms. I stayed that night at the very ritzy Orrington Hotel in downtown Evanston. I had dinner in the Orrington dining room, my first experience with "real Midwestern corn fed beef;" it was far too fat. Most of that interview was conducted by two old time Botanists from the Biology Department. It consisted of me showing them portions of my dissertation on a street bench outside a soda fountain in north Evanston. We all wore suits so I guess that it was not completely casual.

My interview with Gordon Whaley which brought me to UT Austin consisted mainly of a lunch time swimming session at Barton Springs. I remember the day was warm but the water was exceptionally cold. Whaley was a very good swimmer and seemed to be completely oblivious to the frigid water temperature. I initiated that interview with a telephone call to Whaley. On my trip I saw little of the Botany Department and less of the campus. Both of these interviews were really informal in comparison with some later on.

During the latter part of my eight years at UT Austin the administration bug bit me. Honestly, one aspect of my push toward administration was more money and a sure 11 month salary. Another drive was the idea, *completely egocentric*, that I could be a better Chair than others. In my past I paid attention to the activities of Chairs. My major professor at UC Berkeley, Adriance S. Foster, was drafted for the Chair position in Botany and I had an opportunity to see and hear him talk about this position. Although he seemed to find little pleasure in the job and complained constantly of the drudgery, the status it offered brought considerable satisfaction to him. The Botany Department at USC was very small and because of that I had the opportunity to see the Chair, Dr. Luis Wheeler, deal with interesting personalities of his five faculty; Wheeler seemed to function quite well without paying any attention to other faculty thoughts or interests. Of course I had the opportunity to see Ray Watterson in action at Northwestern. I think he was too interested in his own research and teaching to carefully monitor the department. In addition, he had to contend with some faculty who had their own ideas about how to run the department; unfortunately he had not heard of lesson one (see above).

As the result of my administrative interest I started paying attention to the advertisements in *Science* and the *Chronicle of Higher Education*. Once you have drafted a letter of application, prepared your CV and Bibliography and secured support of some referees it was easy to proliferate applications. I sent many and had responses from several. At one point I had interviews and then offers from three Universities at one time.

CHAIR OFFERS

The best of these offers was from Texas Tech as Chair of the Biology Department where I hit it off with their Dean of Arts and Science and with the faculty. I made two interview trips to their campus including one with my wife and four children. In the latter the Tech faculty and their wives were especially gracious. However, in the plane on the way home I decided not to accept their offer. My family and I left the Lubbock airport on May 12, 1970 with beautiful blue sky weather, however, later that night a massive tornado hit Lubbock causing millions of dollars of damage and killing over 20 people. The tornado was not my reason for rejecting their offer, but few on the Texas Tech campus believed that.

At the same time, I had offers from Texas A&M University to be a Professor of Biology and Director of the EM Lab and from State University of New York at New Paltz to become Chair. The recruitment at New Paltz and Texas Tech was very strong, especially from the latter. The TAMU recruitment was not strong; in the department I only interviewed with the Head. However, the highpoint of that trip was meeting the A&M President, the famous General James Earl Rudder. Looking back, each of the three positions was in fact

a great opportunity. One way or another, none of these positions seemed to fit me; thirty-five years later, the exact rationale for my decisions is hard to remember, perhaps it was just faulty thinking!

In the following year I applied for more Chair positions, including the Chair of the Biology Department at the University of South Florida. The Biology Department was formed by a recent union of Botany, Zoology, Microbiology and General Biology (a teaching unit) and consisted of about thirty-five faculty. It was a relatively large and interesting department with noticeable potential for both development and discord. My interview occurred on the same day Hilton Mollenhauer was interviewed for a Distinguished Professorship in the Department. Hilton spoke in the morning and I in the afternoon; both of us had backgrounds in the Cell Research Institute of The University of Texas at Austin, however, the "joint" interview was a surprise to me.

Dr. Warren Silver, the former Chairman of Microbiology, was Acting Chairman and also a candidate for the Biology Chair. I guess there were other candidates but I never got their names, however, I did learn that the Dean of Science was planning to step down soon. Hence, for me there might be an opportunity of a "one-two" career jump. It was a surprise when the position was offered to me. The time "to fish or cut bait" had come. My answer was yes, and in the summer of 1972 we moved to Florida.

CHAIRMAN

I became the first permanent chairman of the new Biology Department. I appointed James Ray, the former Chairman of the Teaching Department, as my Assistant Chair. He was well versed in university activities, having been the **first** faculty member hired by USF. We soon became good friends and worked well together. In my activities I was ably assisted by Bonnie Diaz, the senior secretary and office manager. Almost immediately she and I started reorganizing the obsolete departmental office; soon this involved jackhammers and other inconveniences; meanwhile it rained one hour every afternoon. My life in the "relaxed" atmosphere of Tampa Florida had started.

There were many things to undertake; the first was to begin to become acquainted with the individual faculty, and soon I knew most and could recall something of their backgrounds, interests, etc. What was important, however, was to find out how they fit to the department's structure. In my analysis, which took several months, it seemed some of the least important talked the most; caused the most trouble, were, arguably, the worst teachers; and furthermore they had never done a lick of research since they left graduate school. It is sad but true!

Regrettably, "speaking *often* and *loudly*, will deceive many of your colleagues, most of the *time*."

After a short time I was able to set up a research lab and continue my studies. For electron microscopy I used a Phillips 200 microscope maintained by Dr. Clinton Dawes. He taught the course in electron microscopy and had published a very useful book entitled "Electron Microscopy." Colin Nicol and I continued to study the origin eyeshine in various animals. I started John Gottsch working on the origin of eyeshine in the Opossum eye. John is currently Professor of Ophthalmology at Johns Hopkins University. I was able to secure the services of Betty Loraamm, an excellent electron microscopist, as a research assistant and we started work on a number of problems.

In, what now seems a funny incident, Betty and I spent several afternoons trying to catch a sample of *Nyctidromus albicollis*, a bird that exhibits eyeshine. At that time the entire west end of the campus was an open field. Holding a rope between us we dragged it through the fields hoping to locate a specimen of this bird which sleeps on the ground during the day; no luck. At that time I was also studying eyeshine in a species of catfish which we harvested from a local lake on campus.

My Three Golden Rules of Administration

The first golden rule is: "every faculty member thinks he/she would make a great administrator."

The second golden rule is: "each faculty member believes they could do a better job than their current administrator."

The third golden rule is "ninety-nine percent of faculty will not acknowledge the truth of rules one and two."

Being new to administration, I began to experiment with various rating systems for faculty; attempting to formulate a numerical system that would be a more objective way of understanding faculty "quality." While some of my efforts seemed useful, especially the teaching ratings, most came to naught. This faculty did not want to live with a numerical classification scheme, preferring the traditional less decisive, subjective analyses done by Chairs and/or Committees. Eventually I came to the conclusion that they might be right.

The members of the Biology Department were very sociable and we had several "departmental" parties; Jean and I were invited for dinner or coffee and desert by several faculty. At that time we were living in a large apartment complex and we used their facilities to host the department. The faculty exhibited an outstanding attitude. I will come back to this point later. Just a comment about the apartment complex, it was a real eye opener to modern life; we didn't realize how sheltered we were in single family dwellings. This complex had a "swing" set where Catherine broke both wrists and John broke his arm.

At that time money was allocated to Florida Universities on the basis of expected headcount. If the headcount was less than the expected, universities were required to return funds to the state; this usually happened late in the financial year. In my first year the Biology Department still had funds when take-back time arrived; the process was managed by the College, each department "giving" what they could to the college which returned it to the University. However, if you didn't have any unspent funds, Chemistry and Physics for example, the Dean couldn't get it back. Later the Chemistry Chair showed me how to "hide" funds by putting them in "special" accounts. It was a simple but effective bookkeeping device which saved the department big time.

We began searching for three new faculty at the end of 1972. One search was for a badly needed geneticist; at the time we only had one. As the search went on it appeared that we had excellent genetics candidates and therefore I decided that hiring three geneticists made real sense. Four would make a group that could reinforce each other and build on each other's strength. Three were hired and we had an instant genetics group. They functioned very well, however, divorce, family problems, etc., so characteristic of Florida living, eroded their progress.

Clinton Dawes led a group that were interested in the seaweeds. He and his students often scuba dived several miles off the west coast where they studied various algal populations while trying not to interact with the local sharks. The Dawes' operation was a source of concern because of the inherent danger involved in offshore swimming, but also because they managed to damage boats with some frequency. I remember how pleased Dawes was to get a brand new Boston Whaler; sadly, the Whaler's hull was soon split open by rough water.

Later one of Dawes' graduate student divers, Wayne Fagerberg, came to Texas with me on a Post Doc. Among other things, Wayne

and I worked on thermal bacteria from Mimbres hot springs near Deming, NM. Wayne is currently a Professor of Botany at the University of New Hampshire.

By this time Jean and I were building a house in a new development called Carrolwood Village. Our house was surrounded by the obligatory Florida golf course. Our neighbors lived for, thought of and talked only about golf. For these "sportspeople," each and every one of the 18 holes was a sacred place; each had its own distinctive attributes, and each attribute required constant reiteration in any conversation. The Florida lifestyle, that went along with this golf fanaticism, was equally narrow. Without question, it kept many liquor stores in business. For us the golf course was a great place to ride bicycles. By this time my parents had moved to Tampa and all of us were settling in for the long term. But of course this all changed one day in the spring.

RETIRING DEAN

When I learned that our Dean was retiring I was euphoric. Not that I disliked him, nor that he wasn't a good dean, but because this might give me a lucky break. Maybe the idea about a "one-two" jump would come true. I applied for the dean job with the idea that I was in a strong position because of my efforts as Chair.

Some time later I learned that James Ray, my Assistant Chairman, had been appointed Dean of Science. So instead of "one-two" it was "one-two-three" and out. I was stunned and astonished all at once! Jim Ray was a good person but he had never participated in research and I thought he had little regard for the problems of researchers. All that I held to be important, such as a strong emphasis on research, expansion of a research oriented faculty, the development of graduate programs etc., were probably "going south." The shock of this appointment was even greater since I had no idea Jim was interested in being Dean. Retrospection suggests that I was "blind;" far too much caught up in my own life to recognize reality.

Later on, a zoologist member of the Dean Search Committee said "they had specifically not chosen me to make sure I would continue as Biology Chairman." Of course their action had exactly the opposite effect. Immediately I began to look for another position. My relationship with Jim Ray and with the Biology Faculty was never quite the same after that. I really couldn't blame Jim; he was merely looking out for himself (*remember lesson number two*); during the rest of my tenure at South Florida we worked together without difficulty. Looking back on my response it was at best immature and probably unreasonable. If they had chosen anyone else to be dean, especially an outsider, my reaction would have been 180 degrees different.

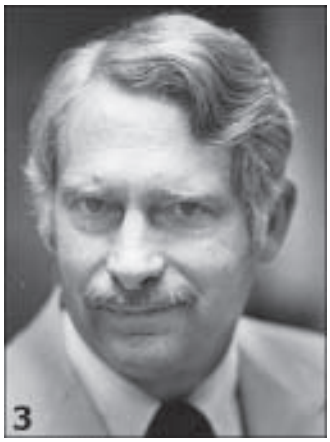
After sending out applications, I received an offer as Dean of Science at the University of Texas at Arlington. I accepted and we were once again headed for Texas in the summer of 1974. By this time we had a dog named Frisky, John had his own car and the trip "home" was a small convoy. We temporarily lost touch with John in downtown New Orleans but otherwise had no difficulty.

Before heading west, we purchased a new home in Arlington; we still live in it today. The Biology faculty gave me a grand going away party, the latter part of which I can't remember; I felt they were sorry to see me go. After the moving van unpacked and we began to settle in as a family, John became a freshman at UT Arlington, and the girls started in their various schools. The Arlington Schools were a relief, because we left "bussing" back in Florida.

Was the move to Arlington a wise one? Still after thirty years we continue to debate that question. Later the question will come up again in relation to the old adage: Is it better to be a big fish in a small pool or a little fish in a large pool?

A NEW START

In 1974, as now, The University of Texas Arlington was the second largest campus in a very large State System with mucho dollars. The College of Science was in its infancy, and I became its first "outside" Dean. The College consisted of *ca.* 120 faculty arranged in six departments, Biology, Chemistry, Physics, Geology, Mathematics and Psychology; We were housed in three separate buildings. Only Psychology had a doctoral program and then there were few doctorial programs on campus. All of the departments had undergraduate and masters programs. Several of the departments, including Biology, seemed to have strong teaching reputations. At that time, because of oil exploration, the Geology Department was booming.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I was hired by President Wendel Nedderman and worked directly for Vice President of Academic Affairs, Bill Baker. Throughout my discussions of the dean position, both Nedderman and Baker had assured me that a Ph.D. program in Biology was in the works and would be in place within one or two years. Likewise, Ph.D. programs for the rest of the departments would soon follow. Regrettably, just after my arrival, the Texas Higher Education Coordinating Board began a moratorium on new Ph.D. programs, claiming that there were too many and they were too costly. There was nothing either Nedderman or Baker could do about it. The moratorium lasted for eight years and strongly influenced the first years of my deanship and ever more so the development of UTA.

The first UTA decision I made concerned the position of the Psychology Department. This took place just after I accepted the job as and before I was actually on campus. The background of this "problem" was the organizational placement of the Psychology Department. Typically, psychology departments are associated with Liberal Arts; so some felt Psychology was out of place in a College of Science. So the question put to me was should they stay in Science or be transferred to Liberal Arts? The argument from our psychologists was that their department was experimental in orientation, and therefore more in tune with Science than Liberal Arts. It was a positive argument; however, the fact that Psychology had a Ph.D. program was the real clincher. I wanted that Ph.D. program in the College of Science. Bill Baker accepted my decision and Psychology remained in the College.

OFFICE ROUTINES

My first day at UTA I was introduced to Mary Jane Goad who was to be my secretary and office manager, as it turned out for my entire 16 years of tenure. I realize now how lucky I was to have Mary Jane in the Dean of Science office. Mary Jane was involved in almost every activity of the dean's office during my tenure. She helped choose the color patterns when we moved to Life Science, rustled furniture from surplus, chose the art on the office walls and helped hire various assistants. However, in considering her preferences you shouldn't get the idea that I always agreed with them! Mary Jane also served as my accountant. Each year she helped with preparation the College and departmental budget proposals. There were many details to keep track of in an office like


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ours, all before the advent of office computers. As soon as possible we moved into the computer world.

In 1974 The Dean's office was on the southwest corner, first floor of the Science Hall. State Highway 157 passed through the center of the campus and was only about 20 feet from the west windows of the office; well over 60,000 cars and thousands of students passed this point daily. It was both noisy and congested. At right angles in the office, a second set of windows provided a great view of the campus central mall. Across the mall to the south was the Life Science Building, where the Biology, Geology and Psychology were located. Geology was set to move into newly constructed Geoscience Building. Concomitantly refurbishment of the Life Science Building was to begin. These changes provided an opportunity to upgrade the outmoded Dean's office by developing new office in the Life Science Building. A space on the second floor was located and I helped design the Dean's Office which served the College well through the last 30 years.

Jack Marquis, a long time Physics Professor and former Chair, was Assistant Dean of Science in 1974. Jack's father had been President of North Texas Normal College (now University of North Texas) and Jack was widely connected on our campus and in the region. We became friends and he loved to tell me "stories" about "the good old days" and "the good old boys" that formerly ran the institution; in those days you could be fired on the spot and no one would lift a finger. He introduced me to many people, but even more helpfully, he explained the inside of University protocol.

EXCLUDED FROM THE IVORY TOWER!

During the first years of being Dean I realized that the faculty no longer considered me one of them. Their attitude came to light in interesting ways. For example, it was made explicitly clear that I was not welcome in Biology Department's faculty meetings. Except for general departmental parties my wife and I were no longer invited to faculty homes as we were in South Florida or in Austin. In one departmental social, a faculty wife asked me in a very sarcastic way, *"Just what do deans do?"* At a Christmas party I was embarrassed by a stream of witty harassment. These attitudes were new to me; those of you who envision administration in your future please take note. In talks with other new deans I found that many had similar experiences. Perhaps it was my naiveté not to expect such a change!

An encounter with the Psychology faculty may be worth reporting because it was so bizarre! Early in my tenure I was interested in learning all the faculty's names. In an effort to facilitate this, I asked each faculty member to come to the Dean's office and be photographed. I set up a photographic stand and photographed most of the college faculty without incident; that is, until the psychologists arrived. Each of them came wearing moustache masks (also called groucho-glasses) (Fig 5). I never learned what this was about. Was this their collective way of thanking me for keeping Psychology in the College? In any case, I photographed them wearing their childish masks, and over the years, occasionally, I found a use for those photographs.


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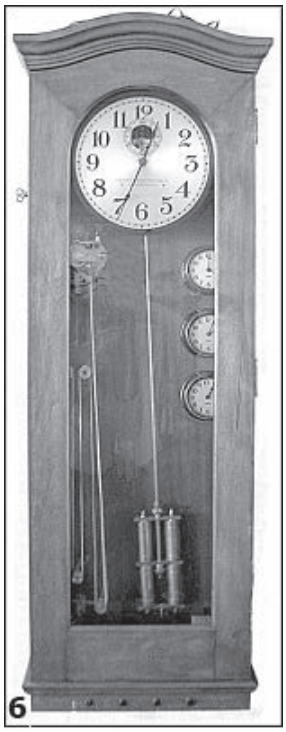
DEAN RESPONSIBILITIES

During my tenure I was involved and responsible for in everything that went on in the College of Science. Aside from a plethora of grapevines, there were several formal mechanisms which helped to enlighten me. We had weekly Chair and Dean's Council Meetings; frequent Undergraduate Assembly Meetings and occasional formalized meetings with the President. In one of these meetings the President made a completely shocking announcement: He was dropping UTA football. There were plenty of meetings with individuals and small groups on an irregular basis; all of this helped to keep me informed. Our office interacted with the Graduate School on a regular basis. The Graduate Dean was Bob Perkins, a geologist; we collaborated on the funding of many small faculty projects and became very good friends.

THE MARQUIS CLOCK

Soon after we moved to our new quarters, I happened to visit the Engineering Dean's office. There I noticed an attractive grandfather clock in his foyer and told Jack Marquis about it. Straight away Jack recollected an old, now idle, master clock that previously was employed to control the clocks and bells on campus; this was a clock with a **history**. At first it seemed unlikely that we would ever find it. However, Jack persisted and finally found it in a janitor's closet in Preston Hall. When he showed me the clock it looked bad. But Jack persisted, he and the Physics shop staff cleaned and polished it so that it looked like new.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The Marquis Clock, along with its history, has graced the wall in the Dean's office since then. In an intriguing way the clock became something of a "trophy" and of interest across the campus. In the end, I appealed to President Nedderman to give it to the College. He acceded by placing it on permanent loan from the Library's Miscellaneous Collection. The clock is a Model 14-AR-1 made by the Standard Electric Time Co, Springfield, Mass, and was put into service October 6, 1934. The clock is 60.5 inches tall and 19.75 inches wide. A punched paper tape apparatus was used to control the bell schedule. Slave dials monitored the time for groups of remote clocks. The master clock was originally powered by batteries; the Physics shop built a conversion unit so that it now runs on a normal 120 volt outlet.

CHAIRMAN'S* MEETINGS

During the spring and fall semesters we had weekly meetings of the Science Chairs. These discussions were useful in supplying information flow, both up and down. They were both necessary and useful in making major decisions that affected the whole College. The Chairs, Associate and Assistant Deans, and Mary Jane attended. Topics commonly debated were budgets, promotions, tenure, and new and changing university policies. However, any thing important to the college could be the subject of a meeting agenda.

*I used the term Chair throughout this paper but the actual name of our meeting was Chairman's Meeting.

While there were hundreds of positive discussions, here are two examples of the alternative side of Chair Meetings. They are of interest because they show the idiosyncratic nature of administration. In the first case, I proposed that each department install a computer-typewriter system which would allow departments to communicate with the Dean's office and with each other. This was long before the advent of PC's, Mac's, campus networks and the internet on our campus. The rub was, however, each of these pre-computer stations was expensive. In short order the Chairs indi-

cated that were absolutely opposed to such a system even if the money came from the Dean's office. The Chairs realized if my money was used for this project that there would be less money for them to acquire. This proposal was way ahead of time and really very innovative. The Chair's reaction was a clear example of **money *ruling the roost.*** (radix omnium malorum). Despite my earlier comment about mucho money in the U.T. System, money has never been plentiful at UTA. The use of money tests a Chair's administrative skills. Luckily I never had to deal with a spendthrift Chair.


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CONSOLIDATED TEACHING EVALUATIONS?

The second example involved Teaching Evaluations. It seems that every place I go teaching evaluations become a stumbling block. You remember that had a problem with Silber at UT and that I had experimented with teaching evaluations at USF with no results. At UTA, as in many institutions, the results of teaching evaluations are returned to the faculty and departments with computer printouts. Viewing the printouts makes it clear that one could manipulate the data to show a score for the entire college, or for each department. I proposed the development of collective teaching scores for each department. The Chairs went ballistic; this was just too much! It didn't seem to mater whether their *collective* teaching skills were exceptionally high, mediocre, or poor; they didn't want to exhibit them. I could have collected the data on my own—but I didn't.

TENURE

The granting of tenure represents the most important decisions made in university life. Promotions are important but unless they carry tenure they won't affect the future in the same way as tenure does. The quality of the tenure candidates that a college presents to the university is a concrete representation of the values of the college faculty and of their dean.


8 Tenure HJArnott

"<u>Weak tenure decisions</u> beget <u>weak colleges which beget weak universities.</u>"

In my first year I had to deal with two candidates for promotion and tenure, a biologist and a chemist. They were both popular and had strong reputations as teachers; on that basis their faculty colleagues and Chairs recommended promotion to Associate Professor with tenure. These recommendations were based on the accepted wisdom that prevailed at UTA in 1974. However, neither candidate exhibited any scholarship in their credentials.

The resolution of these cases proved to be a "*defining moment*" in the development of both the College of Science, and the University. I choose **not** to recommend the promotion of either. They were both popular and competent teachers, but because there was no evidence of scholarship I turned them down. Attempting to develop a College of Science without the appropriate underpinnings


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of scholarship is both hopeless and ridiculous. My decision was unpopular. However, Bill Baker and Wendel Neddermann supported my decision not to tenure these individuals. This was also a "*defining moment"* for me and for my future as Dean. I believe these two tenure decisions started the College and later the University on the road to becoming a research oriented institution.

THE DEAN'S COUNCIL

As a part of my duties in the Dean's Council I became involved in writing the University's rules for tenure and promotion. These rules stipulated that candidates for tenure must demonstrate a potential for scholarship. Currently, in the College of Science, a candidate for tenure must show competency in teaching, demonstrate scholarship and have been awarded a National Competitive Grant, the latter pretty much requires the former.

During my tenure on the Dean's Council each case of promotion or tenure was discussed extensively, of course, while a vote was taken on the candidates, Bill Baker had the last word. These promotion discussions at the Deans level provided me with exposure to a much larger venue. In this broader setting, the strict application of a scholarship rule as a basis of promotion was not practical. After thinking about this for a while, I wrote a white paper which defined three professor models based primarily on the discipline they represented. They were: the Teacher-Scholar model, the Teacher-Practitioner Model and the Teacher-Teacher Model. Using these models one could define the requirements for tenure in a more realistic way. Later, at Bill Baker's request, I also developed a form for uniformly rating faculty; the form rated each faculty member from 1 to 10 on teaching, scholarship and service. The form, still in use, is widely known as the Bo Derek Form.


10 Christmas Party

THE SCIENCE LEARNING CENTER

The concept of a Science Learning Center is an image that I brought from Austin. During my UT Austin time I chaired a Committee on Science Learning. The Committee was set up under a large NSF umbrella grant given to help the sciences on the UT Austin campus. It was a great opportunity for me as I was able to visit several universities to see how they were doing science education. In particular I visited Ohio State, Purdue and Cal, Berkeley. Each of these had developed unique methods of dealing with masses of students in the beginning science courses. During my visit to Berkeley I was able to see the Lawrence Hall of Science and to learn about their methods of instruction

In addition to visiting other institutions, we invited some outstanding teachers to campus in order to learn more about their methods. One who came, and delighted me the most, was Harvey E. White. In my graduate work at Berkeley, Dr. White had been my

physics professor. His physics lectures were justifiably famous for the innovative demonstrations which I saw in real time. We examined many ways in which science was being taught, some of which were already a part of the current practice at Austin. After lengthy discussion we wrote a report which recommended that a Science Learning Center be built on the Austin Campus. In the report we specified an appropriate central location; unfortunately the Chemistry Department also chose this site for a new building.

I left Austin, but the concept of a science learning center stayed with me. To initiate this concept at UTA, I asked the associate dean, to submit a grant application for a Science Learning Center to the National Science Foundation. A proposal was written, it received good comments but it was not funded. Jim Erickson, then Psychology Chair, rewrote and resubmitted the proposal and it was funded. Space was allocated in Life Science Building and Ann Benham (a specialist in forensic chemistry) became the first Director of The Science Learning Center. Under Ann's direction the center expanded its focus, modified its facilities, purchased various types of equipment and became a center for student study. All of the sciences and mathematics had component activities centered in its facilities. In 1976, with the help of another NSF Grant, Ann Benham began UTA's Women in Science Program; this successful program was centered in the Science Learning Center. By 1989 the S.L.C. had over 7500 student visits per year.


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Students interested in a premedical program are common in Biology, Chemistry and Psychology and occasionally in the other science departments. The Deans office was responsible for advising these students. In 1983 Ed Morton was hired as a fulltime Pre Medical Advisor working in the Dean's office. He still continues premedical advising as Assistant Dean of Science. Perhaps his most novel accomplishment was to secure a Medical School student position for a 68 year old man.

GRADUATION

Graduation exercises are usually happy times for the graduating students and their families. They are also a sizeable expenditure of faculty and staff time. During the first years of my tenure, Science students attended the University graduation ceremonies which took place in our major auditorium; the agenda was designed by a committee and the President assigned staff to organize the ceremony. The programs I participated in were interesting. Invited speakers such as Cecil Green, one of the founders of Texas Instruments, and Lady Bird Johnson, President Johnson's wife made excellent presentations. A representative of the Regents would award the degrees. In this setting, however, the auditorium was overly crowded and the individual graduates were unrecognized. Working within a committee two of us redesigned the graduation protocol and this ended the universal graduation exercises.

In our new plan, individual Colleges were responsible for designing their own unique ceremony; the Deans would heavily depend on the College personnel. I helped design a protocol for the College of Science that provided every individual graduate an opportunity for recognition. Our program began in the student union where everyone assembled in their robes. There the graduation candidates received marching directions, were sorted out by department and were placed correctly in line; the latter was necessary since we gave them their actual diploma. The student union building was on the far side of the campus which provided an opportunity for the group to march across campus to the Graduation Hall. The academic parade radiated color generated by the graduation robes, but to add more color and distinction, I had a special Gold Graduation Robe made. This robe was big as it had to fit the six foot four, 290 lb frame of Bob McMahon, who headed our


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procession for many years. In the bright sun it was a great sight, hopefully engendering memories for the graduates. Luckily, it only rained one time in the 20 or more graduations that I attended. Following graduation we marched off the stage, out of the auditorium and back to the student union where the College hosted a reception for the graduates and their families. The reception usually had cake, coffee, punch and fortune cookies.

GRADUATION SPEAKERS

Almost every traditional graduation program has an outside speaker whose general obligation is to give prudent advice to the graduates. On two successive occasions our invited speaker did not arrive. On the second occasion I made a poor substitute speech. Then and there I vowed I would never have that problem again. From that time on I gave the Graduation address, **I always showed up**. This was perhaps another "*defining moment*" in my tenure at Dean. Over time I gave a number of what I considered to be interesting speeches. They were intended to engage both audience and graduates; however, some thought my speeches had bizarre titles.


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The following list gives you a chance to judge if they were bizarre: *"The Beginning;" "MacDonald's Farm;" "Ethics and Science;" "Your Fortune Cookie;" "Developing Scenarios for Science Careers;" Undisciplined Comments;" "The Science of High Technology;" "The Perkins Principle;" and "Scenarios revisited"* to list a few. *"MacDonald's Farm"* concerned the success that comes with hard work and some vision. *"Undisciplined Comments"* was a temporary title that became permanent through "inadequate proof reading." The two talks involving *"Scenarios"* revolved around the simple principal used in radio and motion pictures to develop episodes for their serials. With six or seven major components one has only to change one component to come up with a

new script. For example, change the Lone Ranger's silver bullet to a gold bullet, or a rifle bullet, or a blank, or have him run out of ammunition and you can create a new episode. A simple 7 x 7 matrix provides and easy way to generate 49 episodic scripts. Science careers may be planned in the same way.

The title ***"The Perkins Principle"*** is an obvious rip off of the book "The Peter Principle," by Laurence J. Peter. However, my talk went in a different direction; it dealt with ethics in science. It was dedicated to my friend Bob Perkins, Graduate Dean ***nulli secundus***, for his dedication to the best in Science and for his continued support of the College of Science.

My speech entitled ***"Your Fortune Cookie"*** dealt with the fortune cookie syndrome; a belief in good luck rather that real work. In science fortune cookies do not give answers and are not a substitute for hard work. There was a secondary reason for this title; we wanted to establish a tradition associated with our graduation reception. Why fortune cookies? The mystique of fortune cookies stems from their association with the orient. The surprise, a printed saying, may be witty, comical, hilarious, or droll, but it is almost always entertaining! A graduate, or one of their family members, can easily keep their fortune as a memento of graduation. After my address, I usually opened a fortune cookie and read the random saying. Mary Jane became rather adept at stuffing fortune cookies with the just right random saying.

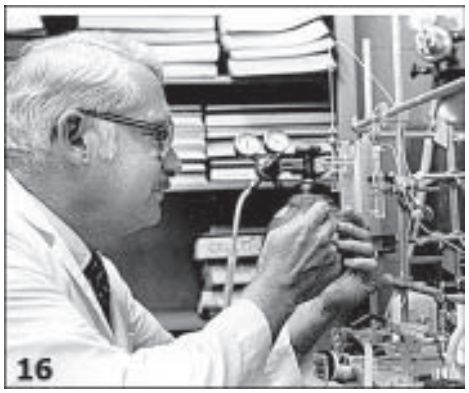
PUTTING OUT FIRES

Department squabbles occurred throughout my tenure. Most often they arose between the faculty and the Chair, but splinter groups could also be unpleasant. Over time it happened in almost every department. The first case that I dealt with was in Geology where a forceful Chair had been accused of mistreating various individuals. The stress became enough to make him want to resign. Naive reasoning led me to believe this was an isolated event; I talked him out of a resigning. Soon it happened again, and he again offered to resign. My eyes opened, his resignation was quickly accepted, much to his surprise. With his resignation we had a chance to restructure the department. A new Chair was hired and the department was stable for many years. The mathematics Chair had intermittent faculty problems. One amusing difficulty occurred because he spoke in a very rapid fashion, a manner often associated with people from the Indian sub-continent. Some of our Texans said they couldn't understand him because he talked so fast. The Chair was equally disturbed with the Texas drawl which caused "his mind to sleep between words." There was not much I could do about this situation except laugh—it is one of the ironies of modern academic life. When good people from all over the world are asked to forge a department, language, accents and other simple problems may become real stumbling blocks.

In another case the Physics faculty felt they needed a new Departmental Chair. I softened the let-down by asking the Chair to become Associate Dean. It worked well on both ends. The difficulties between the Chairs and faculty often seem to arise from a perception of misdeeds. Such perception can easily escalate and led to complete mistrust. Acting as a facilitator in a few cases I was able to sort out the situation and restore a semblance of trust; sometimes this had to be done in an open faculty meeting. Often it seems, the more celebrated a faculty member is, the less able they are to deal with minor problems, frustrated by their inability to cope, they become the root of discord. When the frustrated faculty member is Chair discord is inevitable.

NEW CHAIRS

The daily chores involved in running a department sometime wore down the Chairs and they would resign. At this point it was extremely important to hire a new Chair; my preference was to import someone from the outside. The advantage being that with one appointment you may get a new Chair and top-quality faculty member. When we were looking for a new math Chair the faculty wished to interview several final candidates at the National Math Meeting in New Orleans. Amid some trepidation they accepted the idea of me going with them and being in on the interview process. This actually worked out well and we were able to interview several outstanding candidates at the meeting. One of these was a woman with a substantial reputation. We offered the position to George Fix, an outstanding research mathematician who was also interviewed at the meeting. He accepted. Soon after the lady mathematician called me. She was concerned because she might have been disregarded because she was a woman. She was relieved and understood our position when she found out that Fix had been selected. She was quite aware of his reputation, and on that basis felt there was no slight intended. I too was relieved.

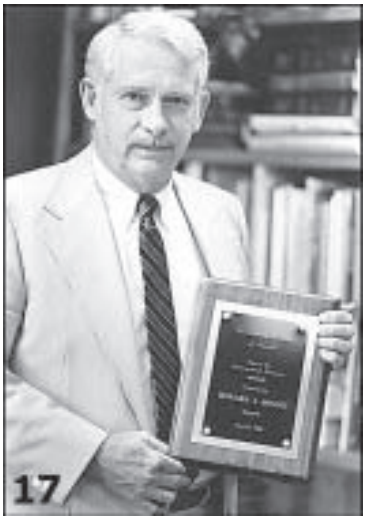


On several occasions, after the department had made their selection of a chair nominee, I visited the candidate on their home campus. I felt it important to know whether the total package we offered was better than their current situation. On these occasions I took a letter of offer, signed by the President, with me. I usually met the candidate's family, some of their colleagues and visited in their offices and laboratories. If I was satisfied that we had a good fit, the offer was made on the spot. This happened when we hired Edmund Brodie for Biology Chair and Roger Mellgren for Psychology Chair. On another occasion I felt the match was not satisfactory and no offer was made. My last recruitment visit was unsuccessful. We were looking for a Chemistry Chair, but our offer was turned down. Having visited him both at home and on campus I was not surprised at his rejection.

ADMINISTRATIVE REVIEWS

Administrators at UTA were reviewed on both an annual and four-year basis. Annual reviews were done by the supervisor and coincided with consideration of salary raises. The four-year dean reviews were far more complicated because they involved an elected faculty committee, one or more faculty surveys and a written report. My first two four-year reports were carried out by, what seems in hindsight, reasonable faculty; each review made some positive suggestions; one that stands out in my mind was "that I should smile more." By University policy I was not given copies of the reports or allowed to read them; feedback was communicated by Baker.

My third (and last) four-year review was altogether different than the first two, however from my view everything was normal. In the end, so I was told, the committee's views were split five to one. The one individual had heavily lobbied his departmental colleagues to become their committee member; he clearly held a grudge against me. Reports indicate, "That during the committee discussions he made absurd and demonstrably false accusations against me." Reports also indicate "That he was unrelenting in his show of hate." Being both pigheaded and obstinate he would not agree with the committee's report; and made a minority report. A supportive secretary from across the street gave me a copy of his minority report. It was laughable in its slanderous misrepresentations; of course I didn't laugh, however, but went directly to Baker seeking remediation and asking if a suit for defamation of character could be filed. We discussed both the majority and the minority reports; his advice was to ignore the latter report. Luckily that faculty member stayed out of my way for many years. I completed my 16 year tenure as Dean without any additional reviews. Designed to be helpful, reviews still engender some amount of discord. Because most administrators "*serve at the pleasure of the President,*" it doesn't take a review to send you packing.



AWARD CEREMONIES

Various kinds of faculty and student awards are a regular part of university life. The most common awards given to faculty were years of service pins. We developed an in-office protocol for the awarding of these pins and over the years, of course, everyone got them. Our office awards were certainly more satisfactory that receiving your 30 year pin in the mail. Retirement ceremonies for our faculty were carried out in the library and generally quite elaborate with friends and family attending.

During the first years, student awards were presented in a luncheon involving only the faculty and students. I changed the format to an evening event which allowed the student's family and friends to attend. After a mixer a dinner was served, a speaker would talk and then the awards were presented by the representative departmental Chairs. In large part the success of this format came from the careful planning of Mary Jane Goad and the departmental secretaries. At the university level, Research and Teaching awards to the faculty were presented by the President in general faculty meetings. I received four awards in this manner: Award for Distinguished Record of Research (1984); Ashbell Smith Professorship (1991), a Jenkins Garrett Professorship (1996) and for 25 years of service to UTA 1992.

NEW Ph.D. DEGREES

This is not the place to detail all the events that are associated with the final attainment of Ph.D. programs in Biology, Chemistry, Math and Physics. However, it is not possible to overestimate the importance of Ph.D. degree programs in the development of a College of Science. The foot soldiers of research in any science department are Ph.D. students. They are the tireless agents of progress—the research equivalent of workers in a bee, ant, or termite colony. When there are no Ph.D. programs there are no Ph.D. students and research has to be carried out in other ways. I am not down playing the roll of professors but the multiplication factor attained by using Ph.D. students is really enormous.

The Ph.D. moratorium affected UTA in many ways. We lost quality faculty to other institutions and the recruitment of first-class faculty was unquestionably hindered. The ability to attract top graduate students was almost obliterated. We suffered academically in many ways until these programs were approved.

Our upper administration did not let me participate in any direct contact with the members of Coordinating Board. Their reasoning was clear enough; they felt that the more people approaching the board members the more chance that they would talk at cross purposes; this would surely "screw things up." I certainly give Baker and Nedderman credit for working hard to get our programs approved. However, as the leader of a College *mostly without Ph.D. programs*, my restriction from what I considered appropriate action chaffed deeply; it was harder to accept than any other incident that happened during my administrative tenure. I wanted to do anything that would help us get our programs approved. I felt, and I made no secret of it, that if I could talk to some of the Coordinating Board Members they would be convinced of importance of approving our programs. However, it appeared that interaction with the Coordinating Board was politics, and Deans were not players.

At that time I did not realize that the Coordinating Board was probably, either directly or indirectly, under the influence of the U.T. Board of Regents. Looking back it seems like the Regents, Chancellors and Deputy Chancellors, used the Coordinating Board, as well as other devices, to control the progress of outlying campuses like University of Texas at Arlington. Disadvantageous control by the Regents and Coordinating Board may still be operational, e.g., no sports arena for UTA.

Thank goodness, Nedderman and Baker relented when it came time for consideration of Biology's Ph.D. by the Coordinating Board. Through Linda Lopez's father I was able to meet directly with a Coordinating Board member. This happened when Linda's father invited Jean and me to dinner in San Antonio where we shared a meal with him and a board member. In that case I had a chance to visit "one on one" with the member. I believe my efforts convinced him that our program was well designed, unique and beneficial to the State. When our program came up before the Coordinating Board he spoke in favour of it. I remember the relief, joy and even exultation that overwhelmed me as I watched Texas Higher Education Coordinating Board vote approval the Ph.D. in Quantitative Biology.

"Politics is no mystery—it is just plain hard work!"

THE BIOLOGY PH.D.

When I first began talking about a Ph.D. in Biology the idea was not met with open arms. There was a vocal faction in the Biology Department that had severe doubts about supporting a Ph.D. program. Their concern was that any shift of emphasis toward research would certainly damage teaching. In my opinion they had everything backward; I believe research helps make quality teachers. At that time, it was possible to find numerous examples of great teachers also being great researchers. Without research as a background, teachers must rely completely on the work of others. Furthermore

you can not develop a quality science college without research. Ph.D. students are not only the "foot soldiers" in research; they also make the best group of teaching assistants.

Resistance to the development of Ph.D. programs in Chemistry, Physics and Mathematics was not present. Was that because they didn't have high quality teaching reputations? No, the faculty these departments understood the need for Ph.D. programs and would do whatever was necessary to get them approved. In the end we had to design the Chemistry, Physics and Math Ph.D. programs with gimmicks in order to differentiate them from other Chemistry and Physics programs in the state. We adopted gimmickry because the Coordination Board forced us to do it. Without a special gimmick it was not possible to say that our programs were different from others in the state. Biology's gimmick is "quantitative biology." A very shrewd and important gimmick indeed.

THE CHEMISTRY BUILDING

In the early part of my tenure it became clear that we would need additional space for Chemistry and Physics. Even though the Science Hall's roof was fixed several times, water still dripped from the ceiling in some Chemistry labs. Student numbers were going up, new Ph.D.s was in place and the importation of higher quality research orientated faculty necessitated a new building. Having broached the need on several occasions I was finally asked by Baker to find a place where the new Chemistry building would go. By that time the center of the campus was filling up and it seemed possible the building might have to be placed on the edge of the campus. While the campus was not that large, a building away from the campus center would not be advantageous. There were several remote sites which I visited. One possible central location was the area where the old women's gym was located. Linda Lopez and I went to the site and measured it and I made some calculations. I reported to Baker that the women's gym site was preferable. Later when the gym was destroyed, one could see that it was an excellent site.

Like many projects there was a priority list for new buildings. It was some time until a chemistry building reached the top, however, every time Nedderman asked me what we needed I said, "A New Chemistry Building." Each dean had a yearly meeting (discussion) with the president and a new chemistry building was always discussed. After there was some agreement on the site, I built a crude model of a possible new building. The site was only a hundred feet east of Science Hall, but there was a major cross-campus travel path between the two. My model projected a second floor attachment between the new and old buildings with a "tunnel" allowing pedestrian traffic to continue normally. I showed the model to Baker and Nedderman and soon Nedderman arranged for a graduate student from the Architecture College to build a more professional model. Under my direction he built a fine model which was used by the administration to sell the new building.

When it was clear that the building would be approved and money appropriated a building committee was developed to oversee the planning. From my first measurements, it was clear that the building would have to be built in two "sections." The first building was not started until I left office; it has offices and laboratories for both chemistry and physics. The building was recently named The W.T Baker Chemistry Research Building. Currently the second Chemistry Building is being completed.

UNIVERSITY RESEARCH STATUS

By law UTA is a part of The UT system; therefore it is subject to any bias that the Regents, Chancellor or Vice Chancellors want to dole out. So it came about, in the 1980s, the System appeared to be functioning with the Coordinating Board to keep UTA from developing. In one example Vice Chancellor Duncan came to our campus to pointedly say, "That we should not be upset or confrontational because we are being downgraded to a level two research institution." He made this statement directly in an address to the faculty which I attended. In my memory the President gave no reply to Dunkin's devastating directive. In the question period which followed, I asked the President, in a harsh voice, "is the faculty to have no roll in this action." His answer to me was short and direct. He said, "That if I wanted to organize the faculty I could." Later in private I asked him why he was not fighting this affront. He said, "Someday, I'll tell you *the rest of the story*!" I immediately got together with the Acting Dean of Engineering and the Dean of Business to establish a plan of opposition. We soon organized the Chairs across the campus to fight this downgrading. In this fight, our major accomplishment, aside from alerting the faculty to the problem, was to organize a protest meeting. We did that, and on a sunny afternoon we filled the Library Mall with students, faculty, staff, alumni, and well wishers protesting the Coordinating Board's planned move. Through our efforts, we were able to publicize the problem on campus and in the local newspapers. In the end the Board did not change our classification.

HIGHER ADMINISTRATION

You may wonder if I ever applied for an upper administration position; the answer is yes. In fact, I tried a number of times. I was offered a position as Vice President for Academic Affairs at Montana State University. Montana State is a good Land Grant University that has many excellent faculty. I also had an excellent and very friendly President. I reluctantly turned the offer down, however, probably with out giving it adequate thought; that's another decision that still bothers me. Perhaps, in the back of my mind, I thought there would be more offers.

My interviews for Vice President provide some interesting anecdotes. Several of interviews were quite elaborate and included me giving a speech and answering faculty questions at a general faculty meeting. In almost every case the local biology faculty members were supportive. In two of my interviews I found out that university presidents regularly lie or at best shelter the truth from the faculty. For example in interviews advertised as outside searches, the president had already chosen the next Vice President; in both cases a current crony was appointed. The searches that were carried out were actually mock searches. During one interview a president took me to lunch with his crony who became the next vice president. I guess it was an amusing situation, since they spent a good deal of lunch giggling, like jaded school girls. Much faculty and staff time was wasted in these pseudo-searches. What those universities actually needed was a new president, someone with honour.

My interview at SMU found the President sour and distant; I would not have been able to work with him. In two other interviews the President was not on hand during my interview; everyone knows presidents are busy, but hiring vice presidents **is** part of their job! I assume I was a contender in several cases, but there were no other offers. I started this round of applications soon in my tenure as Dean, in part as a response to the Ph.D. moratorium. After a while the idea of moving up the academic ladder lost its importance.

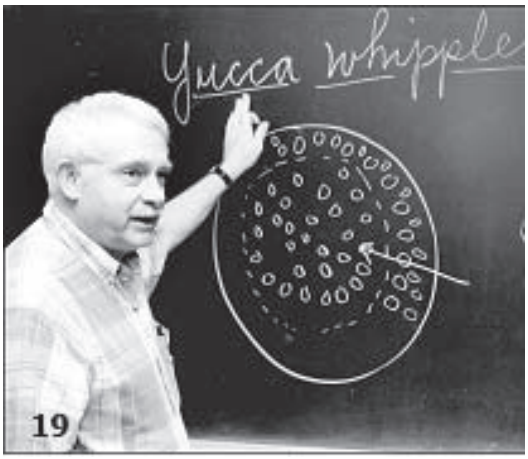
SIGMA XI

In 1958 the U.C.Berkeley Chapter elected me a member of Sigma Xi, The Scientific Research Society; an Honour Society for Science. Jean and I had keep books for the Berkeley Chapter, and remember how amused we were when my major professor was elected President of the Chapter, as he was several years behind in dues payment. At Northwestern I served as Chapter Secretary. At UTA I was elected Chapter President and twice attended the National Meeting of Sigma Xi as their delegate. On the second occasion, I was elected Director, Southwest Region and Member of National Board of Directors of Sigma Xi.

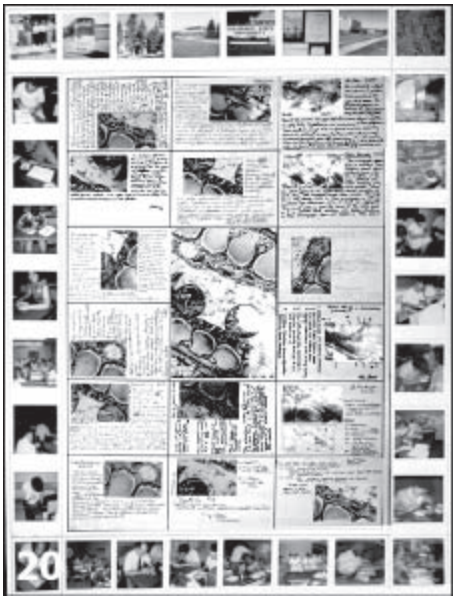
I served eight years as Southwest Director and during that time I met many interesting people, heard some great lectures (e.g., Mandelbrot on fractals), and found out how important politics is in Science. At board meetings I often found myself at odds with Sigma Xi's General Secretary, doubtless I was a thorn in his side. Before attending those board meetings, I had no concept of the role science politics played in the operation of the Sigma Xi and the selection of its National President. As Southwest Director I attended the 1986 one-hundredth annual meeting in Washington, DC. On the UTA campus, Nedderman, Baker, Perkins, Rouse and I (all members of Sigma Xi, planted a young red oak, *Quercus shumardii* Buckl. to mark the 100th anniversary. The tree has done well in the 20 years since.

UTA TEACHING

My teaching at UTA began in 1976 with a course called Biological Ultrastructure. This graduate course featured the infamous micrograph analysis assignments. I taught an early version of this course at UT Austin (Charles Mims has talked about it several times at the TSM Meetings) and later at South Florida. The course combined a series of lectures on cell ultrastructure with series of practical exercises. The later were called micrograph analyses; they were written papers about electron micrographs in which the only the magnification given to the students. These projects were designed to help students see the "**entire"** micrograph, not just the things they already understood. Students usually did not like the work involved micrograph analyses, but later they almost always told me that the exercises changed the way they looked at images. Over the years Biological Ultrastructure gradually morphed in to my current Image Analysis course.



During my dean years I made my most important undergraduate teaching contribution in a junior level course on Cell Biology. During the peak times there were often more than 180 students in class. Then it was common for the students to use audio recorders but some students also used video recorders in class. It was a popular and informative course for the students and was fun for me to give. I did some outrageous things, such as my cell model escapade. My model cell consisted of a garbage bag (cell membrane) full of packing peanuts (cytoplasm), red soft drink cans (mitochondria) and a small white trash bag full of peanuts, (nucleus, chromatin etc.). A coffee can inside the nucleus represented the nucleolus.



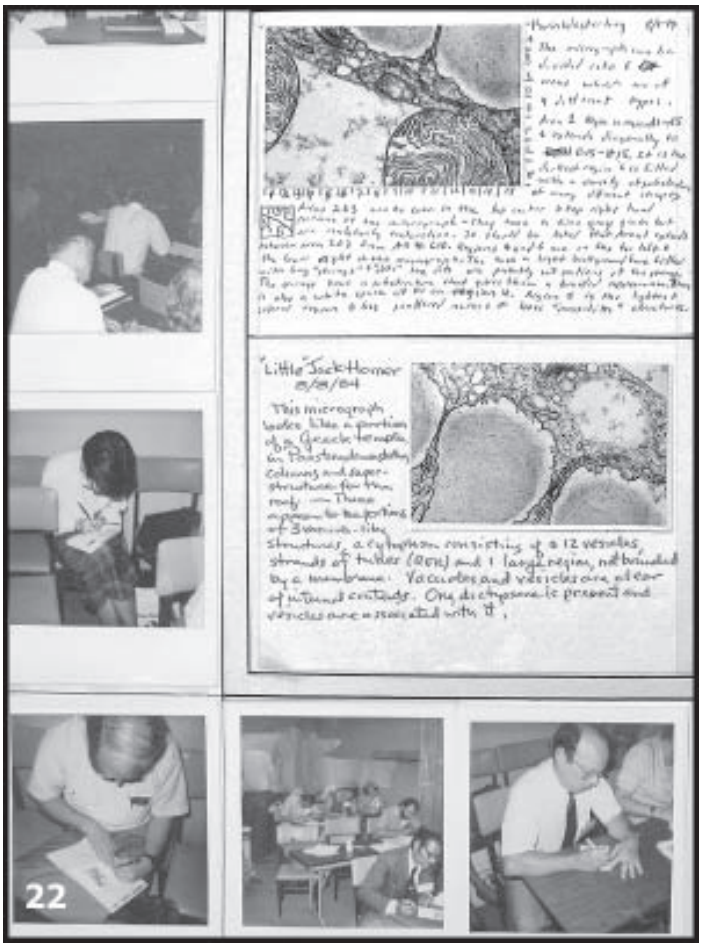
In class I would bounce it, kick it, tear it and otherwise damage the model all the while aiming to demonstrate the nature of an animal cell.

My model of a plant cell was basically the same except for the addition of green soft drink cans to represent the chloroplasts. The cell was placed in a cardboard box to simulate the cell wall. I used Pautard's string of styrofoam balls to demonstrate protein structure and other kinds of polymers. On several occasions I marched back and forth in front of the class with a picket sign simply to make a point. The most notorious picket sign said, "Yea Compartments." I gave out prizes like the Good Sport Award and the Best Handwriting Award, etc. Both Mike Johnson and Regina Huse received the "*coveted*" Good Sport Award. Many students who subsequently went to medical school told me they appreciated my course because it left them very well prepared for the material in med school. During that time I also taught General Botany many times. In 1976, for fun, I taught a seminar course entitled Futuristics, a hot topic in the 70s.

PROCESS ART IN TEACHING

In the early 1980's at a meeting on futurism, I attended an address on "Process Art;" which according to the lecturer was art in which the artist(s) activities become part of the art. He demonstrated the technique in the following manner: members of the audience, including me, were asked to line up in the center of the lecture hall. He then gave the person at the head of the line a Polaroid camera and asked them to take a picture of the person behind them and then hand the camera to that person who would in tern take a picture of the person behind them. So the iterations continued until the camera reached the end of the line. There were about forty individuals in the line and assistants provided additional film and collected the photos. As each color photo developed it was tacked to a cork board in rows. During the "tacking" the "artist" was photographed by his assistants. These photos were added to those already placed, and the sum total was again photographed. "Everything" was declared a piece of *ART—Process Art.* It was an amusing charade which started me thinking about how I could do it!

Process Art is the "Term applied to art in which the process of its making is not hidden but remains a prominent aspect of the completed work so that a part or even the whole of its subject is the



making of the work." (Tate Collection, Glossary). For examples and more information See: John Hilliard's 1971 piece "*Camera Recording its Own Condition (7 Apertures, 10 Speeds, 2 Mirrors*," or see Sean Griffin on the internet. Mary Ann Kohl believes that the process of making a "process art" is more important that the work it's self. See also the work of Christo and Jeanne-Claude; e.g. "*The Gates*."

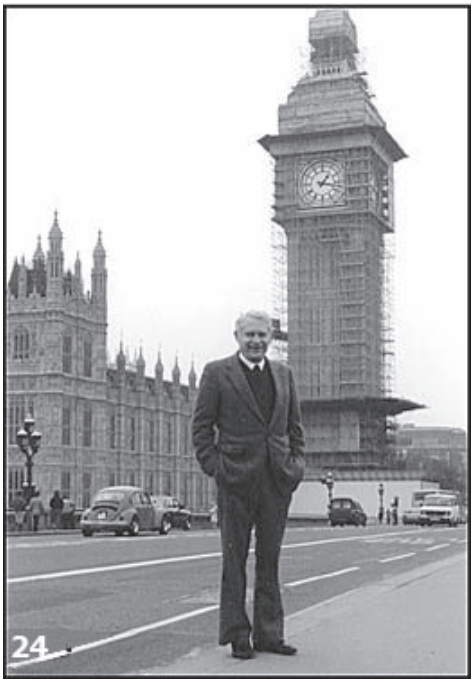
After my process art experience I thought that it would be interesting to see if this could be applied to my science or teaching. I experimented with several options but it was easy to use PA in teaching ultrastructure. In one version of *my process art* I took a transmission electron micrograph of a corn root cell and cut it into 16 equal sized pieces. Each was then glued to a 4 x 6 inch piece of bond paper. During the AIBS Meetings on the campus of Colorado State University, I arranged for a class room in which to do process art. Each of the 16 pieces was given to an individual and they were asked to write about what they saw on the accompanying piece of paper. No one saw the entire micrograph until the exercise was over. While they were writing, Kenneth Whitney and I took Polaroid pictures of them. Then the assemblage, thirty Polaroids and sixteen micrograph analyses were assembled on a 30 x 40 inch foam board to make the final art work. Over time I did this with several groups and everyone seemed to have fun and learn at the same time.

THE SEM CLASS

In the spring of 1980 I started an SEM course. It became popular and is still in our curriculum today. Louis Bragg audited the course and began using the SEM in his research. For a time Louis Bragg also taught the SEM course. The organization of the course is heavy on practice; students have to prepare micrographs of a series of required subjects (see as an example the screw, which is a montage of 36 individual micrographs). They must also submit a paper and make a presentation on a self-generated research topic of their choice.

OVERSEAS TEACHING

In 1985 UTA began a formal overseas teaching program. Prior to this, only summer courses in Architecture had been given in Italy. I was in the first group which taught in "A Semester in London" which consisted of five faculty from UT Arlington, UT Dallas and UT San Antonio along with about 30 students. The group traveled by plane via New York to Gatwick; then by train to London where we were met by British representatives. The students were housed in private rooming houses near Imperial College. Jean and I lived in a cold basement apartment just off Cromwell Road in Kensington. It was winter and it often seemed extremely cold.



On school days Jean and I took the underground from Earl's Court to Russell Square; from there we had a short walk through Russell Square (a park) to University College where I taught and had an office. University College London is located in Bloomsbury near The British Museum and close to the place in which Alexander Fleming discovered penicillin. We made group tours to various nearby locations, museums, castles etc. We also had receptions and parties and attended a series of Plays as a group. I remember seeing "A Little Shop of Horrors" in a West End Theatre. We traveled by train to Edinburgh to visit various architectural sites including the Edinburgh Castle.

In the London program, I taught General Botany. My lectures were given at University College and we spent considerable time at Kew Gardens for the laboratory part of the course. During our visits to Kew we spent time in the herbarium, in many of the greenhouses, and even in the wood-herbarium. We toured the new aquatic greenhouse before it was complete. As one part of the course, students were required write a paper which summarized their interview with a professional botanist. Students interviewed Kew people from the Director down to horticulture interns. This was a great opportunity for me and for the students, although few of them recognized it at the time.

UTA RESEARCH

On arrival I found a good electron microscope laboratory with a Zeiss Microscope under the direction of James Butler. Jim gave a course in transmission microscopy and personally instructed me in the use of his microscope. Several of my students used it and Mary Alice Webb did pioneering work on calcium oxalate in plants using it. Wayne Fagerberg used it in our studies of algae and blue green bacteria from the Mimbres Hot spring system in New Mexico. Using some of my set up money I purchased an ISI table top scanning Electron Microscope. The remainder of my money was used to buy an Olympus Vanox light microscope. The Vanox microscope has been upgraded four times and is still in use. The ISI table top produced some early pictures of cystoliths in *Morus alba*. It was an interesting piece of junk. You could take it apart with little effort and I learned a great deal about how an SEM worked. Later, after we purchased a new scanning microscope I was able to sell it to a faculty member in Engineering. My conscience still bothers me about that. ***C'est la vie.***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THE CENTER FOR ELECTRON MICROSCOPY

After Geology moved out of the Life Science Building, some of the space released in the basement was utilized to establish The Center for Electron Microscopy. The Center consisted of an office, preparation lab with hood, 2 ultramicrotome spaces, 2 dark rooms, and rooms for several microscopes. Our first need was for a scanning microscope as the Zeiss microscope still preformed well. In 1977 we purchased a JEOL JEM 35C with a Tracor Northern energy dispersive X-ray system. Soon after the 35C was installed Jim Foster served as our microscope technician from JEOL; incidentally, Jim still servicing the 35C in 2005. Just after installation Jim was working on the microscope when we had a surprise visit by W.O. Milligan, Director of Research for the Robert A. Welch Foundation. Milligan had done electron microscopy of clay and wanted to see our microscope. Milligan was real important to Chemistry, I mean big time important. Jim was working on the 35C when W.O. arrived; Milligan was full of questions, both about clay microscopy and microscope operation. Jim Foster answered all of his with aplomb, at which point I let out a sigh of relief. We have used the 35C continuously since its installation. It has been used a great deal for research and over 200 users (mostly students) have been trained on the microscope through the agency of the SEM course which was taught through the years. Throughout that time it has been under service contract and JEOL has done an excellent job of upkeep as they have on JEOL 1200EX.


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During the late seventies we inherited a Hitachi HU11a from UT Southwestern Medical School. It arrived in pieces (large and small) and was stored in an office for some time. Two graduate students, Randy Allen and Mark Grimson along with, a post Doc, Ken Whitney, volunteered to put the pieces together and see if it would run. We had space in the E.M. Center and so they carried the pieces down to the basement and began to assemble it. None of them had ever worked on such a project and I didn't know whether all the parts were there or not. Somehow they were able to assemble it. It actually ran and they took some pictures with it. About that time we had purchased a new JEOL 1200X STEM transmission/scanning electron microscope and we needed the space so the microscope was given to Bishop College in Marshall, Texas. Randy Allen earned his MS working with me on the storage proteins of the sunflower, he is currently a Professor of Biology at Texas Tech. Mark Grimson earned an MS with me working on crystal sand in potato, he is currently an EM Research Associate at TexasTech. Kenneth Whitney operates Foothill Associates, an environmental consulting firm located in California. It was a remarkable example of self-learning for the three; it was also a lot of fun.


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LABORATORY SUPERVISION

In the first years of operation of the EM Center Linda Lopez served as our Laboratory Supervisor. Prior to UTA she worked for JEOL and for Tracor Northern in various capacities. She was well versed in TEM, SEM and EDS and was an extremely valuable addition to the Center. Linda, not only maintained the lab and its equipment but she taught many of us EDS as well as various aspects of light and electron microscopy. She was especially helpful when I was studying the young "rocket-like" calcium oxalate crystals of *Vitis vinifera*. In those days I was often gone on University or research business, for example three months in England, during which she handled the EM Center expertly. Linda Lopez studied the air space system in the petioles of the water hyacinth (*Eichhornia crasipes*). She earned a master's degree under my direction in 1992 and was an excellent prototype for those who followed her.


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Cathy Boyles followed Linda as EM Center Supervisor; and she also worked for a Masters Degree studying variation in the guard hairs of the white tailed deer using LM and SEM. Cindi Schwartz took over after Cathy went to work in the Dean of Science Office. Cindi Master's Thesis is entitled "Investigation of Thermogenesis in the American Lotus." She worked Lotus (*Nelumbo nucifera*) flowers which develop and maintain substantial heat above ambient temperature during floral development. Her work involved LM, SEM. Her field studies at the Fort Worth Nature Center involved measuring, *in situ*, the heat developed in the ovary of lotus. Cindi Schwartz is currently Professional Research Assistant at the Laboratory for 3D Electron Microscopy of Cells, University of Colorado, Boulder. Cathy Boyles is now Director of Pro-


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gramming in the Honors College at UTA. Much of the makeup of the EM Center rests on the efforts of these three. They were active participants in TSM (TSEM).

During the 1980-90's I was fortunate to have many research students, some working for degrees and others just learning about research. Some have gone on to become successful physicians and others are still doing research or research related jobs. "*The three caballeros*," Mike Davis, Mike Johnson and Clay Williams, are contributing to the Dallas Forth Worth research community, each

in different way (Fig 27). Mike Davis is an Image Consultant for Nikon Microscopes traveling here and there to advise and consult on Image Analysis. Mike Johnson is a successful sales representative for Nikon Microscopes in the D/FW region. Clay Williams is doing outstanding microscopy as a research associate in the Howard Hughes Medical Institute, Southwestern Med. School. His histochemical work on brain tissue is technically challenging, but the results have illuminated the covers of several national periodicals, and he has been an author of many important journal articles. Their pictures, along with Linda Lopez, Regina Huse and others are seen in the group portrait of student working in my laboratory in the early 80's.

RESEARCH

Through the 1970-90's my research involved the development of calcium oxalate in plants and I attended many conferences on calcium oxalate. In 1981 I visited Germany for a conference on "Biological Mineralization and Demineralization" sponsored by the Dahlem Konferencen. A very classy group! It was my first visit to Berlin we had an excellent conference with many heavy hitters in attendance. Several of us crossed into East Berlin at Check Point Charlie; inspection at the border was intense. I remember seeing

the other side of the Brandenburg Gate, having lunch in small roadside cafe and visiting an elaborate Russian War Memorial.

A few years later Jean and I traveled to International Botanical Congresses in Berlin. After the conference we took a train from the Zoo Station into East Germany and on to Poland. We left the train in Poznan and started our paleobotanical excursion by Orbis bus. We went through Wroclaw, Krakow and on to Warsaw stop-

ping at many sites to look for fossils. At that time Poland was gloomy and depressing; but the Polish Botanists were wonderful hosts and we visited many places where Americans did not usually get to go. I remember a trek through a beautiful forest and finally arriving at a trash dump. As the dump had been excavated it exposed some great fossil sites. There were also reminders of the cold war, for example, when we came near the Polish border there was a large encampment of Russian Tanks just over into Checklosovakia. Our bus journey took us to Krakow where we attended a reception at the Wladyslaw Szafer Institute of Botany. Despite monetary difficulties the botanists in that institute were doing some excellent research. In an interesting coincidence, our tour leader was the daughter of Wladyslaw Szafer. From there we visited Warsaw and saw some of the old Polish culture. The train ride back to Berlin from Warsaw was somewhat upsetting as our car was detached from the train for several hours and we were guarded by soldiers with AK47 automatic rifles, all because someone said something wrong to the conductor. We visited the Berlin Wall and looked at its paintings (graffiti); some painting was being done as we watched. The contrast between east and west was extreme.

In 1986 Rex Crick (Geology) and I jointly organized the Fifth International Biomineralization Symposium which was hosted at UTA. Jean and I had previously attended the Third Symposium in Japan. We made friends with both Japanese and European mineral people. Japan was a wonderful place to visit. We rode all over Tokyo on the trains without trouble. However, we usually had a Japanese companion who made sure that we had no problems.

In 1989 I organized the Second Gordon Conference on Calcium Oxalates, which met at Plymouth State College in New Hampshire. This was considerable work as I had to apply for grants to support the conference as well as work within the rules of the Gordon Conference management. The same group of researchers continued to meet as a part of The Gordon Conferences and more recently under FSAEB; the latest conference organized by Dr. Mary Alice Webb.

TSEM ACTIVITIES

Early in my Texas adventures, Gordon Whaley, Graduate Dean at UT Austin, told a group of us to forget any activities with "local" societies like the Texas Academy, etc. He said, "Work published by local societies counted zero with him and the Dean of Arts and Sciences." Only the national scene had any real importance. I participated in the 2nd TSEM meeting as an invited speaker, but for obvious reasons I only gave a few TSEM papers while I was in The Cell Research Institute at UT Austin.

Since returning to Texas in 1974, my students and I have participated with some frequency in TSEM which is a great place for students "to get their act together." In 1989 I was elected President of TSEM. Over the years I have enjoyed my interaction with many fine Texas microscopists.

FISHING, HOBBIES, ETC.

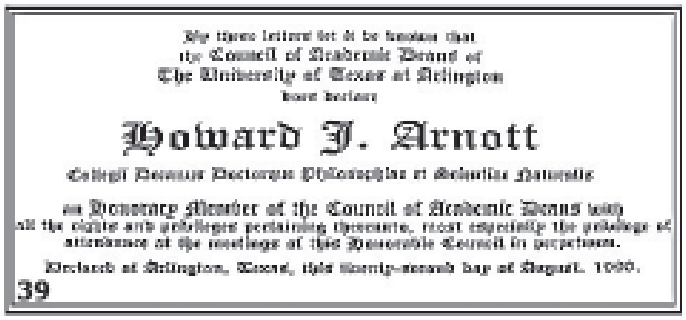
I have always been interested in fishing, and I fished thoughtout my youth. Fred Pautard and I often fished in the lakes around Austin. I mentioned above that I had fished in for blue fin tuna in Nova Scotia during the 40's. I'll take this chance to show the evidence; the bluefin tuna on the left was 139lbs, on right 515lbs; I was twenty years old. When Jean and I visited New Zealand, one of the best places in the world to fresh water fish, I made it a point to go fishing even though the total time I had to fish was only 2 hours. In Lake Rotorua, on the North Island, I hooked and landed a 7.5 lb brown trout**.** This is about as lucky as you can get!

In the 80's I became interested in clocks. It just happened; it's really ironic, because I always thought Gordon Whaley had a "screw loose" because of the many clocks in his home. However, he was a *clock collector* and I choose to be a *clock builder*. I became so interested in clocks that I joined the National Association of Watch and Clock Collectors (NAWCC Member No. 0061496) in 1978. Not long after we registered the business name Colonial Clock Co. of Arlington, TX, however, we never sold any clocks I made.

Most clocks that I made were actually just assembled and finished from clock kits. A few were made from scratch but in either case the movements were always purchased (see Fig. 14). I made around thirty large clocks, including eight grandfather clocks; it is apparent that my grandfather clocks are not in great demand since we still have 5 at home. I also tried collecting clocks and even bought a few, but the ones I wanted, like most things, always cost too much. My favourite clock was made by the Eli Terry in Connecticut in the first part of the 19th century. The clocks are called the "Eli Terry Pillar and Scroll Shelf Clock." The pillar and scroll motif was duplicated my many other builders, including Seth Thomas. The price for these clocks continues to spiral up, and the very best examples are in museums or are not for sale. Not to get carried away, but these clocks are examples of American innovation and style at the very highest level. I have included a dean doodles showing the general nature of the pillar and scroll clock. "Dean Doodles" is a generic name for the doodles that I made over the many years of boring meetings. I have a large collection of doodles which seems to say I have been bored a lot. Aside from fishing and clocks I've not said much about my private life choosing rather to keep on the professional side. As a family we were pretty much on the normal side; as normal as one can be with 4 children and 11 grandchildren.

RESIGNATION

I announced my resignation from the Dean of Science position in a fall 1989 faculty meeting. It was done early so the College would plenty of time to select a new dean before my departure on Aug. 31, 1990. Near the end of my term the members of the Dean's Council along with Baker and Nedderman gave me a great "retirement" party. In addition to joking and talking, they presented me with two gifts. The first was a new personal computer. The second was a diploma which made me an honorary member of the Dean's



Council in perpetuity, signed by all the deans, Vice President Baker and President Nedderman. It hangs on my wall and reminds me of the good times and the many good friends I made. At retirement I was the senior dean, Bob Perkins, who started a year later than me, then became the senior dean; he retired when Baker and Nedderman left office in 1993. There have been four Deans of Science and three Presidents since 1990. I have yet to be asked my advice on anything.

Like the Porsche dealer said to the man about to buy a 911, "If you have to ask! Then you don't have enough money!"

As a result of my retirement I was given a one year's leave. Most of the leave was spent try-

ing to learn something about molecular biology in the laboratory of Mary Alice Webb at Purdue University. I worked on the molecular biology of calcium oxalate crystal cell development. Mary Alice's lab uses molecular biology, light and electron microscopy to study plant crystal systems. Purdue is a large university with many components not found at UTA, including its own airport. It is located in West Lafayette, Indiana.

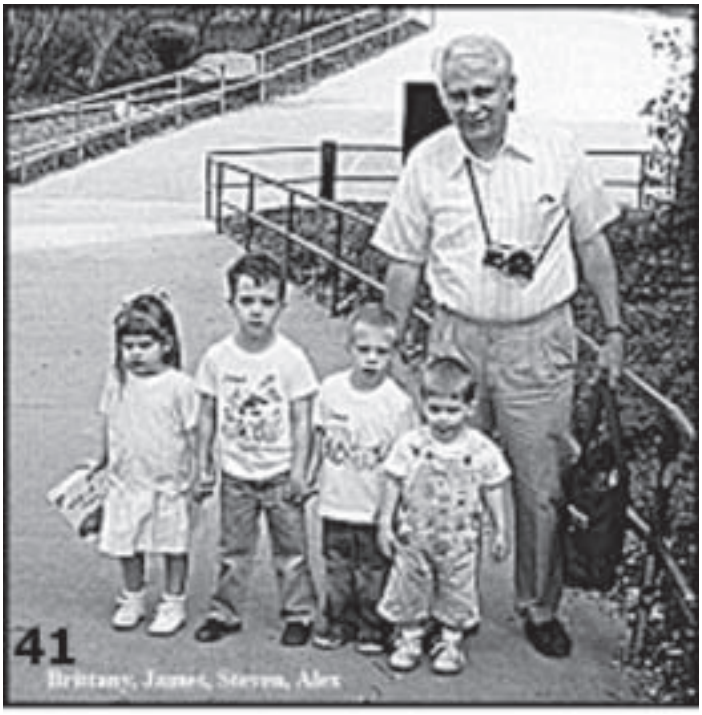
A five minute drive in any direction from West Lafayette takes you into rural Indiana where corn and soy beans fields predominate. I arrived just as the fall semester began; that was a bad mistake since almost all of the local housing was taken up. I found a room in a home about 6 miles out into the country and later when things settled down moved to a furnished apartment in Lafayette, a town across the Wabash River. During my first week the temperature was continuously around 95 degrees and the humidity varied between 99-100%.

Thankfully in two weeks it cooled off and I had a great time marvelling at the "sea of grass." For a city person it was astonishing to look down from a small hill on what seemed to be a "finely mowed lawn" and then realize that it was "just a field of corn." Soon farmers were harvesting corn; and then winter set in and my diesel wouldn't start. The daily routine was to arrive at the lab around 6:00 AM and often not leave till 10:00. I generally had meals at the union which was just across the street from the lab. I soon found out, however, that hard work did not automatically change one into a molecular biologist. In fact, after three months of centrifuges, gels and silver stains, it was time to throw in the towel. I returned to microscopy, a discipline which I knew and loved.

WAS MOVING WORTH WHILE?

Unfortunately changing positions is not an experimental science. There is no control and there is no real way of deciding on whether the change was for the better or worse. Our four children grew up and prospered in Arlington; they have all opted to live in the local area. Each of them graduated from UTA, Susan has MS degrees from UTA and SMU and John has a MS from Carnegie Mellon and a Law degree from SMU; they are all happily married to Texans and we have 11 grand-children. I had sixteen satisfying years as Dean and, so far, another sixteen in the faculty; that's not a bad record.

In the last 31 years both UTA and South Florida have increased in size, UTA from 15000 to 25000 and SF from 17500 to 43000. The Biology Department at each institution has about 30 faculty; UTA has 1600 undergraduate biology majors and 80 graduate students. South Florida has 480 undergraduate biology majors and about 80 graduate students. Even a cursory look at the University of South Florida's complexity indicates that it has changed much more than UTA; it is now one of the top institutions in the south. In the same period, The Regents and the Coordinating Board have impeded UTA's growth. Obviously the changes at USF brought many new administrative positions into being. Could I have moved up in that rapid period of growth? Probably, yes! Could I have moved up at UTA? Perhaps! Would my family and I be better off in



Florida? Probably not!

Thinking about the move from U.T. Austin to South Florida is equally complicated. I was well thought of when I left Austin, had a booming research program and gave up a Full Professor position in the top Botany Department in the U.S., perhaps even number one in the world. I was sorry to leave good friends like Harold Bold and Constantine Alexopoulos. In the Cell Research Institute, W. Gordon Whaley was my enigmatic boss. I think he liked me and I admired him. He never said anything about me leaving at the time I left, however, later he said, "You left too soon;" that was it; he remained enigmatic to the end. A couple of years later Whaley stepped down as Director of the Cell Research Institute. Through the years UT Austin has continued to prosper. Would I have been able to move up at Austin? Probably, yes! I simply did not have enough patience, never enough patience!

"You take your chances…
And, live with the consequences."

Over my administrative years there are hundreds of people that I wish to thank; Bill Baker, Wendel Nedderman, Bob Perkins, Mary Jane Goad, a succession of Deans and Chairs and the list goes on. Beyond question I owe the greatest thanks to my wife, Jean, for she dealt with the ups and downs of an impatient man with compassion and love.

I want to thank the following for their help with the preparation of this manuscript: Catherine Arnott-Thornton, Susan Garrett, Jean Arnott, Martha Gracey and Mary Jane Goad.

FIGURE LEGENDS

1. John and Howard Arnott with black Wildebeest, July 10, 2005 on the Spring Fontein Ranch, Karoo District, Eastern Cape, South Africa.
2. H. J. Arnott, *ca.* 1978. Note the side burns.
3. H. J. Arnott, *ca.* 1980.
4. Mary Jane Goad, Dean of Science Office Manager from 1974 to 1990. See text for more details.
5. Two Psychology Professors *dans le déguisement.*
6. Marquis Clock in Dean of Science Office. See details in text.
7. Chairman's Meeting, Dean of Science Conference Room, *ca.* 1989. Left to right, Dr. Earl Engles, Associate Dean of Science, Dr Richard Timmons, Chemistry Chair, H. J. Arnott, Dean.
8. Tenure doodle (from Dean Doodles by H. J. Arnott). Importance of tenure is emphasized by increasing size of the T.
9. H. J. Arnott, 1986 in Dean of Science Office.
10. Christmas Party in Dean of science Office, *ca.* 1986. Left to right are H. J. Arnott, Betty Lampe, Biology Senior Secretary, Ed Morton Assistant Dean of Science and Premedical Advisor.
11. H. J. Arnott (right) with Dr. Chuck Hall, Professor of Biology at awards party in Dean of Science Office, *ca.* 1984.
12. College of Science Graduation Procession with Dr. Robert McMahon (Professor of Biology, currently Dean of the Honors College) as Procession Leader, note special Gold (yellow) Robe.
13. H. J. Arnott, Speaker at Graduation Ceremony.
14. H. J. Arnott sitting by an Eli Terry Pillar and Scroll Shelf Clock. The case was built from scratch in 1987.
15. Reception in Dean of Science Office *ca.* 1984. Left to right are Dr. Paul Paulus, Professor of Psychology, H.J.Arnott and Dr. Harriett Amster, Professor of Psychology. Dr. Paulus is currently Dean of Science.
16. H. J. Arnott, *Science News* publicity photo *ca.* 1983.
17. H. J. Arnott holding award for Distinguished Record of Research presented in 1984. Note the suit is in Ben Matlock "luxury style."
18. H. J. Arnott using the JEOL JSM 35C, ca 1981. Note careful use of log book and business-like attire and apparent solitude.
19. H. J. Arnott in a UTA Teaching publicity photo, 1990. *Yucca whipplei* Tor. is one of the plants used in his research.
20. Process Art Masterpiece done in 1984 at Colorado State University. Sixteen mini-micrograph analyses surrounded by thirty two Polaroid photos mounted on 30 x 40 inch foam board (see text and Fig. 22 for mini-micrograph analysis by Dr. H. T. Horner).
21. "Screw" montage made up of 36 individual micrographs put together with PhotoShop. Original micrograph were taken by Nicole Grose, UTA graduate student. The montage was refined by H. J. Arnott. This is a typical SEM course project, such projects are used to develop skills in microscope use; "it is harder than it looks."
22. Lower left side of Process Art seen in Figure 20, showing details of mini-micrograph analyses by Dr. H. T. Horner and Karen Westerling. Note the use of a grid in Westerling's analysis. Polaroid at lower right shows Louis Bragg working on a mini-micrograph analysis; Wayne Fagerberg is constructing another analysis in the left corner Polaroid.
23. Dr. Louis Bragg, Professor of Biology, ca 1996. Dr. Bragg was President of the Texas Society for Microscopy.
24. H .J. Arnott. Big Ben in background, London, England, 1984.
25. James Butler, Professor of Biology (deceased). Dr. Butler was supervisor of our Zeiss electron microscope, about 1985.
26. Reassembled Hitachi HU11a with Dr. Kenneth Whitney at controls.
27. H. J. Arnott's research group. Left to right are Steve Gieser, Mike Davis, unidentified, Amy Jeffres, Regina Huse, Mike Johnson, Donovan Yamada, Juliet Morphew, Linda Lopez, Clay Williams, Lori Lane, and Dr. Rodger Metcalf.
28. Linda Lopez was first E. M. Center Supervisor (see text).
29. Cathy Boyles was second E. M. Center Supervisor (see text).
30 Cindi Schwartz, later E. M Center Supervisor (see text).
31. Louis Bragg and H. J. Arnott's research Group. Left to right top row; Linda Lopez, Susan Rudd, Melissa Tennant, Ina Kin, HJA, Todd Simpson; bottom row, Courtney Kennedy, Louis Bragg, unidentified, Tammy Hancock Nelson, Dr. Rodger Metcalf and Robert Wells.
32. Biological Mineralization and Demineralization Seminar members. Conference sponsored by the *Dahlem Konferencen*, Berlin, 1981.
33. International group of Scientists on a Paleobotanical Tour of Poland. The lady at the left was our Orbis Tour guide and also the daughter of Professor Wladyslaw Szafer the founder of the Botanical Institute, Polish Academy of Science, in Krakow,1987.
34. H .J. Arnott at the Berlin Wall, 1987.
35. Presidential plaque given to H.J.A. by TSEM in 1989.
36. H. J. Arnott and bluefin tuna caught in the summer of 1949 at Wedgeport, Nova Scotia. The fish weighed 139 lbs and 515 lbs.
37. An Eli Terry Pillar and Scroll Shelf Clock doodle (from Dean Doodles by H. J. Arnott). (See also Fig. 14)
38. Jean and Howard Arnott at Niagara Falls.
39. Part of Dean's Council Diploma awarded in 1990 at retirement from Dean's position. Note: "*member in perpetuum*."
40. H. J. Arnott is holding his first grandchild, James Arnott, 1986. James is now a senior in Aerospace Engineering at UT Austin.
41. H. J. Arnott with four grand children at Ft. Worth Zoo in 1990. Left to right, Brittany Scott, James Arnott, Stephen Arnott, Alexander Scott, first and last are children of Virginia Anne Arnott Scott, the middle two sons of John Joseph Arnott.

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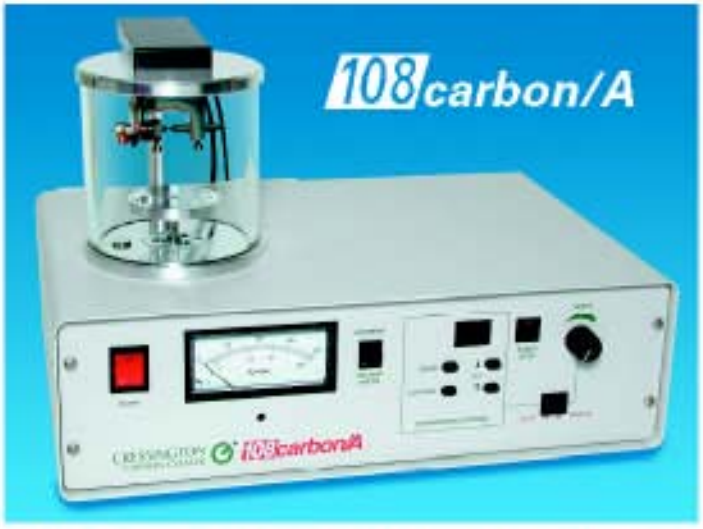

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108 auto/SE	Au, Au:Pd, Pt:Pd	A/M	150 x 165 (adjustable)	Yes	Optional RT or RPT	MTM-10 or MTM-20
108 carbon/A	Carbon	A/M	120 x 120	No	Z axis	MTM-10 or MTM-20
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208C	Carbon	A	150 x 165 t (adjustable)	No	Optional RT or RPT	MTM-10 or MTM-20
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