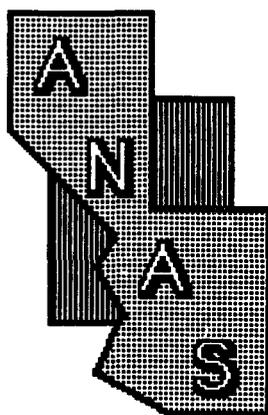


2005

VOLUME 40

**PROCEEDINGS
OF THE
ARIZONA-NEVADA
ACADEMY OF SCIENCE**



FORTY-NINTH ANNUAL MEETING

April 9, 2005

**University of Nevada
Las Vegas, Nevada
2004-2005 Annual Reports**

**Proceedings
of the
49th Annual Meeting
of the**

ARIZONA-NEVADA ACADEMY OF SCIENCES

**April 9, 2005
University of Nevada
Las Vegas, Nevada**

Table of Contents

ABBREVIATED SCHEDULE AND ACTIVITY LOCATIONS.....	2
SUMMARY OF SECTION MEETINGS	3
ANTHROPOLOGY/PSYCHOLOGY/SCIENCE EDUCATION SECTIONS.....	4
BIOLOGY SECTION	7
CHEMISTRY SECTION.....	12
GEOLOGY SECTION.....	25
HYDROLOGY SECTION.....	30
POSTER SESSION.....	38
ACADEMY BUSINESS AND ANNUAL REPORTS.....	46
COMMITTEE ROSTER	47
REPORT OF THE PRESIDENT	48
MINUTES OF THE 48TH ANNUAL MEETING.....	50
REPORT OF THE PERMANENT SECRETARY	51
REPORT OF THE FELLOWS COMMITTEE	52
MEMBERSHIP SECRETARY REPORT	52
NECROLOGY REPORT	52
OUTSTANDING SERVICE AWARD COMMITTEE.....	53
BUD ELLIS SCHOLARSHIP	ERROR! BOOKMARK NOT DEFINED.
REPORT OF THE GRADUATE GRANTS-IN-AID COMMITTEE	54
TREASURER’S REPORT 2004.....	55

ABBREVIATED SCHEDULE AND ACTIVITY LOCATIONS

Friday, April 8

6:30 – 8:30 PM Board Meeting: Cozymels Restaurant , Flamingo Road, Las Vegas

Saturday, April 9

All section meetings on Saturday, April 9 will take place on the campus of the University of Nevada, Las Vegas

7:00 - 8:30 Registration: Classroom Building Complex, C Building, Northeast Lobby

8:00 - 10:00 Paper Sessions (See Section Schedules)

10:00 - 10:30 Coffee Break and Poster Session: Classroom Building Complex, A Building Foyer

10:30 - 11:30 Paper Sessions (See Section Schedules)

11:40 - 1:40 Luncheon, Annual Business Meeting and Awards: UNLV Dining Commons

1:45 - 3:00 Paper Sessions (See Section Schedules)

3:00 - 3:30 Coffee Break: Classroom Building Complex, A Building Foyer

3:30 - 5:30 Paper Sessions (See Section Schedules)

SUMMARY OF SECTION MEETINGS

Section	Session	Time	Room
Anthropology/ Psychology/ Science Ed*	I	9:00	C113
Biology*	I	8:00	C110
Chemistry*	I	8:00	C112
Conservation	I	8:00	C116
Hydrology*	I	8:00	A112
	II	1:45	
Poster Session*		10:00	Foyer

* Indicates a paper to be considered for the Best Student Paper Award or Best Student Poster Award

ANTHROPOLOGY/PSYCHOLOGY/SCIENCE EDUCATION SECTIONS

SESSION I 9:00

ROOM: A113

Chairperson: Barbara Roth

**9:00 – 9:15 ROCKS OF MOHAVE COUNTY, ARIZONA, AN
EDUCATIONAL LANDSCAPE DISPLAY**

Doyle C. Wilson (Mohave Community College, Lake Havasu City, AZ)

Timothy L. Montbriand (Mohave Community College, Lake Havasu City, AZ)

Forty-seven boulder-sized rock samples representing 22 different major rock types that occur in Mohave County, Arizona have been collected and displayed on the Lake Havasu Campus of Mohave Community College to provide the public an opportunity to view the geologic diversity of the county and to provide an educational resource for college students; K-12 educators and students; and local rock and mineral clubs. Boulders have been placed in separate groups on campus based on their association with geologic provinces recognized within the county: Colorado Plateau, Basin and Range, and Colorado River Extensional Corridor. They are labeled with descriptions, age, a map of the collection locality, and sponsors supporting the project. Introductory signs describe the uniqueness of each geologic province. The Colorado Plateau display consists of specimen representing rock layers within Grand Canyon and Zion National Parks and is laid out in chronological order to provide a walk-through-time experience. A geologic timeline is being established along the Colorado Plateau boulder display, complete with panels depicting continental positions and geologic and biologic descriptions of each geologic period. Curriculum has been developed for introductory geology classes at the college and for K-12 visiting students. Greater details of the display and associated curriculum are presented on the college's science web site (www.mohave.edu/science).

9:15 – 9:30 DOES THIS TREATMENT WORK?

Melinda Davis (University of Arizona, Tucson, AZ)

In health outcomes research, the important question is usually "How well does this treatment work?" Scientists want to know if a particular medical treatment is effective for a specific illness or disease, and just how effective the treatment is. There are a number of statistical techniques that can be used to estimate treatment effects, and different techniques can give disparate results. We will present outcomes from a pediatric cerebral palsy treatment study and compare the results obtained using statistical techniques of increasing

complexity; t-tests, multiple regression and latent variable modeling. When a study has multiple outcomes and covariates, using simpler analytical methods can provide erroneous results. Multivariate approaches can be useful in any experimental or quasi-experimental study, whether in medicine, climate change, or wetlands renewal.

9:30 – 9:45

***ORAL HEALTH SCREENING & PARENTAL SURVEY OF ORAL HEALTH ATTITUDES AND EDUCATION: A CORRELATIONAL STUDY**

Anthony Paventy, Mildred A. McClain and Clifford R. McClain, (University of Nevada, Las Vegas, NV)

Despite the declining prevalence of dental caries over the past several decades, caries remain the most common chronic childhood disease, especially in high-risk (low socio-economic status) populations. This appears to be true even when parents are aware of good oral health habits. The purpose of this study was to gather oral hygiene data on children in a high-risk elementary school in Nevada and to assess parental attitudes and education concerning their children's oral health. Using visual examinations and a severity index, 235 lower SES children were screened and given treatment recommendations. Following the screenings, the parents were surveyed concerning their knowledge and attitudes toward oral health. The screenings showed larger than expected prevalence in both caries experience and untreated decay. Surprisingly, results from the parent survey showed a very positive attitude and high educational level towards oral health and their children's dentition.

Conclusions suggest that future programs designed to better educate parents may not be as effective in controlling childhood caries, while programs designed to better motivate parents as well as create access to dentistry to meet children's dental needs may be more useful in helping Nevada's children.

10:00 – 10:30

COFFEE BREAK: FOYER

10:30 – 10:50

ECOLOGY, RISK, AND THE TRANSITION TO AGRICULTURE IN SOUTHERN ARIZONA

Barbara J. Roth (University of Nevada, Las Vegas, LV)

Models of the transition from hunting and gathering in southern Arizona have generally been structured around two opposing viewpoints: either maize was introduced by migrant farmers who came into the region and out-competed or co-opted local hunter-gatherers, or local hunter-gatherers adopted maize and integrated it into their diet. In this paper, I propose that by examining the ecological setting in which this transition took place, we can gain a clearer understanding of the processes involved in this important subsistence shift. I examine the resources available to Middle Archaic foragers in the Tucson Basin of southern Arizona prior to the introduction of maize, and argue that the use and manipulation of seedy annuals along the floodplain of the Santa Cruz River served as a "pre-adaptation" to the adoption of maize.

**10:50 – 11:10 THREE YEARS WORK IN COYOTE SPRINGS VALLEY,
NEVADA**

Kevin Rafferty (Community College of Southern Nevada, Las Vegas, NV)

In 1990 a land exchange was made between the Federal government and Aerojet General Corporation in the Coyote Springs Valley, Nevada. Portions of this land were then purchased by Coyote Springs Investment Company. Beginning in 2001 plans were put into motion to develop this land, triggering the operation of a Memorandum of Understanding (MOU) between the Federal government and the developer of the land to conduct the necessary cultural resource work on the parcels prior to development. Two surveys, covering roughly 2800 acres, were undertaken recording a total of 13 sites. Of these six were considered eligible for nomination to the National Register of Historic Places (NRHP). This paper discusses the surveys and the results of the mitigation efforts at the NRHP eligible sites, and attempts to place the data within the larger context of southern Nevada prehistory.

**11:10 – 11:30 PATTON’S INVASION OF SOUTHERN NEVADA: THE
HIGHWATER MARK?**

Jeffrey Wedding (Harry Reid Center, Las Vegas, NV) and Alex Heindl (Marjorie Barrick Museum, Las Vegas, NV)

In the earliest days of World War II, when this Nation was thrust into the greatest global conflict the world has ever seen, the War Department realized the necessity for troops well trained under harsh conditions to withstand the rigors of battle over rough terrain and in inhospitable climates. Thus, the Desert Training Center, California-Arizona Maneuver Area (DTC-CAMA) was created in 1942. This simulated theater of operation was the largest military training ground in the history of military maneuvers to that time. The young troops that trained here would carry their early lessons on to victory in the sands of North Africa, the mud and mire of Europe, the ice and snow of Alaska, and even into the Pacific jungles. A small previously undocumented Nevada archaeological site is a physical touchstone during this 60th anniversary of the war’s end.

**11:30 – 1:40 LUNCHEON, ANNUAL BUSINESS MEETEING AND
AWARDS: UNLV DINNING COMMONS**

BIOLOGY SECTION

SESSION I 8:00

ROOM: C110

Chairperson: Robert Bowker

**8:00-8:20 *FEEDING AND DIGESTION IN HYPOXIA, THE
BEHAVIORAL RESPONSE OF THE DUNGENESS CRAB**

J.L. Bernatis, and I.J. McGaw., (University of Nevada, Las Vegas, NV)

The Dungeness crab, *Cancer magister*, inhabits inshore environments that are frequently subject to periods of hypoxia. A variety of physiological mechanisms allow survival, however, this results in competition between metabolic systems, which may reduce energy available for other activities, such as foraging. In Barkley Sound, British Columbia, the inshore habitats of *C. magister* ranged in dissolved oxygen from 20 kPa to less than 1.0 kPa at the sediment/water interface. In feeding experiments, the crabs showed a significant decrease in the amount of food consumed and time spent feeding, as dissolved oxygen levels decreased. In a gradient chamber starved crabs would enter hypoxic waters to obtain and consume food, but exited the area of hypoxia and settled in higher oxygen regimes for digestion. In a high (21.5 kPa to 10.5 kPa) and low (10.5 kPa - 3.0 kPa) dissolved oxygen gradient, starved crabs showed no preference for a specific oxygen regime and were more active than postprandial crabs which preferred higher oxygen levels (>10.0 kPa). Consistent with this, crabs released into their natural habitat and tracked with telemetry tags exhibited similar behavior. Starved crabs ventured into areas of hypoxia and remained mobile, while postprandial crabs settled in areas of higher oxygen. This suggests *C. magister* reduces the use of costly physiological mechanisms by engaging specific behaviors during foraging and digestive processes.

**8:20-8:40 *BEHAVIOURAL RESPONSES TO THE SIMULTANEOUS
COSTS OF DIGESTION AND OSMOREGULATION IN THE
DUNGENESS CRAB, *CANCER MAGISTER***

Daniel L. Curtis and Iain J. McGaw (University of Nevada, Las Vegas, NV)

The salinity regimes of estuaries are constantly changing, imparting varying levels of physiological cost on their inhabitants. The costs of osmoregulation may be compounded by an increase in metabolic parameters associated with feeding and digestion. This results in an alteration in cardiac and ventilatory parameters as well as an increased mortality rate in postprandial crabs. The Dungeness crab, (*Cancer magister*), is classified as a weak osmoregulator, surviving in salinities as low as 11ppt. This species exhibited behavioral responses to low salinity that may reduce the use of physiologically costly mechanisms. In the laboratory, there was a decrease in feeding rate as well as the percentage of animals feeding as a function of salinity. Crabs ceased feeding in salinities below 16ppt (50% seawater). Despite the added metabolic demands of digestive processes, pre and postprandial *C. magister* exposed to both a high (20-28ppt) and low (10-24ppt) salinity gradient showed no

difference in salinity preference. Crabs were able to detect differences in salinity as low as 2ppt, showing preference for the highest salinity offered. In the Sarita estuary, British Columbia, crabs fitted with CTD data tags were exposed to salinities from 18-32ppt. Exposure periods to low salinity lasted from less than 10min up to 10h. This work serves as important baseline data for planned studies on feeding and digestion in physiologically challenging environments.

8:40-9:00

***PHYLOGEOGRAPHY OF THE PAINTED BUNTING
(*PASSERINA CIRIS*)**

Connie Herr and John Klicka (University of Nevada, Las Vegas, NV)

The Painted Bunting (*Passerina ciris*) currently has two recognized subspecies *P. ciris ciris* and *P. ciris pallidior*. These two subspecies have two geographically disjunct breeding populations: a western population found primarily in Kansas, Oklahoma, Texas, Arkansas and Louisiana; and an eastern population limited to coastal portions of North Carolina, South Carolina, Georgia, and northern Florida. These allopatric eastern and western ranges are separated by at least 550 km at their closest point. However, these ranges do not match the currently recognized ranges of the two subspecies based on previous studies using morphological characters. Intensive genetic sampling throughout the breeding range could clarify the boundaries of each subspecies and provide insight into patterns of gene flow and therefore the degree of isolation between the populations.

9:00-9:20

***INTERACTION BETWEEN CYCLIN-DEPENDENT
KINASES AND NITRATE REDUCTASE ACTIVITY IN
PHASEOLUS VULGARIS ROOTS GROWN UNDER
NITROGEN DEFICIT**

Janis Hansberry (University of Nevada, Las Vegas, NV)

In well-aerated soils, nitrate (NO_3^-) is the major nitrogen source available for uptake by crop plants. Initially NO_3^- is reduced to nitrite (NO_2^-) through nitrate reductase activity (NRA). Excess NO_3^- remaining in the soil may potentially contribute to ground and surface water pollution through leaching and erosion. Conversely, superfluous NO_3^- taken up by plants accumulates in tissues and has been implicated in the occurrence of methaemoglobinemia (Blue Baby Syndrome) and possibly other diseases, such as gastric cancers in humans. Understanding the role of nitrate reductase (NR) in vascular plants is of potential economic importance, especially in light of recent studies expounding the enzymes role in the controlled integration of carbon and nitrogen metabolism. Increased evidence has pointed to phytohormonal participation through regulation of the cell cycle, possibly via cyclin-dependent kinases (CDK). Cytokinins (CK's) are principle regulators of cell cycle progression through activation of cell cycle checkpoints. CDK regulation, occurring at multiple levels, is often altered in human cancers. Collaborations with the Czech Republic have brought together two labs working on identification of three CDK's proposed as novel cytokinins. Their importance is concomitantly being investigated due to their antagonistic effect on tumor suppressor cells and oncogenes. The purpose of this study is to analyze the

effects of these compounds on NRA in nitrogen deficient roots of *Phaseolus vulgaris* to resolve whether these compounds can be labeled as cytokinins or cytokinin inhibitors.

9:20-9:40

***CORRELATION OF LACTATE DEHYDROGENASE AND TIME AFTER DEATH TO DETERMINE POSTMORTEM INTERVAL**

Jamie Sickles, Leonard Bell, Ann Bucholtz, and Carleton 'Buck' Jones (Midwestern University, Glendale, AZ)

Determining time of death is important to criminal investigators as it may eliminate or suggest suspects in criminal proceedings. Postmortem interval (PMI) has been studied within forensic science for short range PMI (0-200 hours). For long range PMI (weeks to months) only a few biochemical methods have been researched. Lactate dehydrogenase (LDH) is a ubiquitous cellular enzyme whose activity is easily assayed using a colorimetric method. We hypothesized that LDH activity will decrease at a predictable rate over time following cell death, allowing correlation with long term PMI. Thus the aim of this study was to investigate a method for determining PMI by correlating levels of LDH activity to both time after death and temperature. Samples included MDA-MB-231 cells and human brain tissue incubated 7, 14, & 21 days. Samples were incubated at several temperatures. Post-incubation LDH activity was measured using an in vitro toxicology assay kit purchased from Sigma-Aldrich. We observed a decrease in LDH activity beginning at 7 days postmortem. Additionally, LDH activity at 7 days postmortem for both 37°C and 50°C decreased compared to LDH activity at 4°C and 2°C. As evidenced by the results of the LDH assays, there is a decrease in activity dependent on both time and temperature. The ability to predict the LDH activity corresponding time and temperature will provide another critical tool to investigators examining PMI.

9:40-10:00

THE EFFECT OF VASCULAR ENDOTHELIAL GROWTH (VEGF) FACTOR ON LEUKOCYTE ADHESION IN ISCHEMIA-REPERFUSION (IR) INJURY

Brian K Hansen, Linda L Stephenson, Kayvan T Khiabani, Wei Z Wang, William A Zamboni (University of Nevada School of Medicine, Las Vegas, NV)

Research has shown that hyperbaric oxygen (HBO) significantly reduces leukocyte adherence and upregulates VEGF mRNA in ischemic skeletal muscle. The purpose of this experiment was to determine the effect of anti-VEGF on *in vivo* neutrophil-endothelial adherence in skeletal muscle IR injury. Twenty four male Wistar rats (130g ± 40g) were randomly assigned to four groups: 1) Nonischemic Control, 2) IR, 3) IR + HBO, 4) IR + HBO + Anti-VEGF. The right anterior gracilis muscle flap was raised using standard microsurgical technique. All groups that contained IR were subjected to four hours of global ischemia followed by two hours of reperfusion. HBO treatment consisted of 100% O₂ at 2.5 ATA for 90 min. Anti-VEGF (167µg/kg) was infused into the contralateral femoral vein beginning at 90 minutes of ischemia for 60 minutes. Intravital videomicroscopy was used to view adherent leukocytes and quantified at baseline, 5, 15, 30, 60, and 120 minutes post-reperfusion (reported as change from baseline, mean ± SEM). ANOVA and post hoc multiple range tests were used for group mean comparisons and a p of ≤ 0.05 was accepted as

significant. IR caused a significant increase in the neutrophil endothelial adherence that was significantly reduced by HBO treatment (Sham 0 ± 0.5 , IR 12.8 ± 1.4 and IR + HBO -3 ± 2.5 at 120 min reperfusion, $p \leq 0.05$). Anti-VEGF significantly increased adherent neutrophils at 15, 30, 60, and 120 minutes when compared to IR + HBO (9.9 ± 1.6 vs -3 ± 2.5 , $p < 0.01$ at 120 minutes post reperfusion). Increased leukocyte adherence upon infusion of Anti-VEGF in an IR + HBO treated rat suggests that VEGF does play a significant role in the protective mechanism induced by HBO in ischemic skeletal muscle tissue

10:00 – 10:30

COFFEE BREAK: FOYER

10:30-10:40

**THE EFFECT OF HYPERBARIC OXYGEN ON NOS
ACTIVITY AND TRANSCRIPTION IN ISCHEMIA
REPERFUSION INJURY**

Richard C Baynosa, Anna L Naig, Patrick S Murphy, Brian K Hansen, Xin H Fang, Linda L Stephenson, Kayvan T Khiabani, Wei Z Wang, William A Zamboni (University of Nevada School of Medicine, Las Vegas, NV)

Hyperbaric oxygen decreases ischemia-reperfusion injury through a nitric oxide mechanism that is nitric oxide synthase dependent. The purpose of this study was to evaluate the effect of HBO on NOS activity and transcription in early and late phase reperfusion injury. A gracilis flap was raised in 4 groups of Wistar rats: 1) SHAM, 2) SHAM-HBO treated with HBO for 90 minutes, 3) IR, 4hrs of ischemia and (4) IR-HBO, 4hrs of ischemia with HBO during the last 90min. of ischemia. After 30min reperfusion, samples ($n=20$ /group) were harvested from gracilis and pulmonary tissue and tested for eNOS activity via a radioisotope assay. To test late phase NOS upregulation, the SHAM, IR and IR-HBO groups ($n=5$ /group) were allowed to undergo 24hrs of reperfusion. Samples were harvested from gracilis muscle, rectus muscle, aorta and pulmonary vessels and rt-PCR was performed to detect eNOS mRNA. : eNOS activity in the IR-HBO group was increased $>100\%$ vs. IR in the pulmonary vessels (0.049 ± 0.009 vs. 0.023 ± 0.003 , $p < 0.05$). Expression of eNOS mRNA in the pulmonary vessels of the IR-HBO group was increased $>200\%$ vs. the SHAM and IR groups (91.0 ± 31.2 vs. 30.0 ± 7.8 and 30.2 ± 3.1 , $p < 0.01$). Likewise, eNOS mRNA in gracilis was increased 120% vs. the IR group (79.4 ± 22.3 vs. 36.1 ± 4.5 , $p < 0.05$). These results suggest the NOS dependent effect of HBO is by an early increase in eNOS activity followed by a late phase upregulation of eNOS mRNA.

10:40-11:10

**HYPERBARIC OXYGEN UPREGULATES VEGF THROUGH
A HIF-1 PATHWAY**

Patrick S Murphy, Brian K Hansen, Kayvan T Khiabani, Linda L Stephenson, Wei Z Wang, William A Zamboni (University of Nevada School of Medicine, Las Vegas, NV)

Hyperbaric oxygen is known to have a protective effect on ischemia-reperfusion injury. Previous research has shown that HBO induces VEGF mRNA in ischemic tissue. HIF-1 is a

well-described inducer of VEGF under hypoxic conditions, and we suspect that HIF-1 is also involved in the hyperoxic increase in VEGF mRNA. To evaluate this we have utilized YC-1, a HIF-1 blocker, to measure the effects of HBO on VEGF mRNA. A gracilis flap was raised in 28 male Wistar rats, which were divided into four groups (n=7/group): (1) IR, (2) IR-HBO, and (3) IR-HBO + 30 microg/g of YC-1 suspended in 0.6 microl/g DMSO, and (4) IR-HBO + 0.6 microl/g DMSO alone, given 24 hours prior to surgery. Four hours of ischemia followed, with HBO treatment (100% O₂ at 2.5 ATA) given during the last 90 minutes. Following 30 minutes of reperfusion, tissue samples were taken from the reperfused gracilis flap and other nonischemic tissues. RNA purification, reverse transcriptase, and PCR for VEGF mRNA were performed. The results are reported as % GAPDH, mean \pm SEM. There was a significant increase in VEGF mRNA expression in the gracilis muscle in IR+HBO compared to IR ($11.14 \pm 1.65\%$ v. $5.79 \pm 0.87\%$, $p < 0.05$). The HIF-1 blocker, YC-1, blocked the HBO-induced increase in VEGF mRNA to a level similar to IR ($7.41 \pm 1.06\%$, $p < 0.05$). This reduction was not seen in the DMSO (vehicle) group. These results show that HBO may exert its effect on VEGF-mRNA through a HIF-1-dependent pathway. By blocking HIF-1 with YC-1, the HBO-induced increase in VEGF mRNA was attenuated.

11:10-11:30

**SEED FATES OF *ARCTOMECON CALIFORNICA*
(PAPAVERACEAE)**

Laura Megill and Lawrence Walker (University of Nevada, Las Vegas, NV)

The Las Vegas bearpoppy, *Arctomecon californica* Torr. and Frem., is a rare herbaceous perennial endemic to the Mojave Desert mainly inhabiting gypsum outcrops. The Las Vegas bearpoppy is listed as Critically Endangered by the State of Nevada and a Category 2 species by the Federal Government, which signifies that more research is required before Threatened/ Endangered status will be assigned. There is some information on the demography, life history, reproductive biology, germination phenology, and soil seed banks of the Las Vegas bearpoppy. However, a vital aspect of the life history of the bearpoppy that has been overlooked in previous studies is seed fates. The unknown fate of the bearpoppy seeds provides an information gap in conservation management plans that is critical to plan mitigation measures. Therefore, the objective of this research project is to determine the seed fates of the Las Vegas bearpoppy to further promote conservation efforts.

11:30 – 1:40

**LUNCHEON, ANNUAL BUSINESS MEETING AND
AWARDS: UNLV DINNING COMMONS**

CHEMISTRY SECTION

SESSION I 8:00

ROOM: C112

Chairperson: Timothy Vail

**8:00 – 8:15 *THERMODYNAMIC STUDIES OF C-MYC MODEL
QUADRUPLEXES AND THEIR INTERACTIONS WITH A
CATIONIC PORPHYRIN**

M. W. Freyer¹, R. Buscaglia¹, H. Anderson¹, K.K. Kaplan¹, K.E. Tenney², and E.A. Lewis¹. ¹(Northern Arizona University, Flagstaff, AZ, ²Colorado College, Colorado Springs, CO)

Chemotherapy is plagued by undesirable side effects. Novel approaches, targeting cancer specific genes, have the potential to minimize side effects while improving treatment efficacy. Our studies have focused on the thermodynamics of interactions between model drug compounds and cancer specific DNA targets. G-quadruplex DNA structures are known to form in the telomere and in the promoter regions of several important oncogenes. This study isolates an abbreviated portion of the promoter region of one of these oncogenes, c-MYC. Three model G-quadruplex forming sequences were selected: the promoter unit (PU) 18-mer, PU 27-mer, and PU 27-mer 14:23 G→A Mutant, which differ only by length and/or base substitution in two positions. Isothermal Titration Calorimetry (ITC) and Differential Scanning Calorimetry (DSC) were used to determine thermodynamic parameters for quadruplex DNA/TMPyP4 interactions. Circular Dichroism (CD) was used to confirm quadruplex structures in solution and observe structural changes during drug binding titrations. ITC data demonstrated unusual complex binding between TMPyP4 and model c-MYC quadruplexes. Two or three distinct binding modes were observed depending on salt concentration. Dissecting the free energy change for each of the binding modes into enthalpic and entropic contributions yielded thermodynamic profiles consistent with both exterior binding and intercalation. NMR studies were done on TMPyP4 complexes of a simpler TG₄T quadruplex in order to assign site geometry to each binding mode.

**8:15 – 8:30 *INTERACTION BETWEEN METAL FISSION PRODUCTS
AND TRISO COATING MATERIALS (SiC)**

G. Gajjala, V. Marepally, T. Hofmann, J. White and C. Heske, (Univ. of Nevada, Las Vegas, NV) and L. Weinhardt, S.Hansen, O.Fuchs and E.Umbach, (Univ.of Wuerzburg, Germany)

The great potential of SiC as a semiconductor material for applications in high power, high temperature, and radiation stable electronics as well as in nuclear fuels is challenged by the stability of metal/SiC interfaces at elevated temperatures and in a radioactive environment. When SiC is subjected to operate at high temperatures, a reaction between SiC

and the metal (in particular metallic fission products) is often unavoidable. There is thus a need to study the electronic and chemical properties of metal/SiC interfaces. We have prepared Pd/6H-SiC(0001) interfaces under controlled conditions in an ultra-high vacuum environment and studied them using X-ray Photoelectron Spectroscopy (XPS) and X-ray Emission Spectroscopy (XES) using laboratory sources and high-brilliance synchrotron radiation, respectively. Several different chemical interface species are found, as will be discussed in our presentation. This project is funded by the Department of Energy, Advanced Fuel Cycle Initiative, within the UNLV TRP Program (Task 17).

The great potential of SiC as a semiconductor material for applications in high power, high temperature, and radiation stable electronics as well as in nuclear fuels is challenged by the stability of metal/SiC interfaces at elevated temperatures and in a radioactive environment. When SiC is subjected to operate at high temperatures, a reaction between SiC and the metal (in particular metallic fission products) is often unavoidable. There is thus a need to study the electronic and chemical properties of metal/SiC interfaces. We have prepared Pd/6H-SiC(0001) interfaces under controlled conditions in an ultra-high vacuum environment and studied them using X-ray Photoelectron Spectroscopy (XPS) and X-ray Emission Spectroscopy (XES) using laboratory sources and high-brilliance synchrotron radiation, respectively. Several different chemical interface species are found, as will be discussed in our presentation. This project is funded by the Department of Energy, Advanced Fuel Cycle Initiative, within the UNLV TRP Program (Task 17).

8:30 – 8:45

***³¹P MAS NMR SPECTROSCOPY OF PRASEODYMIUM-COMPLEXED TRIBUTYL PHOSPHATE ADSORBED ON THE CLAY HECTORITE**

Katherine VandenHeuvel and Cynthia J. Hartzell (Northern Arizona University, Flagstaff, AZ)

Praseodymium-complexed tributyl phosphate (TBP) adsorbed on Hectorite was studied by ³¹P MAS NMR spectroscopy at 162 MHz. Peaks were observed for both Pr-complexed TBP and uncomplexed TBP. The ³¹P signal from the complexed TBP is 80 ppm downfield from the signal of the uncomplexed TBP. The results of the solids NMR differ dramatically from the solution spectra in which only one exchange-averaged peak is observed. At TBP:Pr ratios of 1:1 to 3:1, the chemical shift of the ³¹P peak is 59 ppm downfield from the signal observed for TBP alone. Comparison of the solid and solution results indicate that, even at low TBP:Pr ratios, the solution NMR signal displays some exchange-averaging.

8:45 – 9:00

***THERMODYNAMIC STUDY OF BINDING INTERACTIONS BETWEEN TMPYP4 AND THE COMPLETE C-MYC SILENCER ELEMENT**

R. Buscaglia, M. Freyer and E.A. Lewis (Northern Arizona University, Flagstaff, AZ)

G-quadruplex DNA structures, known to form in the promoter regions of some oncogenes, have been extensively studied in terms of their ability to bind ligands as a possible means of gene regulation. A new anticancer drug developed to maximize its interaction with the G-quadruplex formed in the c-MYC promoter region is just now entering clinical trials.

Recently, the Molecular Biophysics Laboratory at NAU has made the discovery that ligand affinity for the Cytosine rich strand (i-motif) of the complete c-MYC silencer element is comparable to that of the G-tetrad forming strand in both affinity and stoichiometry. This discovery has increased the interest in the i-motif as an alternative bio-target for new classes of drug compounds selected for their binding affinity for the i-motif rather than the G-quadruplex. It is even possible that i-motif binding is responsible for some of the therapeutic effect of the quadruplex interactive drug (QIA) entering clinical trials. We have now conducted studies on the separate G and C-rich strands, as well as the complete c-MYC silencer element (NHE-III₁). We have used ITC, DSC, CD, and NMR Spectroscopy. The dissection of the free energy change for TmPyP4/quadruplex and/or i-motif interactions into enthalpic and entropic contributions is beginning to yield a molecular understanding of these interactions. Our binding models are being used to develop new lead compounds specific for the i-motif (different from the QIA-drug) and for the promoter sequences of other oncogenes.

9:00 – 9:15 *THIRD PHASE FORMATION IN URANIUM LIQUID-LIQUID EXTRACTIONS

Jennifer Petchsaiprasert, Amber D. Wright, James Ormord, Cynthia-May S. Gong, and Kenneth R. Czerwinski. (University of Nevada, Las Vegas, NV)

Uranyl, or $U(VO)_2^{2+}$, is generally reprocessed by the nuclear industry using the Plutonium Uranium Redox EXtraction (PUREX) process, during which spent fuel is dissolved in nitric acid and purified using liquid-liquid extractions. Under conditions of high concentrations of uranium and nitrate, the organic phase can form two phases, an event known as third phase formation. The heavier phase concentrates uranium and nitrate, creating criticality concerns and engineering issues. This phenomenon is well known, but there is disagreement about the speciation and mechanism of the formation of the uranyl complex in the heavy phase. Current literature seems to indicate a micelle-type phase formation, but a systematic study of the conditions at the edge of the limiting organic concentration of uranium is lacking. We aim to elucidate the speciation and formation mechanism by chemical and spectroscopic characterization of the dependence of third phase formation on $[H^+]$, $[NO_3^-]$, $[U]$, and temperature.

9:15 – 9:30 *TOXICITY OF URANYL ACETATE IN REPAIR-DEFICIENT CHINESE HAMSTER OVARY CELLS

Adam Ashby and Diane M. Stearns, Ph.D. (Northern Arizona University, Flagstaff, AZ)

Questions are now being raised concerning the genotoxic health effects associated with exposure to uranium. Uranium is radioactive; however, its possible toxicity as a heavy metal is drawing attention as a result of environmental contamination and its use by the military. This study is measuring the toxicity of depleted uranium as uranyl acetate (UA) in mammalian cells. The hypothesis being tested is that if uranium causes direct DNA damage, then it should be more toxic in cells that are deficient in DNA repair. This hypothesis is being tested in a series of Chinese hamster ovary (CHO) cells that are sensitive to DNA crosslinks and strand breaks. Cytotoxicity is being measured as clonogenic survival by measuring colony formation of cells exposed to UA relative to untreated controls. Current

data support our hypothesis. For example, UA is more cytotoxic in the XRCC1-depleted EM9 line than the parental AA8 line. Since complementary studies (Shelley, Ashby and Stearns) show that uranium-DNA adducts are formed under these conditions, results suggest that uranium may have a chemical genotoxicity independent of its radioactivity. Supported by NIH grant CA096320.

**9:30 – 9:45 *SYNTHESIS OF NON-REDUCIBLE ANALOGS OF
CYSTINE**

Takuhei Yamamoto and Edgar R. Civitello, PhD. (Northern Arizona University, Flagstaff, AZ)

Somatostatin, vasopressin and oxytocin represent a group of naturally occurring peptides that display a diverse capacity to be used as therapeutic and diagnostic imaging agents. In order to develop such peptides into drugs it is often necessary to synthesize structural analogs to control certain key properties such as bio-distribution and metabolic stability. The labile disulfide bond of cystine is often a target for derivatization. By replacing the disulfide bond with a more stable moiety, we expect that biostability will increase while maintaining conformational activity. We have proposed a series of cystine analogs for this purpose. Previous work culminated in the synthesis of an analog with one of the sulfur atoms of the disulfide bond replaced by a methylene group. This thioether was designed to be enantiomerically pure and regiospecifically protected for Fmoc solid-phase peptide synthesis, and has also been successfully incorporated into oxytocin. Herein we report our progress on a second generation cystine analog where the disulfide moiety is replaced by a phenyl ether.

**9:45 – 10:00 DIRECT ANALYSIS OF CAUDAL FIN CLIPPINGS FOR
MERCURY: A NON-LETHAL MEASURE AND PREDICTOR
OF FISH MUSCLE MERCURY**

James Cizdziel (University of Nevada Las Vegas, NV) and Paul Gremillion (Northern Arizona University, Flagstaff, AZ)

The caudal (tail) fins from 17 walleye (*Sander vitreus*) and 12 northern pike (*Esox lucius*) from three northern Arizona lakes were analyzed for total-Hg by combustion-atomic absorption spectrometry. Results indicate that the fin contains measurable Hg that correlates ($r^2 > 0.76$) with muscle-Hg concentrations. As the body burden of Hg increased, the concentration in the fin increased relative to the muscle. Mercury concentrations also increased with fish weight, although the relationship was lake-dependent. Fish from Soldier's Lake had the most efficient uptake of Hg, likely due to the trophic structure of the lake, but possibly due to an acute source of Hg or the physiological condition of those individuals. Overall, this study demonstrates that caudal fin clippings can be used as a non-lethal predictor for muscle-Hg concentrations, which can reduce the number of fish sacrificed in routine-monitoring programs. This presentation will begin with a brief background on environmental mercury and mercury in fish followed by an overview of the analytical method and discussion of study results.

10:00 – 10:30

COFFEE BREAK: FOYER

10:30 – 10:45

DNA DAMAGE INDUCED BY CHROMIUM PICOLINATE IN CHINESE HAMSTER OVARY CELLS: ANALYSIS BY THE COMET ASSAY

Alejandro Lencinas and Diane M. Stearns, Ph.D. (Northern Arizona University, Flagstaff, AZ)

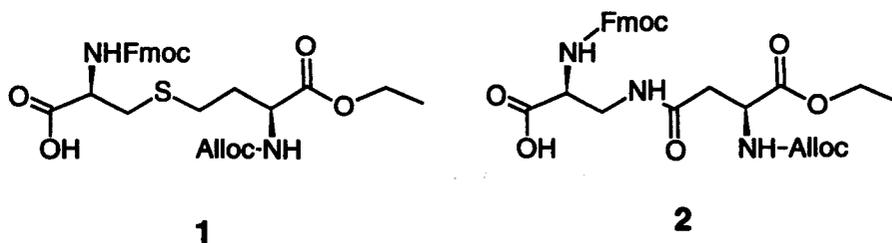
Chromium picolinate (CrPic) is the second most widely sold dietary supplement in the United States. However, as a dietary supplement it is not regulated by the Food and Drug Administration; therefore, its safety has not been verified. Previous work has shown that CrPic causes mutations and chromosomal aberrations in cultured cells. The purpose of the current work was to identify the specific types of DNA damage that may underlie its genotoxicity. The comet assay (single cell gel electrophoresis) was used to detect strand breaks and DNA crosslinks in Chinese hamster ovary (CHO) AA8 cells. Cells were treated with 20-160 $\mu\text{g}/\text{cm}^2$ of CrPic over a 24 hour period. Crosslinks and oxidative damage were detected with post-treatments of methyl methanesulfonate (MMS), and formamido pyrimidine glycosylase (FPG). Data suggest that CrPic causes DNA crosslinks in CHO cells, and results are also consistent with the molecular analysis of mutations. It is inferred from these results that the analysis of CrPic safety should continue. Supported by NIH grant GM056931 and the Arizona Board of Regents Biotechnology and Human Welfare Program.

10:45 – 11:00

SYNTHESIS OF NON-REDUCIBLE ANALOGS OF CYSTINE

Calden Stimpson & Edgar Civitello, Ph.D. (Northern Arizona University, Flagstaff, AZ)

Somatostatin, vasopressin and oxytocin represent a group of naturally occurring peptides that display a diverse capacity to be used as therapeutic and diagnostic imaging agents. In order to develop such peptides into drugs it is often necessary to synthesize structural analogs to control certain key properties such as bio-distribution and metabolic stability. The labile disulfide bond of cystine is often a target for derivatization. By replacing the disulfide bond with a more stable moiety, we expect that biostability will increase while maintaining conformational activity. We have proposed a series of cystine analogs for this purpose. Previous work culminated in the synthesis of an analog with one of the sulfur atoms of the disulfide bond replaced by a methylene group (Compound 1). This thioether was designed to be enantiomerically pure and regiospecifically protected for Fmoc solid-phase peptide synthesis, and has also been successfully incorporated into oxytocin. Herein we report our progress on a second generation cystine analog where the disulfide moiety is replaced by an amide bond (Compound 2).



11:00 – 11:15

***QUANTITATION OF URANIUM-DNA ADDUCTS VIA
INDUCTIVELY COUPLED PLASMA OPTICAL EMISSION
SPECTROSCOPY (ICP-OES)**

Jake T. Shelley, Adam Ashby, and Diane M. Stearns, Ph.D. (Northern Arizona University, Flagstaff, AZ)

Exposure to depleted uranium in mining and processing and through contact in the military poses a potential risk to human health. However, mechanisms through which such effects might be mediated are not understood. In particular, the biological reactions by which uranium might exhibit carcinogenicity have not been described. The current study used ICP-OES to measure the binding of uranium to DNA in cultured cells. Chinese hamster ovary (CHO) AA8 cells and XRCC1-deficient CHO EM9 cells were exposed to depleted uranium as uranyl acetate at 50 – 300 μM over 24 hr and 48 hr. DNA was extracted, digested in nitric acid and hydrogen peroxide, and assayed for uranium and phosphorous. Metal-nucleotide binding ratios were calculated as moles of uranium per moles of phosphorus. A maximum adduct level of 5 U atoms / 10^3 DNA-P was found in the EM9 line for the 300 μM dose, and adduct levels were statistically higher in the EM9 line than the AA8 line after 48 hr. This is the first observation of the formation of uranium-DNA adducts in mammalian cells after direct exposure to a depleted uranium compound. Data suggest that uranium could be chemically genotoxic through the formation of covalent U-DNA adducts. Supported by NIH grant CA096320 and the Arizona Board of Regents Biotechnology and Human Welfare Program.

11:15 – 11:30

***QUANTUM DOT LATERAL FLOW ASSAY FOR
ENDOCRINE-DISRUPTING COMPOUNDS IN THE
AQUATIC ENVIRONMENT**

Laura DeMoss, Amber Evans, Catherine R. Propper, and Timothy L. Vail (Northern Arizona University, Flagstaff, AZ)

A growing body of evidence suggests that exceedingly low concentrations of synthetic steroidal compounds and surfactants in wastewater effluent can cause endocrine disruption in populations of aquatic organisms, including the feminization of males. We are designing and optimizing an immunochromatographic assay for the rapid and sensitive detection of this group of compounds. We are currently able to detect <10 ng per liter of ethynyl estradiol (an active ingredient of oral contraception) that has been conjugated to bovine serum albumen as a carrier molecule. The assay design takes advantage of high quantum yield and

photostability of fluorescent quantum dots in conjunction with a lateral flow system that provides a time-to-result of less than 10 minutes. Future research will focus on designing a series of assays for common endocrine disruptors in wastewater.

11:30 – 1:40

**LUNCHEON, ANNUAL BUSINESS MEETING AND
AWARDS: UNLV DINNING COMMONS**

CONSERVATION SECTION

SESSION 1 8:00

ROOM: C116

Chairperson: James deVos

**8:00-8:20 *PREDICTING FUTURE PLANT DISTRIBUTIONS IN
NATIONAL PARKS: SOME PARK NAMES MAY NEED TO
CHANGE**

Kirsten Larsen (Northern Arizona University, Flagstaff, AZ) and Kenneth Cole (USGS Colorado Plateau Research Station, Flagstaff, AZ)

Plant species distributions are chiefly controlled by climate, and as climate has changed in the past, species have responded through dispersal and migration. Global Atmospheric Circulation Models predict drastic changes in temperature and precipitation in the near future. And, over the last decade, climates of the arid southwest seem to be already changing in the predicted directions. It is important for park managers to address likely future impacts to prepare management and monitoring strategies to adequately address them. We have developed a geospatial modeling strategy to estimate the relationships between plant species and climate, and for modeling the likely future areas of migration or extinction using GIS. These methods will be demonstrated using species such as Saguaro and Joshua Tree within the National Parks named for them.

8:20-8:40 INDEXING PREDATOR ABUNDANCE IN ARIZONA

Ted McKinney, Thorry Smith, and Jeff Ng (Arizona Game and Fish Department, Phoenix , AZ)

We studied scent station visitations by bobcats, coyotes, and foxes between December 2004 and March 2005 in 3 major habitats in Arizona: Sonoran Desert scrub, semi-desert grassland, and chaparral. We used 20 transects with 10 scent stations/transect in each vegetation type, used fatty acid scent tablets as lures and lime as tracking beds. We placed scent stations at about 0.5 km intervals on each transect, separated transects by ≥ 5 km, and operated scent stations for 1 night. We identified no bobcat scent station visits in desert scrub or grassland habitat, and bobcats visited 4.0% of stations in chaparral. Coyotes visited 7.1, 8.3, and 4.0% of stations in desert scrub, grassland, and chaparral habitats, respectively. Foxes visited 23.6% of scent stations in desert scrub and 21.2% of stations in chaparral, but visited 0.5% of stations in grassland habitat. Our preliminary findings suggest scent stations may provide a practical method to monitor long-term trends in indices of habitat-specific relative abundance of bobcats, coyotes, and foxes in Arizona.

8:40-9:00

**CHANGES IN MOUNTAIN LION (*PUMA CONCOLOR*)
DIETS FOLLOWING INCREASED HARVEST OF THE
PREDATOR AND REMOVAL OF CATTLE**

Ted McKinney, Thorry W. Smith and James C. deVos, Jr., (Arizona Game and Fish Department, Phoenix, AZ)

We studied mountain lion (*Puma concolor*) diets in association with increased sport harvest of the predator and removal of cattle in the Sonoran Desert of central Arizona from 1999 to 2003. Diets shifted from initially about equal use of biomass of large (cattle, collared peccary [*Pecari tajacu*], deer [*Odocoileus* spp.], desert bighorn sheep [*Ovis canadensis*]) and small prey (rabbits and rodents) to predominantly large wild prey, particularly collared peccary, and diet diversity declined >50%, following increased mountain lion harvest and removal of cattle. Reduced intraspecific interference and higher ratios of large prey per predator ostensibly might explain observed changes in mountain lion diets.

9:00-9:20

**STANDARD SAMPLING METHODS FOR NORTH
AMERICAN FRESHWATER FISHES: BOOK
DEVELOPMENT**

Scott Bonar (Arizona Cooperative Fish and Wildlife Research Unit, Tucson, AZ), Wayne Hubert (Wyoming Cooperative Fish and Wildlife Research Unit, Laramie, WY) and David Willis (South Dakota State University, Brookings, SD) and Research Specialist Alison Iles (Arizona Cooperative Fish and Wildlife Research Unit, Tucson, AZ)

Despite the positive effects of standard sampling protocols, sampling of inland fish populations across North America remains unstandardized, or at most, standardized at a state or local level. With data sharing on the Internet, large-scale studies such as global warming, and advances in sampling equipment, the reasons for wide scale standardization are more compelling than ever. Our objective is to edit a text that will provide standard methods for sampling fish populations in various types of freshwater environments across North America. These freshwater environments will include small lakes and ponds, reservoirs, large natural lakes, wadable streams, and large rivers. For each environment, we will provide standard ways to obtain the most commonly used indices of fish population structure and abundance: presence, length frequency, relative weight, relative growth, and catch per unit effort. The book will also include a chapter compiling national and regional average and range values for measures of size structure, catch per unit effort, growth and condition indices for common species collected using the standard techniques. Finally, a data management and statistical analysis chapter will concentrate on those statistics crucial to standard sampling, such as a brief explanation on how bias works in fisheries sampling, how to convert or compare data collected with one technique to data collected with another, and how to determine sample size.

9:20-9:40

**EVALUATING USE OF GENETICS FOR MONITORING
MAMMALIAN SPECIES DIVERSITY IN NATIONAL PARKS**

Melanie Culver, (USGS Arizona Cooperative Fish and Wildlife Research Unit, Tucson, AZ)

Monitoring natural resources is a critical component of conservation biology, and can aid in preserving resources for future generations. We have completed a survey of mammals at Saguaro National Park West – Tucson Mountain District. The techniques used in this survey are to be incorporated into a long-term mammalian monitoring program. Despite the high profile of mammals, many species are rare and difficult to sample, and several new species have been documented at the park as a result of the current effort. However, developing scientifically valid monitoring programs remains a major problem throughout the National Park Service due to the high costs involved. The purpose of this study is to compare a genetic survey technique with other existing survey techniques for terrestrial mammals, especially infrared-triggered (remote) photography. We identified mammal species using DNA obtained from scat gathered at established monitoring plots in the Tucson Mountain District in 2003; mitochondrial cytochrome B DNA sequences from scat was compared to mitochondrial cytochrome B DNA sequences from published sources and tissue samples collected near the park. We used established molecular genetic techniques to identify both predator and prey species from predator scat. The final product of this research was a complete inventory of mammals at Saguaro National Park that includes a cost/benefit assessment of genetic surveys in comparison with more traditional techniques.

9:40-10:00

**MONITORING SURVEYS AND RADIO TELEMETRY OF
NARROW-HEADED GARTER SNAKES IN OAK CREEK,
ARIZONA: INITIAL RESULTS**

Erika M. Nowak, Manuel Santana-Bendix, (USGS Colorado Plateau Research Station) and Susi MacVean, (Arizona Game and Fish Department, Phoenix, AZ)

Narrow-headed garter snakes (*Thamnophis rufipunctatus*) are a species of special concern in Arizona due to an apparently declining status across their historic range in the United States. From 1999-2001 I and Manuel Santana-Bendix conducted surveys for narrow-headed garter snakes in Oak Creek, Arizona to determine the status of the population in the creek, and to determine basic ecological information for the population such as habitat and prey use. In 2004, these surveys were supplemented by a grant from the Arizona Game and Fish Department to implement the first radio telemetry study of the species and to continue surveys at targeted sites. The objectives of our research are to continue monitoring surveys to detect trends in the population status, and to determine key habitat requirements and movement patterns of focal adult narrow-headed garter snakes. This research is significant given that an aquatic snake in a desert environment make them a potential indicator species for the overall health of the creek ecosystem. As well, this is the first-ever telemetry study of the species. Monitoring surveys were conducted at four locations from June to September. We also implanted radio transmitters in three adult females in the fall of 2004. Initial results will be discussed, including population trends, long-term recapture of adults, and movement patterns, active sites, and use of human-modified habitats by telemetered snakes.

10:00-10:30

COFFEE BREAK: FOYER

10:30-10:50

**CONSERVATION OF BAND-TAILED PIGEONS: AN
EVALUATION OF POTENTIAL SURVEY TECHNIQUES**

Chris Kirkpatrick (University of Arizona, Tucson, AZ), Courtney J. Conway (USGS Arizona Cooperative Fish and Wildlife Research Unit, Tucson, AZ), Katie Hughes (University of Arizona, Tucson, AZ), and Jim deVos (Arizona Game and Fish Department, Phoenix, AZ)

Harvest data indicate that populations of the interior sub-species of band-tailed pigeon (*Patagioenas fasciata fasciata*) have declined since the late 1960's. Conservation of interior band-tailed pigeons requires better knowledge of the distribution, abundance, and population trajectory of the species. From 2002 to 2004, we evaluated 5 potential survey methods in Arizona. We also estimated the population trajectory of band-tailed pigeons in southeastern Arizona by repeating a survey conducted in the late 1960s. We found that use of call-broadcast during walking surveys increased the average number of pigeons detected by 22% and increased the number of replicate surveys with ≥ 1 pigeon detection by 16% compared to strictly auditory survey methods. Moreover, based on estimates of detection probability, use of call-broadcast increased both the accuracy and precision of band-tailed pigeon counts during surveys. Relative to other survey techniques, we found that capture-recapture and bait-site counts were the least effective survey methods and will likely be of limited use for monitoring band-tailed pigeons in Arizona. Numbers of band-tailed pigeons appear to have declined substantially (82%) in southeastern Arizona since the late 1960s. We recommend regular call-broadcast surveys in at least some portions of band-tailed pigeon habitat in Arizona (and perhaps elsewhere in the interior region) to monitor trends of interior populations of band-tailed pigeons.

10:50-11:10

**HOME RANGE AND HABITAT USE BY COYOTES (*CANIS
LATRANS*) IN THE SONORAN DESERT**

Robert B. Waddell, Chantal S. O'Brien, Steven S. Rosenstock, and Susan R. Boe. (Arizona Game and Fish Department, AZ)

Few studies have evaluated home range and habitat use by desert coyotes (*Canis latrans*). Most of these efforts relied on conventional very-high frequency (VHF) radio-collars with relatively infrequent relocations of marked animals. We fitted 4 coyotes with Global Positioning System (GPS) collars that acquire 4 locations/day from April 2003 - May 2004 (a total of 5,197 locations). All 4 coyotes had large annual home ranges ($\bar{x} = 543 \text{ km}^2$, range = 47–1,591 km^2). Seasonal home ranges were largest during pup rearing ($\bar{x} = 193 \text{ km}^2$, range = 36–374 km^2) and smallest during dispersal ($\bar{x} = 108 \text{ km}^2$, range = 31–183 km^2) seasons. All 4 coyotes exhibited long daily ($\bar{x} = 8 \text{ km}$, range = 0.1–50 km) and monthly ($\bar{x} = 236 \text{ km}$, range = 58–503 km) movements. The longest distances traveled in a single day (range = 27–50 km) occurred during pup rearing and dispersal seasons. The largest monthly distances traveled (range = 273–503 km) occurred during breeding and pup rearing seasons. We tested the hypothesis that habitat use by coyotes would be concentrated near wildlife

waters. Twenty-seven wildlife waters were in or near the annual home ranges of collared coyotes but did not appear to play a role in habitat selection. Mean distance to water for 2 coyotes ($\bar{x} = 10,426$ m and 7,007 m) did not differ from the mean distance to water from random locations ($\bar{x} = 10,113$ and 7,158 m; $p > 0.15$), while 2 coyotes were located 521 m and 2,277 m farther from water ($\bar{x} = 6,929$ m and 9,765 m) than random points ($\bar{x} = 6,408$ m and 7,488 m; $p < 0.001$).

11:10-11:30 **CORRELATION BETWEEN COYOTE DENSITY, FAWN COVER, TREE DENSITY, AND PRECIPITATION AND PRONGHORN (*ANTILOCAPRA AMERICANA*) FAWN SURVIVAL IN 8 SITES IN ARIZONA**

Stan C. Cunningham, Jaime L. Warren, Richard A. Ockenfels, Dan McDonald, James C. deVos, Jr., (Arizona Game and Fish Department, Phoenix, AZ)

Arizona pronghorn (*Antilocapra americana*) populations estimated at 12,000 in 1987, have declined to less than 8,000. The decrease is attributed to poor fawn recruitment human development, restrictive fences, limited water availability, diseases, nutritional deficiencies, and predation. With respect to predation, it is documented that fawn survival increases when coyote densities are reduced through aerial gunning, and that fawns select “better” hiding cover characteristics than found randomly to presumably escape predation. To examine these relationships, we correlated coyote density, fawn hiding cover characteristics, and tree density to fawn:doe ratios in 8 Arizona study sites in 4 regions of Arizona. We used linear and multilinear regression to model relationships between the fawn:doe ratios measured in August aerial surveys, with the coyote indices determined through April-May scat indices, vegetation cover measured at different height intervals (0-10 cm, 11-20 cm, 21 –30 cm, 31-40 cm, and > 40 cm) during fawning, and tree density. We expected increased coyote density to have a negative relationship with fawn survival, and higher vegetation cover, particularly between 11-30 cm, to have a positive relationship with fawn survival. None of the independent variables were associated with fawn survival however, no correlations significant. We also looked at fawn survivorship and the relationship with fawn cover when coyote density was high or low, or visa versa and no relationship was found. The only positive, significant correlation we found with fawn survival was the preceding precipitation from October-April ($r^2 = 0.38$; $P = 0.02$).

11:30-11:50 **HABITAT USE, MOVEMENTS, AND SURVIVAL ESTIMATES FOR SONORAN PRONGHORN IN ERA OF ABOVE AVERAGE RAINFALL**

James C. deVos, Jr. (Arizona Game and Fish Department, Phoenix, AZ) and William H. Miller (Applied Biological Sciences, Arizona State University East, Phoenix, AZ)

Sonoran pronghorn (*Antilocapra americana sonoriensis*) occur in an arid desert in northwestern Sonora, Mexico and southwestern Arizona; their numbers have declined since 1920. Causes of the decline are largely speculative, but include habitat alteration by humans, excessive herbivory by domestic livestock, illegal harvest, and exposure to domestic livestock diseases. We initiated this study to develop information on habitat use and survival

to aid in developing recovery strategies. We captured 19 Sonoran pronghorn and monitored their movements and habitat use patterns from 1983 through 1991 to assess habitat use and survival. Sonoran pronghorn used the paloverde (*Parkinsonia* spp.) – mixed cacti and creosotebush (*Larrea tridentata*)-white bursage (*Ambrosia dumosa*) associations greater than expected. Locations of Sonoran pronghorn in close proximity to water were used greater than random sites and areas most distant from waters were used less than expected. Sonoran pronghorn used areas within 1 km of roads less than random sites and locations >1 km from roads were used as expected or greater than expected as distance increased from roads. Mean annual estimated survival for females was 0.96 (SE = 0.04), with mean estimated annual male survival of 0.92 (SE = 0.04). The female mortality was attributed to coyote (*Canis latrans*) predation and males died of unknown causes. During the period we studied Sonoran pronghorn, the subspecies had very low mortality rates and the population expanded to levels that likely have not occurred in the last 80 years.

11:30-1:40

**LUNCHEON, ANNUAL BUSINESS MEETING AND
AWARDS: UNLV DINNING COMMONS**

GEOLOGY SECTION

SESSION I 8:00

ROOM: C114

Chairperson: Randall L. Nydam

**8:00-8:20 *VEGETATION CHANGE AND HUMAN OCCUPATION AT
LA 162, NEW MEXICO.**

Nicole M. Arendt (University of Arizona, Tucson, AZ)

The pollen profiles from LA 162 (Paa-ko), a late prehistoric/early historic period Pueblo site located on the east side of the Sandia Mountains east of Albuquerque, New Mexico (excavated by the University of Chicago, Dr. Mark T. Lycett, project director), can be used to study vegetation changes in both the prehistoric and historic periods, particularly as they relate to the human occupation and use of the site. These samples were taken from four test excavation units located in plazas associated with the prehistoric and historic occupations of this site. These test units were excavated to bedrock, a depth of 0.9-1.3 meters. In three of these units, a 20 by 20 centimeter continuous column sample, divided into 10 centimeter levels, was taken for flotation, reserving a small pollen sample from each level. In the remaining unit, pollen samples were taken from strata visible in the north profile. These samples show little evidence for dramatic vegetation change in either the prehistoric or historic periods. *Zea mays* pollen is found in samples from both the prehistoric and historic plazas. The samples from the prehistoric plaza unit show relatively low amounts of *Pinus* associated with the occupation, with higher amounts in the earlier and later samples, which is also seen in the samples from the historic plaza units, similar to what has been seen elsewhere on the site. Also, *Artemisia* pollen is present in higher levels in the samples from the historic plaza unit and *Juniperus* is also present, while it is absent in the samples from the prehistoric plaza unit. Finally, there is little evidence for the presence of historically introduced plants, with the exception of small amounts of *Tribulus* pollen found in the uppermost level in the historic plaza.

**8:20-8:40 *THE HOLOCENE VEGETATION RECORD FROM
PETRIFIED FOREST NATIONAL PARK, ARIZONA: A
POLLEN PERSPECTIVE.**

John M. Logan (University of Arizona, Tucson, AZ)

Petrified Forest National Park is located in northeastern Arizona. It is in a grasslands zone and has a "badlands" landscape located within the park boundaries -- the Painted Desert. Gottesfeld (1971) conducted pollen analysis of the Chinle formation within the park. This study examines pollen record recovered from a fissure in the vicinity of "Newspaper Rock", a large petroglyph and pictograph panel along the face of a mesa in the northern section of the park. There are a series of pending studies of vegetation change derived from fissures.

Dr. Kenneth Cole and Jessa Fisher from Northern Arizona University have examined a pollen record from a fissure in Wupatki National Monument. These studies were conducted to determine if usable vegetation records could be recovered from fissures and to examine as well, what vegetation change had occurred within the areas. For the Petrified Forest pollen study, a column sample was removed processed, and examined. The sample was removed in a continuous column in 1 cm. levels from ground surface to 50 cms. A record of vegetation change during the Holocene was recovered. *Quercus*, deteriorated grains, and mesquite midway through the column are indications of the mid-Holocene. This suggests that the entire Holocene record is present in the sample.

8:40 – 9:00 *A RECORD OF VEGETATION CHANGE FROM ROCK SHELTER IN CHACO CULTURE NATIONAL HISTORIC PARK, NEW MEXICO.

John M. Logan (University of Arizona, Tucson, AZ)

Chaco Canyon is a significant archaeological district in northwestern New Mexico. Chaco is listed on the National Register of Historical Places and is listed as a World Heritage site, one of only seven archaeological World Heritage sites in the United States. Pollen and packrat middens from Chaco Canyon have previously been studied by a number of palynologists, notably pollen studies by Stephen A. Hall in published in 1977 and 1988, and packrat midden studies by Julio L. Betancourt and Thomas R. Van Devender published in 1981 and Julio L. Betancourt, Paul S. Martin and Thomas R. Van Devender published in 1983. The current study resulted from a column sample taken from a rock shelter on the platform above Pueblo Bonito and below Pueblo Alto. The sample was taken in a continuous column from ground surface down to 40 cm. in 1 cm. levels. Vegetation change was studied with particular reference to evidence of grazing in the historic period and the overall vegetation change signal in Chaco Canyon. An historic period signal noted in the study was the increase in juniper pollen at the top of the record. The modern pollen signal is the presence of *Ulmus siberica*, probably from the tree at the door of the Park visitor center.

9:00-9:20 *FOSSIL LIZARDS OF THE RED OWL LOCALITY, SOUTH DAKOTA.

Joanna Wigfield (Grand Canyon University, Phoenix, AZ)

Lizard material from the Red Owl Locality (Fox Hills Formation) northeast of Red Owl, South Dakota was studied in order to identify fossil taxa. The Fox Hills Formation spans the Late Cretaceous period, but controversy remains as to the exact age of the Red Owl Locality. There is very little information about the vertebrate fauna of the Red Owl Locality, and no lizards have been previously described. A comparative study was done on each fossil lizard specimen (primarily jaws and osteoscutes) with comparison to other specimens from paracontemporaneous localities such as the Hell Creek Formation of Northern Montana (Lancian Age) and the Kaiparowits Formation of Southern Utah (Judithian Age). Based on this analysis two specimens were identified to species (*Odaxsaurus priscus* and *Leptochoamops thrinax*), three were identified to genus (*Odaxosaurus sp.* and *Chamops sp.*), and the remainder were identified to the family level (Scincidae, Teiidae, and Anguillidae).

Both *O. priscus* and *L. thrinax* are also known from the Judithian, but it is debatable whether such a limited sample can accurately identify the Red Owl Locality's age.

9:20-9:40

**PRELIMINARY POLLEN ANALYSIS OF SENTENAC
CIENEGA, SAN DIEGO, CA.**

Owen K. Davis and Chris Eastoe (University of Arizona, Tucson, Az), Jared Aldern (The Land Conversation, Ranchita, CA) and Norrie Robbins (San Diego State University, San Diego, CA)

Although many palynological records of vegetation change have been procured in recent years from coastal southern California, few records of historic vegetation change have been published for the desert of southeastern California, adjacent to Arizona. In the wetlands of southern Arizona, the established pattern of historic vegetation change is the expansion of woody plants such as juniper and mesquite in the uplands, and the expansion of trees such as ash, buttonbush, hackberry and willow in the wetlands. Both are accompanied by decreased frequency of burning. Coastal California wetlands typically do not show this invasion of trees – with the exception of tamarisk – even though they do record decreased fire frequency. On October 9, 2004, we obtained a 6.4 m from Sentenac Cienega, elevation 623 m, on the western boundary of the Anaza Borego Desert State Park. Three radiocarbon dates confirm the late-Holocene age for the record, and extremely rapid sedimentation during the historic period. 375 cm of sediment have accumulated in the last 300-400 years. Like the Arizona wetlands, Sentenac Cienega has been invaded by trees, including tamarisk, but this has occurred within the last century, as has the expansion of oak woodland, in the uplands.

9:40-10:00

**A LATE HOLOCENE POLLEN STRATIGRAPHIC RECORD
OF GRAZING IMPACTS FROM A ROCK FISSURE AT
WUPATKI NATIONAL MONUMENT, AZ.**

Kenneth L. Cole (USGS, Flagstaff AZ), Jessa Fisher and, Kirsten Larsen (Northern Arizona University, Flagstaff, AZ).

The history of past vegetation changes in desert grasslands has been difficult to study because of the scarcity of suitable stratigraphic depositional records. Basins preserving an orderly sequence of sediments with preserved fossils such as pollen, are rare. Some data on paleovegetational change can be reconstructed from plant macrofossils from packrat middens, providing that abundant deposits are located in the study area. However, these plant macrofossil records reveal plant species that grew close to the middens, most likely in rocky habitats. Past records representing flat grassland landscapes are far more difficult to find. In this paper we report on the analysis of a sedimentary sequence taken from Doney Crevice, just south of Wupatki National Monument. This crevice, about 2 m wide and 20 m deep, has preserved a series of sediments deposited over the last 500 years. Pollen analysis from these sediments reveals that the dominant pollen of the grass family shifted to more abundant pollen of the juniper family as historic grazing began and periodic wildfires ceased. These records are compared to series of late Holocene packrat middens from nearby rock outcrops that reveal many of the grass species involved in this shift. Other proxy data, such as abundant plant phytoliths, stable isotopes, and fossil charcoal may also be available for study from this sequence.

10:00-10:30

COFFEE BREAK: FOYER

10:30-10:50

**SEVERE LATE PLEISTOCENE CLIMATE FLUCTUATIONS
IN THE GRAND CANYON MEASURED USING PLANT
CONTENT AND STABLE ISOTOPES FROM PACKRAT
MIDDENS.**

Kenneth L. Cole (USGS, Flagstaff AZ) and Samantha Arundel (Northern Arizona University, Flagstaff, AZ).

Carbon isotopic composition of rodent fecal pellets and content of Utah Agave (*Agave utahensis*) were measured on packrat (*Neotoma* spp.) middens from the Grand Canyon, Arizona. Both chronologies exhibit a late Wisconsinan rise and dramatic dip followed by a sharp increase corresponding chronologically to the global Bølling/Allerød-Younger Dryas-early Holocene sequence common throughout the Northern Hemisphere. The modern geographic distribution of Utah Agave was compiled using GIS and compared to Twentieth Century climates modeled for North America. The results demonstrate that the upslope distribution of Utah Agave within the Grand Canyon today is controlled by cold season minimum temperature of -8 °C. These data suggest that cold season mean minimum temperatures were 4.5 to 6.5 °C below late Twentieth Century values between 17.0 ka and 14.0 ka (1000's of calendar years B.P.). Then, starting after 13.5 ka, temperatures dropped to 7.5 to 8.7 °C below modern around 12.7 ka during the Younger Dryas. Midden samples with calendar year means dating between 11.65 and 11.5 ka suggest a rapid temperature increase at the close of the Younger Dryas of about 4.0 °C in about 150 years. This warming trend then continued, reaching values above the late Twentieth Century means by 8.5 ka. These extreme climate fluctuations, previously unrecognized mostly because of crude dating control on many southwestern records, had a major affect on the terrestrial, arid habitats of the southwestern United States.

10:50-11:10

**LACERTILIANS FROM THE SMOKY HOLLOW MEMBER
OF THE STRAIGHT CLIFFS FORMATION (TURONIAN),
SOUTHERN UTAH**

Randall L. Nydam (Midwestern University, Glendale, AZ)

The Smoky Hollow Member of the Straight Cliffs Formation provides one of the few opportunities for recovery of Turonian-aged (~90-95 mya) vertebrate fossils from North America. Specimens collected from this horizon are primarily from locality MNA 995, but two other localities sampled are lithologically identical to MNA 995. The most common lizard (numerous jaws, osteoderms) is the anguid *Odaxosaurus* sp. (cf. *O. piger*). This marks the oldest known occurrence for this taxon, which is a common component of Campanian-Maastrichtian faunas of the Western Interior. There are also jaw fragments of the enigmatic anguimorph cf. *Dorsetisaurus*; a taxon previously known only from the Late Jurassic of North America and Europe. If confirmed this represents a temporal extension of approximately 50 my for this taxon. Several incomplete jaw fragments represent at least 2-3 taxa of varanoids, one of which may have venom grooves. Scincomorph lizard taxa include

several taxa with similar dental morphology to Late Cretaceous teiids, several specimens with apparent affinities to the Late Jurassic-Early Cretaceous paramacellodids, and the polyglyphanodontine taxon *Dicothodon*. Comparison of this fauna to the bracketing older and younger faunas from Utah shows that lizards from the Smoky Hollow Member of the Straight Cliffs Formation are more similar in faunal composition to younger lizards in overlying sediments (Campanian) than to older lizards (Albian-Cenomanian). The presence of Jurassic relicts may be an artifact of isolation or a result of the low paleolatitude.

11:30 – 1:40

**LUNCHEON, ANNUAL BUSINESS MEETING AND
AWARDS: UNLV DINNING COMMONS**

HYDROLOGY SECTION

SESSION I 8:00

ROOM: A112

Chairperson: Peter F. Ffolliott

8:00-8:20 A MULTI-COUNTRY ASSESSMENT OF VEGETATION DYNAMICS, SOIL EROSION, AND WATERSHED DEGRADATION AFTER WILDFIRES

Daniel G. Neary (USDA Forest Service, Flagstaff, AZ), Barron Orr (University of Arizona, Tucson, AZ), Wim Leeuwin (University of Arizona, Tucson, AZ), Susana Bautista (University of Alicante, Spain), Leah Wittenberg (Haifa University, Israel), Yohay Carmel (Technion Institute, Israel)

Wildfires in semi-arid regions can induce vegetation changes that alter fire frequency, increase erosion, and lead to general watershed degradation. This paper describes an International Arid Lands Consortium project in Arizona, Spain, and Israel that is examining the use of MODIS satellite imagery and ground-based verifications to develop a tool to evaluate vegetation changes, erosion, and landscape degradation after wildfires. Site specific GIS data, erosion rates, and vegetation changes are being used to validate MODIS-based models on Indian and Rodeo-Chediski wildfire sites in Arizona, the Guadalest, Calderona, and Millares wildfire sites in Spain, and several wildfires on Mt. Carmel, Israel.

8:20-8:40 *WATER REPELLENT SOILS ON THE STERMER RIDGE WATERSHEDS FOLLOWING THE RODEO-CHEDISKI WILDFIRE: A PRELIMINARY ANALYSIS

Cody Stropki, Peter F. Ffolliott, and Leonard F. DeBano (University of Arizona, Tucson, AZ) and Daniel G. Neary (USDA Forest Service, Flagstaff, AZ)

The presence of water repellent soils impacts the infiltration process in a manner that is similar to that of a dense or hardpan layer that restricts water movement through the soil. Infiltration of water into a water repellent soil is inhibited and often completely impeded in which case the net precipitation reaching the soil surface becomes surface runoff. One mechanism causing water repellent soils to form is the vaporization of organic matter and the condensation of hydrophobic substances on mineral soil particles during fire. This mechanism resulted in extensive water repellency in the sandstone soils on the Stermer Ridge watersheds in north-central Arizona following the Rodeo-Chediski wildfire of 2002. One of the two watersheds experienced a stand-replacing fire of high severity while the other watershed was burned with a stand-modifying fire of low to moderate severity. The occurrence of water repellent soils on the two watersheds have been, and continue to be, monitored in terms of the spatial distributions and temporal changes in this occurrence to assess the impacts of this wildfire on this soil parameter and the consequent hydrologic function of the burned watersheds.

8:40-9:00

**EVALUATION OF STEADY STATE INFILTRATION RATES
ON WALNUT GULCH WATERSHED, TOMBSTONE,
ARIZONA**

Donald F. Post and E.M. Shiers (University of Arizona, Tucson, AZ) and J. Stone (USDA Agricultural Research Service, Tucson, AZ).

The soils on Walnut Gulch Watershed are strikingly different as to their soil properties and taxonomic classification, yet evaluations of the steady state infiltration rates (or runoff) are similar. Rainfall simulator data were collected in the spring and fall on three very different soils from 1981 to 1984. We returned to the simulator sites and collected detailed soils data for these soils. The three treatments studied were natural, all vegetation clipped at the soil surface, and bare where all vegetation was clipped and rock fragments >5mm were also removed. The steady state infiltration for the soils ranged from 10.4 mm/hr for bare fall plots to 28.5 mm/hr for natural spring plots. Regression equations relating steady state infiltration rates to site cover characteristics and soil properties were determined. The % vegetation cover, % rock cover on the soil surface, and the season of the year explained almost all the variance for the natural plots. The clipped and bare plots data showed again % rock cover and selected soil properties were the best predictors of steady state infiltration rates. Correlation and regression relationships between steady state infiltration rates and site cover characteristics for the three plot conditions and for the three different soils will be presented.

9:00-9:20

**INITIAL ESTIMATE OF SOIL EROSION ON THE
CASCABEL WATERSHEDS IN THE OAK SAVANNAS OF
THE MALPAI BORDERLANDS REGION**

Peter F. Ffolliott and Cody L. Stropki (University of Arizona, Tucson, AZ) and Gerald J. Gottfried (USDA Forest Service, Phoenix, AZ), and Daniel G. Neary (USDA Forest Service, Flagstaff, AZ)

Initial estimates of soil erosion obtained on the Cascabel Watersheds in the summer of 2004 represent the first of such estimates in the oak savannas of the southwestern United States. Measurements of referenced to erosion pins installed on 12 small watersheds established on the eastern side of the Peloncillo Mountains to evaluate the effects of prescribed burning treatments on hydrologic and ecological characteristics formed the basis for obtaining these estimates. The estimates reflect the mostly hillslope soil erosion rates following the summer monsoonal season of 2004. Measurements and monitoring are continuing to furnish a longer, more comprehensive picture of pre-fire soil erosion rates on these watersheds. Anticipated measurements to be made following the burning treatments will provide a framework to evaluate the impact of these treatments on soil erosion

9:20-9:40

***POTENTIAL EFFECTS OF ASH FLOWS ON
SOUTHWESTERN FISHES: LABORATORY LC50S**

Codey Carter and John N. Rinne (USDA Forest Service, Flagstaff, AZ)

Recent research has demonstrated that post fire runoff impacts can be devastating to aquatic habitats and lethal to fishes. Presently, the cause for mortality in fishes resulting from post-fire flow events is not known. Hypotheses are that flood (physical effect) and ash flows (chemical effect) acting either singularly or in combination are responsible for mortalities observed in the field. LC 50s were generated in the laboratory on a suite of native fishes and one introduced species. Values ranged from an LC 50 of 10.6 for the native longfin dace *Agosia chrysogaster* to almost 27.0 for the introduced red shiner *Cyprinella lutrensis*. Laboratory data suggest that toxicity associated with ash flows may be lethal in itself, however, the often sheer physical force of successive flood events may then be fatal to surviving organisms with reduced resistance. Stream hydrology, annual southwestern weather patterns and timing of fire events all contribute to the short- and long-term impacts on native southwestern fishes, many which are threatened and endangered species. Comparison of field data and laboratory-generated LC 50s will be presented and compared and management recommendations offered based on data accumulated to date.

9:40-10:00

**INCREASED WATER YIELDS FROM THINNINGS: FACT
OR FICTION?**

Daniel G. Neary (USDA Forest Service, Flagstaff, AZ), H.Todd Mowrer, (USDA Forest Service, Fort Collins, CO), Larry J. Schmidt (USDA Forest Service, Fort Collins, CO), C. Luce (USDA Forest Service, Boise, ID), R.E. McRoberts (USDA Forest Service, Grand Rapids, MN), Kelly J. Elder (USDA Forest Service, Fort Collins, CO), Charles A. Troendle (USDA Forest Service, Fort Collins, CO), and James Sedell (USDA Forest Service, Albany, CA)

Extensive thinning of Rocky Mountain forest stands has been designated as the preferred practice to minimize the likelihood of widespread and severe property- and life-threatening wildfires in the Western United States. Historical hydrologic research has been incorrectly popularized to indicate that forest canopy removal can measurably augment water yields from forested watersheds anywhere in the Rocky Mountains, and only by clear-cutting. A popular misconception has therefore arisen that these two, often incompatible, goals can be achieved simultaneously on the same land. Responsible and appropriate silvicultural activities for other purposes, such as hazardous fuels reduction, may increase water yield from upper elevation forests or improve water balance within lower elevation forests, depending on the intensity of canopy removal, tree species, latitude, elevation, and aspect. These same activities may also restore many other desirable characteristics to landscapes, as well, and should not be directed solely at water yield. In any event, increases in water yield will be difficult or impossible to quantify. Increased water yield from canopy removal should therefore only be considered as a serendipitous benefit that may occur in conjunction with other advantageous results, and not an expected result of hazardous fuels reduction treatments.

10:00-10:30

COFFEE BREAK: FOYER

10:30-10:50

IF YOU BUILD IT, THEY WILL COME: FLOODS AND FISHES, VERDE RIVER, ARIZONA

John N. Rinne, Codey Carter, and Albert Sillas (USDA Forest Service, Flagstaff, AZ)

The importance of stream hydrographs and instantaneous peak flow events or floods to native fish sustainability in the southwestern USA has been hypothesized and documented in by case studies. Mechanisms of benefit appear to be, in part, post flood optimization of physical habitat for native fishes. Complementing this positive influence is the apparent negative impact on nonnative fishes. Over a decade of information on fish assemblages have been accumulated from the upper Verde River, Arizona. Fish assemblage and habitat data have been collected following extensive flooding in 1993 and during a period of sustained drought to 2004. Significant flooding occurred again in September 2004 on the upper Verde. Post flood fish assemblage and selected physical habitat data will be compared to a previous decade of information to further test the hypothesis that floods always provide a positive benefit to native fishes.

10:50-11:10

***GEOLOGIC CONDITIONS OF SPRINGS AROUND LAKE HAVASU, ARIZONA AND CALIFORNIA**

Doyle C. Wilson, Robert Johnson, Robert Peyton, and Janan Rabebl (Mohave Community College, Lake Havasu City, AZ)

Sixteen springs within the Lake Havasu Field Office Management Area of the BLM have been evaluated for their geologic, biologic, and archeologic characteristics. Water from active springs eventually flows into Lake Havasu or the Colorado River south of Parker Dam. This region is geologically complex containing many rock types which have been subjected to tectonic extensional stresses. Springs emanate from rocks as diverse as gneiss, rhyolite, diabase, volcanic breccia, and fanglomerate. The geologic control for water migration at these springs falls into one of four conduit types: fault controlled, fracture systems within crystalline rocks, bedding contact between a more permeable layer and overlying impermeable layer, and cross-cutting contact (dike intrusions). All springs lie within drainage channels seeping either from the channel walls or base. Some springs are perennial and some are seasonally active after a series of heavy precipitation events, indicating variations in residence times and extent of subsurface connectivity. Two springs were still inactive after several months of higher than normal rainfall amounts in 2004. Total hardness content of spring water varies from 39mg/l to over 1200mg/l, mostly as calcium. Caliche occurs as stains on bedrock or as accumulations of microcrystalline powder within alluvium at nearly all the springs. Unexpected elevated nitrogen-nitrate levels, as high as 9mg/l, are present in some of these backcountry spring waters.

11:10-11:30

RIPARIAN FORESTS OF THE CORONADO NATIONAL FOREST

Robert E. Lefevre (USDA Forest Service, Tucson, AZ)

Riparian data has been collected beginning in 1983 from 362 points within the Coronado National Forest. The purpose of the data collection was to determine riparian conditions for reports, project analysis, and monitoring. From 1983 until 1993, only vegetation data was gathered on a systematic basis. That data has been compared to the vegetation standards and guidelines in the Coronado Forest Plan to determine condition classification. From 1993 through the 2003, data for cross section and bed material analysis was also collected. Analysis of the data shows that four distinct vegetation types that could be considered riparian are found along channels within the Forest, and that the channels are highly variable within each vegetation type. Some characteristics of each vegetation type and channel type are presented.

11:20-1:40

LUNCHEON, ANNUAL BUSINESS MEETING AND AWARDS: UNLV DINNING COMMONS

SESSION II 1:45

ROOM: A112

Chairperson: Peter F. Ffolliott

1:45-2:05

***WIND PATTERNS OVER THE LOWER COLORADO RIVER REGION DURING THE 2004 SUMMER MONSOON**

Doyle C. Wilson, Robert Johnson, Janan Rabehl, and Rob Peyton (Mohave Community College, Lake Havasu City, AZ)

Exploring the interrelationship of the summer surface heat low over the Lower Colorado River region with monsoonal flow surge from the Gulf of California were part of NOAA's 2004 North American Monsoon Experiment field research season. Pilot weather balloon observations taken twice a day in Lake Havasu City, Arizona and spanning the monsoon season, monitored wind speed and direction from the surface to a maximum of 13,000 meters which is generally above the 200mb pressure level. The monsoonal flow, based on dew point temperature trends, entered Lake Havasu City July 12th, 5 days after the Gulf of California SST's began a 3°C rise. Total averaged AM and PM wind directions over Lake Havasu City are different in the lower 4000m, but align themselves to northeast directed flow above that level. When broken into pre-monsoon, monsoon, and post-monsoon averages, three patterns emerge: (1) both AM and PM monsoon period wind direction patterns depart from the pre- and post-monsoon patterns, particularly in the interval between 1000m to 4000m, (2) the pre- and post-monsoon AM and PM patterns are significantly different above 6000m, and (3) The pre- and post-monsoon patterns for the AM and PM, respectively are

similar, particularly above 5000m. Interestingly, the average calculated wind speeds, as divided into the above categories, indicates lower velocities for particular corresponding elevation intervals during the monsoon period.

2:05-2:25 UTILIZING GIS TO APPLY FVS ON A LANDSCAPE SCALE

Boris Poff (Northern Arizona University, Flagstaff, AZ)

The Forest Vegetation Simulator (FVS) is a model used for predicting forest stand dynamics. FVS is the standard model used by various government agencies, such as the USDA Forest Service and the USDI Bureau of Land Management. However, many land management decisions are made on a large watershed or landscape scale. This paper attempts to show how FVS can be applied to such a larger scale by incorporating it into a Geographic Information System (GIS). Using the ArcGIS model builder an attempt is made to display the dynamic FVS output spatially. This is accomplished by dividing the landscape into a series of stands for which FVS is able to predict future tree characteristics and estimates of periodic increment. This output is then fed back into the GIS, which can then display this dynamic output over a given landscape. Such a management tool is not only helpful in forest hydrology, where forest stand characteristics in a watershed affect the hydrologic conditions of the watershed, but also in other forest management arenas, such as fire management.

**2:25-2:45 FACTORS THAT AFFECT THE HYDROLOGY OF THE
UPPER RIO DE FLAG WATERSHED NEAR FLAGSTAFF,
ARIZONA**

Duncan S. Leao and Aregai Teclé (Northern Arizona University, Flagstaff, AZ)

The Upper Rio de Flag Watershed is located in the Southern flanks of the San Francisco Peaks to the north of the City of Flagstaff, Arizona. It is drained by the Rio de Flag whose path winds from an elevation of 3750 meters to 2164 meters at Flagstaff on its way to the Little Colorado River. The hydrology of the area is influenced by its unique characteristics, which include steep mountain topography, montane and subalpine conifer forest vegetation type, and a volcanic derived geology. The important factors that influence the hydrology in the area include topography, geology and soils, climate (such as precipitation, atmospheric humidity, temperature, solar radiation and wind speed), vegetation cover, and wildlife and man's use of the area. We have spatial data on these factors and we evaluate their hydrologic effects in an integrated manner using geographic information systems (GIS).

**2:45-3:00 THE RESTORATION CAPABILITIES OF THE FORMER
BEAVER CREEK PROJECT WATERSHEDS**

Assefa Desta and Aregai Teclé (Northern Arizona University, Flagstaff, AZ)

The former Beaver Creek experimental watersheds are located in the Coconino National Forest in north central Arizona. Starting in 1956, twenty watersheds with a total area of 111,293 hectares were selected some for treatment and others as control to study the effects of various levels of vegetation treatments on water yield. Later, the objective of the study was modified to become watershed treatment effects on the different resources in the forest.

In any case, the experimental watersheds were treated with vegetation removal that ranges from a light of one-third stripcut to clearcut. It has been a little more about 30 years since the last treatment of the pilot project. The purpose of this study is to examine the different treated watersheds and compare them with the untreated control ones to see the level of recovery of the treated watersheds to their original conditions.

3:00-3:30 COFFEE BREAK: FOYER

**3:30-3:45 THE SOCIAL AND ECOLOGICAL COSTS OF DAMMING
THE COLORADO RIVER**

Aregai Tecele (Northern Arizona University, Flagstaff, AZ)

In the realm of water resources systems, the fifty years ending in the 1970s may be referred to as the Age of Impoundment. During that era close to 35,000 dams were built around the world, to divert and obstruct the natural flow of rivers. Two of the first biggest of such dams, Hoover Dam and Glen Canyon Dams, with capacities of 36,702,792,500 and 33,304,500,000 m³, respectively were built in the Colorado River. In addition, there are eight other large dams built for various purposes in the Colorado River basin. The construction and operation of Hoover and Glen Canyon dams alone provide a large portion of the energy and water responsible for transforming the arid southwest into a national breadbasket and one of the fastest booming urban growths in the USA. In spite of such benefits, however, there are critical social, cultural and environmental costs accrued from the construction and operation of these dams. Many large fertile agricultural areas, invaluable cultural remains, areas of natural beauty, and valuable environmental treasures along and away from the river are inundated and covered by lakes that backup for hundreds of kilometers upstream from the dams. Aquatic and terrestrial habitat are altered to the extent that many native plant and animal species become endangered and even extinct due to submergence under water and ensuing chemical and physical changes. Damming the river and extensive diversion of its water for irrigation and water supply purposes have prevented the river water from reaching the coastal lowlands for some months in the year significantly affecting communities like the Cocopa Indians that depended on it for their survival. These and many other effects will be examined and possible alternative solutions presented in the paper.

**3:45-4:00 TWELVE YEAR POST-FIRE CHANGES IN CHANNEL
MORPHOLOGY OF DUDE CREEK**

Jackson Leonard (Northern Arizona University and USDA Forest Service, Rocky Mountain Research Station, Flagstaff, AZ) and Alvin L. Medina (USDA Forest Service, Rocky Mountain Research Station, Flagstaff, AZ)

In 1990, the Dude Fire burned over several streams below the Mogollon Rim, including Dude Creek. Changes in channel morphology of burned (Dude Creek) and an unburned (Pine Creek) were determined by comparing cross sectional data across 4-5 year periods. Differences between channel profiles were quantified to provide volume estimates of channel materials gained or lost. Graphs of channel profiles are used to illustrate differences in channel morphology. Photographs were used to provide visual contrasts of conditions over

time using paired photos of treated and untreated streams. The long and short term effects of fire on riparian areas are discussed with respect to restoration strategies.

4:00-4:15

**INTEGRATING ECOLOGICAL RESTORATION PROJECTS
IN THE FLAGSTAFF AREA INTO THE LITTLE
COLORADO RIVER WATERSHED PROJECT**

Joseph Trudeau (Northern Arizona University, Flagstaff, AZ)

The Little Colorado River (LCR) drains approximately 26,000 square miles of northeastern Arizona and northwestern New Mexico, flowing nearly 350 miles from the high forests of the White Mountains to the low desert in Grand Canyon National Park, where it meets the Colorado River. Continued flood damages in the communities of Winslow and Holbrook, AZ, led to the 1997 establishment of the LCR Resource, Conservation and Development Area, Inc., a locally led non-profit organization. Within this organization, citizens, Native American tribes, state and federal agencies, and businesses with interests in the watershed contribute to a Multi-Objective Management approach to watershed planning. The acting body of this organization, the LCR Watershed Coordinating Council, has seen much success preserving and restoring ecological and social components of the watershed. However, a significant portion of the LCR basin has not been included to the degree necessary to qualify the project as truly whole-watershed in scope. Recent years have seen a proliferation of forest, spring, stream, wetland and range restoration projects in the ponderosa pine and pinion-juniper ecosystems near Flagstaff, AZ that lie within the LCR watershed. This paper examines whether future collaboration between restorationists in the Flagstaff area and downstream stakeholders in the LCR watershed is appropriate, feasible, and productive. In addition, I examine the ecological, social and economic benefits that could be gained by enhanced communication and collaboration, and provide suggestions for making connections in the future.

4:15-4:30

**STOCHASTIC SIMULATION OF WET PERIODS USING
MARKOV CHAIN MODELS**

Gustavo Perez-Verdin and Aregai Teclé (Northern Arizona University, Flagstaff, AZ)

Daily precipitation is a random process than can be studied with stochastic models to reduce the level of unpredictability. We analyzed precipitation data collected during the period 1958-80 from 80 gauging stations in the Beaver Creek watershed of the Coconino National Forest in north central Arizona. A gradient of *wetness* was established for the data considering the number of consecutive days with 5 mm or more of daily precipitation. Transition matrix probabilities for wet periods were modeled by means of first-order, time-variable Markov chains. We found that first-order six-state Markov chains fit well the wetness data. We also found the Weibull probability function to fit the monthly frequency distributions of wetness data. The study concludes that precipitation is a Markov process, in which the main contribution comes from the first-order transitions. The implication of this study is gaining experience and better understanding in reconstructing, simulating, and predicting wet periods under uncertainty.

4:30-4:45

HYDROLOGY SECTION BUSINESS MEETING

POSTER SESSION

SESSION I

10:00 – 10:30

CLASSROOM BUILDING COMPLEX, A BUILDING FOYER

Chairperson: Erik Gergus

***SPECTROSCOPIC STUDIES OF URANIUM SPECIATION IN ACTINIDE EXTRACTIONS**

James Ormord, Cynthia-May S. Gong, Jennifer Pretschaiprasert, Amber D. Wright, and Kenneth R. Czerwinski. (University of Nevada, Las Vegas, NV)

Uranium and plutonium, used as fuels in nuclear reactors, are generally reprocessed using a series of redox reactions and liquid-liquid extractions. Under certain conditions, the organic phase can split into lighter and heavier phases (third phase formation); the heavy phase concentrates uranium and nitrate, leading to engineering issues and safety concerns. Although this phenomenon is well-documented, the speciation of the uranyl complex and its mechanism of formation is yet unknown. In this work, we characterize the organic phase using UV-vis, NMR, and IR spectroscopy before and after third phase formation.

***MECHANISTIC STUDIES OF THIRD PHASE FORMATION IN URANIUM SEPARATION**

Amber D. Wright, Jennifer Pretschaiprasert, Cynthia-May S. Gong, James Ormord, and Kenneth R. Czerwinski. (University of Nevada, Las Vegas, NV)

Uranium in the form of $U(VI)O_2^{2+}$ (uranyl) is generally reprocessed by the nuclear industry using the Plutonium Uranium Redox EXtraction (PUREX) process. In this procedure, spent fuel is dissolved in nitric acid and purified using an extractor dissolved in an organic diluent. Under high concentrations of uranium and nitrate, the organic phase can split into two phases (third phase formation). The heavier phase is of especial interest because it concentrates uranium, leading to safety concerns and engineering issues. The speciation of the uranyl complex in the heavy phase and its mechanism of formation is yet unknown. Our work aims to elucidate this mechanism by systematically characterizing the $[H^+]$, $[NO_3^-]$, and $[U]$ distributions under varying extraction conditions in normal, light, and heavy phases as well as the aqueous layer in the liquid-liquid extractions.

***ONLINE SENTENCE PROCESSING AND OFFLINE SENTENCE COMPREHENSION: COMPARISONS OF AGE AND MODALITY OF PRESENTATION**

Michelle L. Reinheimer and Karen A. Kemtes (University of Nevada, Las Vegas, NV)

In the current study, we asked younger adults, ages 18-30, and older adults, age 65 and up, to read sentences that were presented segment-by-segment using a self-paced serial presentation method. Each sentence was followed by a visually presented comprehension question. This study does a comparison between how long it takes to answer the comprehension question versus if the answer is correct. Reaction times were longest for the most complex sentences. During this study, we also ran Waters and Caplan, a sentence span task requiring individuals to read sentences on a computer monitor, and decide whether the sentence makes sense semantically. We are measuring the comprehension along with reaction times.

MORPHOLOGICAL VARIATION IN ALLOPATRIC POPULATIONS OF *NERITA* GASTROPODS IN THE NORTHERN GULF OF CALIFORNIA

Allison Gilliland, Shannon O'Hara, Urs Riner; Michael Lorentzen, Ryan Horenziak, Emerald Tatarin, Raena Cota, and Stephen Shuster.(Northern Arizona University, Flagstaff, AZ)

Geographically distant populations are often morphologically distinct. Environmental effects, genetic effects, or an interaction of the two can cause these differences. To address this issue we examined morphological variation in three disjunct populations of *Nerita*, near Puerto Peñasco, Sonora, Mexico. The three populations included, (1) Estero Morua, where comparatively large snails were isolated on a coquina limestone island near the mouth of the sandy estero habitat; (2) Punta Peñasco, where smaller snails were wide spread on the basalt boulders in the upper intertidal zone; (3) Punta Pelicano, where medium sized snails were clustered on granitic outcrops in the middle intertidal zone. We measured 8 morphological shell characteristics. The characteristics include; shell height, shell width, aperture height, aperture width, medial tooth length, lateral tooth length, whorl height and operculum length. Principal components analysis (PCA) showed significant morphological differences among the three populations ($A=.68$, $P<.001$); snails from Estero Morua were markedly larger than the other two populations, which were similar in size. These results suggest that snails in Estero Morua are geographically isolated from the other two populations.

***A PRELIMINARY PHYLOGENY OF *PROSOPIS* BASED ON NUCLEAR RIBOSOMAL DNA SEQUENCES**

Raul Gutierrez, Christopher J. Munoz, Martin F. Wojciechowski (Arizona State University, Tempe, AZ)

A preliminary phylogeny of the genus *Prosopis* L. (Fabaceae, Mimosoideae, "mesquites"), based on sequences of the Internal Transcribed Spacer Region (ITS) of nuclear ribosomal DNA is presented. The purpose of this study is to evaluate the utility of nrDNA ITS sequences in determining relationships within the genus and to ascertain the its' monophyly

relevant to related genera. The genus consists of 44 taxa as accepted by Burkhart (1976). There are two centers of diversity for the group. One center of diversity is the southwestern region of North America. The second is the arid region of South America that centers around Argentina, Chile, and Paraguay. Four species occur in Africa and the Middle East. Sampling of taxa from the genus, i.e., from each section and series, and related mimisoids, was guided by Burkhart's (1976) monographic treatment of *Prosopis* and recent results from analyses of higher-level relationships within subfamily Mimosoideae based on chloroplast and nuclear gene sequences, respectively. Results suggest the nrDNA ITS region contains sufficient variation to elucidate infrageneric relationships.

MICROBIAL COMMUNITIES IN THE NASAL PASSAGES OF HEALTHY AND URTD TORTOISES

Ashley M. Ordorica, F. Harvey Pough, and Charles E. Deutch (Arizona State University West, Glendale, AZ)

Natural communities of microorganisms are believed to provide an important barrier to infection by potential pathogens. We characterized the microbial communities in the nasal passages of desert tortoises (*Gopherus agassizii*) quantitatively to determine if there are individual or seasonal variations, or differences between healthy tortoises and those with symptoms of upper respiratory tract disease (URTD). Captive tortoises at the Adobe Mountain Wildlife Rehabilitation Center in Phoenix, AZ were divided into four groups: three healthy tortoises were sampled monthly, three URTD tortoises were sampled monthly, three healthy tortoises were sampled bimonthly, and three healthy tortoises were sampled once. At each sampling time, both nares were probed with moistened sterile swabs. The bacteria on the swabs were suspended in sterile saline, serially diluted, and plated on tryptic soy agar medium. Total bacterial counts/ml varied from tortoise to tortoise, generally increasing from May to August and decreasing from September to November. Total counts were usually higher in URTD tortoises. The microbial communities were dominated by pigmented Gram-positive cocci, but Gram-positive rods, coryneforms, and Gram-negative rods also were found. The proportions of different bacteria varied from month to month and did not differ substantially between healthy and diseased animals. These studies suggest that a broader ecological and microbiological analysis of these communities would be valuable.

MOVING FROM THE LAB TO THE INTERNET: GETTING STARTED

Linda Kelso and Kimberly A. Barchard (University of Nevada, Las Vegas, NV)

On-line research reduces costs, increases sample sizes, and can increase the diversity of your research participants. Many people would like to do on-line research, but do not know how to get started. We describe the technology and skills necessary to shift from laboratory research to on-line data collection. Most on-line research involves putting questionnaires and tests on webpages, which participants complete over the Internet. Therefore, researchers need access to a computer on which they can create their webpages, and access to a server that will host the webpages. Most educational institutions will provide free server space to their employees. Second, researchers need software to create the webpages. Programs such

as *Dreamweaver* and *Frontpage* can be used, but free software is also available. Third, researchers need a few basic skills: these are easily learned, and we provide resources such as books, websites, and course recommendations. Researchers interested in advanced on-line data collection techniques will also want to have a strong understanding of html, learn a web programming language (such as PHP or ASP), and be able to use an Internet-compatible database program (such as Access or MySQL). We will provide resources for these, as well.

LYSOSOMAL PATHWAY AND VPS3 GENE FUNCTION

Jenny Sanchez, Corina Prieto, Jaimee Galindo and Pamela Marshall (Arizona State University West, Glendale, AZ)

In *Saccharomyces cerevisiae*, many proteins destined for the lysosome-like vacuole transit the early stages of the secretory pathway until they are actively sorted away from secretory proteins in the late Golgi. At least sixty genes are required for the vesicle-mediated sorting of protein to the lysosome-like vacuole. The proteins of the *VPS* (vacuole protein sorting) pathway are composed of several molecular apparatuses responsible for recognition, packing, and vesicular transport of proteins to the vacuole in yeast. *VPS3* is a gene previously identified as producing a protein that functions to transport cargo from Golgi to the endosome. However, microscopy indicated that a least one protein routed from the Golgi to the endosome was delivered correctly in cells lacking *VPS3* (Unpublished, Amanda Attyde, Marshall lab). We decided to try to determine the correct function of Vps3p based on the conflicting data. We cloned the gene and now we are studying the function of Vps3p by two different methods. First, we deleted the gene to study the phenotype of the cells lacking *VPS3*. Secondly, we will perform a yeast two hybrid screen to determine other possible proteins.

ACCUMULATION OF VOLUTIN GRANULES IN SACCHAROMYCES CEREVISIAE

Kristi L. Harrigan and Pamela A. Marshall (Arizona State University West, Glendale, AZ)

Volutin granules are inclusions of inorganic polyphosphate for storage. In *Saccharomyces cerevisiae*, volutin granule formation can be induced by phosphate starvation, followed by culture in high phosphate media. Our experiments have demonstrated that the accumulation of volutin granules is rapid, with granules forming in as little as 15 minutes following the transfer of cells to high phosphate media with growth at 30C. Previous work in other labs has indicated that the vacuole (equivalent to the mammalian lysosome) is the site of polyphosphate storage and phosphate sequestering. No research has been done into the localization of volutin granules in *S. cerevisiae*. Volutin granules in our yeast strains appear to be located diffusely throughout the cytosol. Furthermore, we have observed the accumulation of volutin granules in several strains, including strains with mutant vacuoles. These strains include mutants that lack protein targeting to the vacuole and lack vacuole structure all together. Research is ongoing and we plan to track the accumulation of volutin granules under a variety of conditions.

SAMPLES STAINED WITH FUN1 DYE CAN BE STORED AT -20C FOR LATER OBSERVATION

Matthew D. Eggleston and Pamela A. Marshall (Arizona State University West, Glendale, AZ)

FUN1 (Molecular Probes, Eugene, OR) has been observed to form Cylindrical IntraVacuolar Structures (CIVS) within the vacuoles of metabolically active yeast cells (Appl Environ Micro: 63, 2897 (1997)). FUN1 starts off as a diffuse pool of fluorescent intracellular stain and utilizes an unknown endogenous biochemical processing mechanism to compact and form orange-red CIVS within the cell vacuole. In the clinical setting FUN1 is primarily used for identification of fungal infection and is utilized in a laboratory setting to quickly distinguish between metabolically active and dead fungal cells. Because of the time necessary for the FUN1 dye to locate within the vacuole (several hours), and the apparent need to analyze cells immediately after staining, few studies have utilized this chemical. Thus, it would be of interest to be able to stain cells and store them for later use. Our lab examined the longevity of CIVS in vacuolar-protein sorting (VPS) mutants of *Saccharomyces cerevisiae* stained with FUN1 and stored at -20⁰C. We found that CIVS could be reliably observed and imaged utilizing Differential Interference Contrast (DIC) microscopy and fluorescence microscopy for up to 21 days. We also observed that cells stained with FUN1 would resume propagation on media plates after being frozen for up to 21 days. The modification to the published procedure for FUN1 dye staining should allow for a more widespread and less time consuming use of this important biological tool.

CONSTRUCTION OF GFP FUSION TO THE AMINO- AND CARBOXY- TERMINI OF PHA P OF WAUTERSIA EUTROPHA

Edgar Martinez, Evan Turner, Vicki Sein, and Douglas Dennis (Arizona State University, Tempe, AZ)

The purpose of this project is to create two translational fusions between the phaP gene of *Wautersia eutropha* and the green fluorescent protein gene (gfp) of *Aequorea victoria*. One fusion places the GFP gene at the amino terminus of PhaP and other fusion places the GFP gene at the carboxy terminus of PhaP. These fusions and a control fusion of the green fluorescent protein under phaP promoter control will be used in fluorescent microscopy studies to determine the location and prominence of PhaP during cell growth and polyhydroxyalkanoate (PHA) accumulation. Preliminary studies using the amino-terminus fusion have been conducted and they suggest that during exponential growth in *Escherichia coli* phaP:GFP under non-PHA accumulating conditions PhaP coalesces at the boundary of the cell and may migrate from the center to the poles, as does ParA a chromosome partitioning protein. In *Wautersia eutropha* the tagged PhaP accumulates on the boundary of the nascent PHA inclusions, but also can be prominently imaged around the boundary of the cell. Further experiments are underway to definitively assess the functioning of PhaP in cell division and PHA formation.

AMBIENT ODORS IN THE CASINO SERVICESCAPE

Soyoung Bo (University of Nevada, Las Vegas, NV)

Individuals may be affected physically by the perceived servicescape (Bitner, 1992). Wakefield and Blodgett (1994) found that when servicescape has a relatively consistent and strong effect on the length of time customers' desire to stay in the leisure service setting and on their patronage intentions. Several studies have been conducted regarding customers' appreciation of casinos' environment (Mayer and Johnson, 2003; Lucas, 2003). It is interesting to note that despite Wakefield and Blodgett's acknowledgement that ambient features, including aroma, may influence perceptions (1994), such factors were not included in their following studies. Of the five senses, the sense of smell is often overlooked in the gaming industry, perhaps because of the prevalence of many other environmental factors that directly impact the sight, hearing, and touch senses that can be controlled, such as type of gaming devices, floor layout, temperature, and lighting. However, the sense of smell can be motivating influence and a contributor to consumer's impressions of the servicescape of a gaming establishment. In fact, the sense of smell may have the greatest impact on emotion (Hirsch, 1995). Studies should be conducted to determine if ambient odors might differentiate gaming entities from its competitors and increase revenue. While it is clear that the servicescapes of casinos is important in overall customer satisfaction, the degree of importance of the ambient odors to players has not been sufficiently investigated. Additionally, it is necessary to determine the amount type of odorant that would have the greatest impact, if any, on customer satisfaction and increasing gambling.

***THE ROLE OF PROCESSING SPEED IN YOUNGER AND OLDER ADULTS' PERFORMANCE ON A READING DISTRACTION TASK**

Shaida S. Jetha and Karen A. Kemtes (University of Nevada, Las Vegas, NV)

Salthouse (1992) proposed that older adults' difficulties with memory and attention tasks are due to a general slowing of mental function. To date, most of the research on cognitive slowing has focused on attention, memory, reasoning, and spatial ability tasks. Little is known about the effects of general slowing on language processing—particularly under distracting conditions. In the current study, we measured general slowing and performance on the reading distraction task used by Connelly, Hasher, and Zacks (1991, Experiment 2). Overall, older adults' reading times, particularly in text-with-distraction condition, were significantly longer than those of younger adults. This elevation in readings times was strongly associated with the measure of general slowing, but only for older adults.

THE PUBLIC LANDS INITIATIVE AT UNLV: A NEW MODEL FOR CONSERVATION

Margaret Rees, Allison Brody, Donna Grady, George Phillips, and Daphne Sewing
(University of Nevada, Las Vegas, NV)

Conservation Initiatives, funded through the Southern Nevada Public Land Management Act, meet conservation and recreation goals on seven million acres of federal public land surrounding Las Vegas. UNLV's Public Lands Initiative (PLI) is playing a crucial role in implementing many of these Conservation Initiatives. Working with Federal Agencies and community partners, PLI is working to contribute to the environmental literacy of Clark County residents; provide recreational experiences to disadvantaged youth; increase capacity for the protection of cultural sites on public lands; give high school juniors on-the-job experiences in conservation; and connect community volunteers with opportunities for direct involvement in the conservation and stewardship of public lands.

***RAINFALL PROXY RECORD FROM A COSTA RICAN SPELEOTHEM CORRELATED TO WARMING EVENTS DURING THE LAST GLACIAL PERIOD**

Lindsay R. Burt and Matthew S. Lachniet (University of Nevada, Las Vegas, NV)

A high-resolution paleoclimate history, focusing on rainfall variability in Costa Rica during the last glacial period has been reconstructed using a speleothem (cave calcite deposit). Speleothems constitute a record of climatic change preserved in the form of oxygen isotopes. Using $\delta^{18}\text{O}$ values throughout sample CT-6, I have generated a record of relative rainfall levels and correlated it to warming-cooling cycles known as Dansgaard-Oeschger (D-O) events during the last glacial period. Radiometric dating utilizing U/Th decay serves as an age constraint for successive layers of calcite within the sample. The growth record spanning ~26 to 35 kyr BP overlaps D-O events recognized in Greenland ice cores (GRIP, GISP2). Higher values of $\delta^{18}\text{O}$ from Greenland ice correspond to higher temperatures in the northern hemisphere, and an inverse correlation is apparent between the $\delta^{18}\text{O}$ record of CT-6 and those of GRIP and GISP2. In tropical regions, such as Costa Rica, annual rainfall levels dominate $\delta^{18}\text{O}$ values as opposed to temperature. Data from sample CT-6 can establish variability in rainfall in this region during the last glacial period and also has implications for interpreting past global climate change. The benefits to this study include further understanding of paleoclimate, and potential modeling for future water resources, as water availability in Central America is critical to agriculture, biodiversity, and global economics.

SYNTHESIS OF NOVEL 1,10-PHENANTHROLINE LIGANDS FOR PT(II): POTENTIAL CHEMOTHERAPEUTIC AGENTS

Michael Krainock, Alex Isom and Byron Bennett (University of Nevada, Las Vegas, NV)

Diamine complexes of Pt(II) are currently in use as chemotherapeutic agents for treatment of cancer. The physiological side effects associated with these complexes have prompted investigation of improved agents. Initial in vitro experiments utilizing a diimine Pt(II)

complex have shown enhanced cytotoxicity. The purpose of the research below was to prepare a new diimine complex for evaluation. The preparation and characterization of novel 4,7-dialkyl-1,10-phenanthroline ligands featuring fluorine containing alkyl substituents will be presented. Alkylation through deprotonation of 4,7-dimethylphenanthroline at -78°C followed by treatment with 3,3,3-trifluoro-1-iodopropane resulted in isolation of products with $-(\text{CH}_2)_3\text{CF}_3$ substituents. Details of product isolation and spectroscopy will be provided in addition to detail of the initial attempts to coordinate these diimine ligands to Pt(II) by reaction with the (1,5-COD)PtCl₂.

ASSESSING THE IMPACT OF GOLF COURSE TRANSITION TO REUSE WATER

A.M. Lockett (University of Nevada, Las Vegas, NV), D.A. Devitt (University of Nevada, Reno, NV) and R.L. Morris (Univ. of Nevada Cooperative Extension)

Explosive population growth in southern Nevada has placed greater demands on the available water resources. Water managers have begun to investigate all possible sources of water, including waters of lower quality, in order to alleviate the supply-demand dilemma in southern Nevada. Currently 35 out of 58 Las Vegas valley golf courses are utilizing reuse water. This study was conducted to assist the golf course industry in the transition from irrigation with fresh water to irrigation with reuse water by assessing reuse water's impact on plant response, water use and salt balance. The information obtained from this study will be evaluated to determine whether reuse water is a viable option for long-term irrigation of golf courses. Results from the 55-month research study have shown that while transitioning to reuse water has led to increased soil salinity on both fairways and greens, critical soil salinity threshold values have not been reached. However, irrigation management practices of zero leaching on some courses suggest that if such irrigation management practices do not change in the near future, significant increases in soil salinity and a decline in turf grass quality will occur. Proper irrigation management with reuse water is essential in preventing critical soil plant threshold values from being reached.

BIOCHEMISTRY STUDENTS' PERCEPTIONS OF BUFFER PROBLEMS

Faith Chan and MaryKay Orgill, (Department of Chemistry, University of Nevada, Las Vegas, NV)

Even though the concept of buffers is taught in nearly every undergraduate chemistry and biochemistry class, students continue to have considerable difficulty solving calculations involving buffer systems. In order to help biochemistry students develop better understandings of buffer problems, we invited them to participate in a workshop. The students were interviewed before and after the workshop about their understanding of the concept of buffers; during the workshop, the students were audio- and video-taped as they worked together in small groups to reason through various buffer problems. In this poster presentation, we will present the results of the current pilot study. We will discuss the students' perceptions of the concept of buffers, their perceived difficulties in solving buffer-related problems, and misconceptions they had about buffers that kept them from correctly solving these problems

ACADEMY BUSINESS AND ANNUAL REPORTS

OFFICERS 2005 - 2006

ELECTED

Owen Davis	President
William Perry Baker.....	Past President
Peter Ffolliott.....	President Elect
Carlton 'Buck' Jones.....	Recording Secretary
Ingrid Novodvorsky.....	Membership Secretary
Karen Conzelman	Treasurer
Mick Diehl.....	Director, Southern Arizona
Robert Reavis	Director, Central Arizona
Stephen Shuster	Director, Northern Arizona
Kathy Lauckner	Director, Nevada

APPOINTED

Owen Davis	Permanent Secretary
Tony Brazel	Editor, Journal
Kathy Lauckner	Editor, Newsletter
Florence Slater & Family	Editor, Proceedings

SECTION CHAIRS

Barbara Roth.....	Anthropology
Robert Bowker.....	Biology
Timothy Vail	Chemistry
James deVos	Conservation
Steven Yool	Geography
Randall Nydam.....	Geology
Peter Ffolliott.....	Hydrology
Erik Gergus.....	Poster Session
Melinda Davis	Psychology
Ingrid Novodvorsky.....	Science Education

COMMITTEE ROSTER

BUD ELLIS SCHOLARSHIP

Stephen M. Shuster

MEMBERSHIP

Ingrid Novodvorsky

R. M. HARRIS AWARD

Tony Brazel

OUTSTANDING SCIENCE TEACHER

William Perry Baker

GRANTS-IN-AID

GRADUATE

Aregai Teclé

BUDGET

Karen Conzelman

FELLOWS, NOMINATING

Owen Davis

BEST STUDENT PAPER

Owen Davis

NOMINATING

Owen Davis

William Perry Baker

Jim deVos

NECROLOGY

Ingrid Novodvorsky

PUBLICITY

Robert Reavis

PROGRAM

Kathy Lauckner

GRANTS-IN-AID

HIGH SCHOOL

Paul Smolenyak

BUD ELLIS OUTSTANDING SERVICE AWARD

Don Pinkava

Milton Sommerfeld

Karen Conzelman

Gordon Johnson

Bud Ellis

Stephen Williams

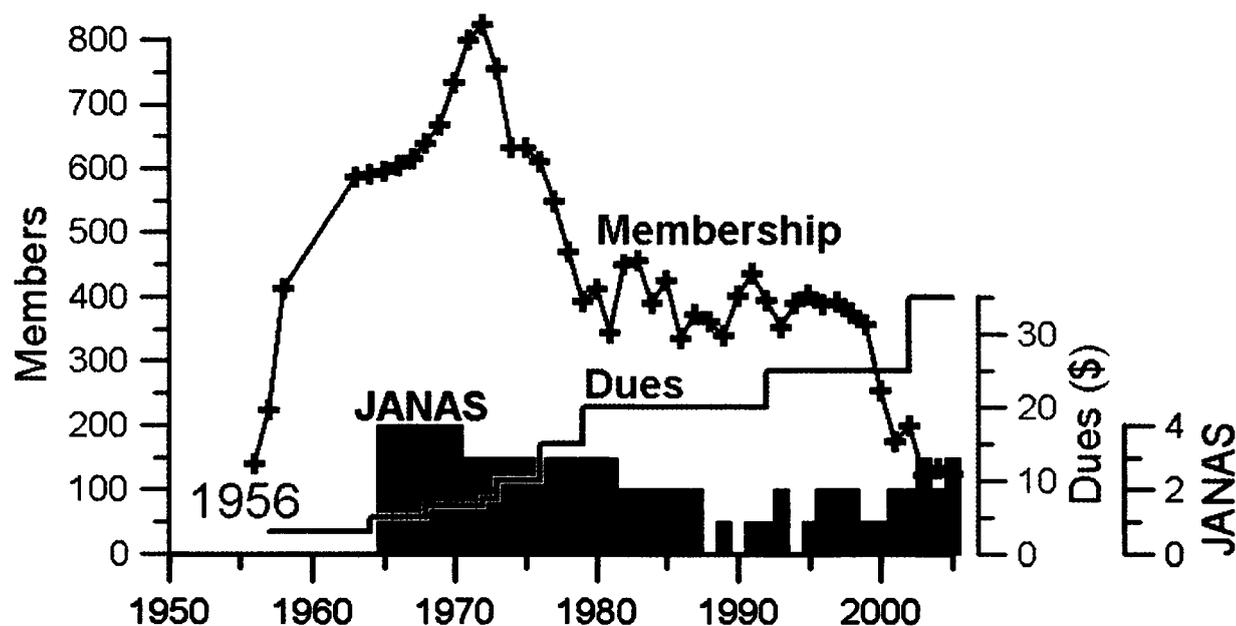
BEST STUDENT POSTER

Eric Gergus

REPORT OF THE PRESIDENT

I feel like Frodo under the Party Tree. I have stayed too long, but this parting comes too soon. I have served you three times as President 1998-1999, 1999-2000 and now 2004-2005. That is two times longer than anyone should. In addition, during the last seven years, I have served you as Regional Director for Southern Arizona, as Permanent Secretary, and in the unofficial capacity of Webmaster.

Looking back, my thoughts fall to some disappointments and pleasures. First of these is our membership numbers. When I took office in 1998, there was no up-to-date list of ANAS members. Gordon Johnson, then Permanent Secretary, suggested a physicist from the University of Arizona who said she would take on the task. Karen Conzelman and Betsy Cooper then put what little information we had in a spreadsheet and Ingrid Novodvorsky took over the post of Membership Secretary. The result was an alarming decline in membership, due to nearly 200 ex-members who had been carried on the books for over a decade. Thereafter, Ingrid has kept accurate records. After an additional drop, the membership has stabilized. My first disappoint was the decline, and among my greatest pleasures is having been able to work with Ingrid as Membership Secretary.



A second disappointment was the necessity to raise dues during my period of service. This was brought about by several factors. The increased costs of printing and mailing the Newsletter and JANAS were chief among these. But, I can take pleasure in having avoided even further increases. Starting in 1998, we began providing optional electronic copies of the Newsletter as a means of reducing costs. Starting this year, 2005-2006, we will offer *only* electronic copies as a privilege of membership and collect a fee for paper copies. I likewise explored the option of going to electronic copies of JANAS for our members. This was not successful but, as publication costs continue to rise, I'm sure the board will revisit this topic. The choice is simple, go electronic or raise dues. The website that makes this possible, and

costs ANAS nothing, it is provided free-of-charge by the Department of Geosciences of the University of Arizona.

A third cause for pleasure has been the renaissance of our *Journal of the Arizona-Nevada Academy of Science* under the editorship of Tony Brazel with the assistance of Cindy Zisner. *JANAS* commenced publication in 1967, at four issues per year, went to three issues per year in 1972 and to two in 1982. Thereafter publication became irregular until 2001, when Tony Brazel took over. Tony has published two or three issues a year, honoring our commitment to library subscribers and catching up on three “lost issues.” Beginning this year (2005) *JANAS* will be distributed electronically by BioOne to hundreds of libraries worldwide.

Finally, it is with great pleasure that I surrender the duties of President to my good friend and colleague, Peter Ffolliott. Pete has been a member of ANAS since 1971 and was elected Fellow of Arizona-Nevada Academy of Science that same year. It will be Pete’s duty to serve as President during our Silver Anniversary. Several events are planned for next year’s meeting at the University of Arizona. Already, Pete and other authors have presented a second edition of “*ARIZONA’S NATURAL ENVIRONMENT*,” a publication written by the prolific contributor to *JANAS* and founding member of ANAS, Charles Lowe.

I look forward to attending next year’s meeting and to helping plan it, but I will no longer serve ANAS in any official capacity – only in the unofficial post of your webmaster.

It has been a pleasure.

Owen Kent Davis
President, ANAS

**MINUTES OF THE 48th ANNUAL MEETING
ARIZONA-NEVADA ACADEMY OF SCIENCE**

The meeting was called to order at 12:05pm by ANAS President Perry Baker.

Perry invited the members to read the minutes from last year's annual meeting. He then moved (Owen Davis seconded) that they be accepted. Motion was passed.

Perry invited the members to read the President's Message that encouraged the participants to continue being active in the Academy and to urge others to join.

Perry moved to accept the reports from the President, Permanent Secretary, and Membership Secretary. Motion was seconded and passed.

Owen identified a new Fellow, Aregai Tecele, who was not in attendance to receive his plaque because of a long-running hydrology section at the time of his award presentation.

Perry presented the Outstanding Science Teacher Award to Lara Zeisler-McGuckin of Benjamin Franklin Charter School. Lara is a first grade teacher, with a degree in wildlife biology. She teaches first graders to appreciate science through observation and motivates students through hands-on activities.

Perry extended warm thanks to Sharon Torcivia who helped coordinate today's meeting.

Milton Sommerfeld presented the Outstanding Service Award to Donald Pinkava. Don has been a member of the Academy for 40 years and has been involved in every aspect of its work. Some of his many accomplishments were presented: Chair of the Biology Section, Chair of the Scholarship Section, frequent judge and evaluator for poster competitions, served as editor or co-editor of JANAS for 10 years (Vols. 24-33), over 50 presentations at ANAS meetings, and has mentored many students including 36 Master's or PhD recipients. His research work involving the taxonomy of the *Cactaceae* and was described. Don was described as, "...An intellectual resource who knows every plant in Arizona." Don graciously accepted the award with thanks to the members.

The Grants-In-Aid Committee presented the Fall Graduate Award of \$300 to Thomas 'Rob' Taylor of Midwestern University.

Election of Officers

The following were all elected by unanimous voice vote:

Owen Davis - President

William Perry Baker - Past President

Peter Ffolliet – President Elect

Carleton 'Buck' Jones - Recording Secretary

Ingrid Novodvorsky - Membership Secretary

Karen Conzelman – Treasurer

Owen Davis - Director, Southern Arizona

Robert Reavis - Director, Central Arizona
Stephen Shuster - Director, Northern Arizona
Kathy Lauckner - Director, Nevada

Perry then turned the proceedings over to newly elected ANAS President, Owen Davis.

Owen presented the award for Best Student Talk to Matt Freyer for his presentation, "Evidence of Complex Binding of Netropsin and Dapi to the A-T Rich Region of a 20-Base-Pair Hairpin DNA Structure."

Kathy Lauckner presented Best Poster awards to Jennifer Broyles for her presentation: "Gold Nanoshell Formation on Paramagnetic Silica Nanoparticles," Jennifer Broyles, Deron Daugherty, Michael Valentine, Timothy L. Vail (Northern Arizona University, Flagstaff, AZ); and Amy DeMers for her presentation: "Immunochromatographic Assay for Ethynyl Estradiol in Municipal Wastewater," Amy Demers, Michael Valentine, Catherine Propper, and Timothy L. Vail (Northern Arizona University, Flagstaff, AZ).

Perry officially turned over the Presidency to Owen and invited everybody to attend next year's meeting of the Arizona-Nevada Academy of Science at UNLV in Las Vegas that will be sponsored by Kathy Lauckner.

Carleton 'Buck' Jones
Recording Secretary

REPORT OF THE PERMANENT SECRETARY

The regular duties of this office are providing a permanent mailing, phone, and email address for the Academy. Effective at the end of this meeting, these addresses will all change as William Perry Baker takes over this post of Permanent Secretary. The Permanent Secretary also provides reports to various governmental and academic societies, and maintains the ANAS archives. The Permanent Secretary provides copies of the Proceedings Volumes and "reprints" from the archived journals and other materials upon request. The Permanent Secretary sends awards letters to recipients, and posts the award reports in the Newsletter.

Owen Kent Davis
Permanent Secretary

REPORT OF THE FELLOWS COMMITTEE

The ANAS Fellows Committee nominates James C. deVos as a Fellow of the Arizona-Nevada Academy of Science. Jim has been actively involved in the Arizona-Nevada Academy of Science since the mid 1980s when he first served as the chair of the Conservation Section; he has also been chair of this section eight of the last ten years. Jim has served as Central Region Director as well as President of ANAS from 2000-2001.

Jim deVos has worked in natural resource conservation for over three decades and has published more than 300 popular and peer-reviewed articles. He currently is the Research Branch Chief for the Arizona Game and Fish Department.

If you know of an ANAS member of long standing, worthy of this honor, please contact us! The criteria are: "Any member who has been a regular or sustaining member of the Academy for not less than five years and who has successfully engaged in recognized scientific work or who has made significant contributions to the Academy may be nominated as a Fellow by the Fellows Committee."

Owen Kent Davis
Fellows Committee

REPORT OF THE MEMBERSHIP SECRETARY

We currently have 131 dues-paying members of ANAS, and 64 dues-exempt members. Of our dues-paying members, 21 are student members. While most of our members live in Arizona, we have members from 19 different states, and from Canada and Mexico. We have instituted a web-based membership application that automatically forwards the applicant's information to the Membership Secretary. However, please note that membership dues must still be submitted via check, as we do not currently have the membership base to support the expense of on-line payments

We currently have 43 institutional subscribers, from 17 different states and 6 different countries. Of those 43, 2 receive complimentary subscriptions, the Institute of Scientific Information of the Russian Academy of Sciences and the Zoological Record in York, United Kingdom.

Ingrid Novodvorsky
Membership Secretary

NECROLOGY REPORT

Nothing to report.

Ingrid Novodvorsky
Membership Secretary

OUTSTANDING SERVICE AWARD COMMITTEE

The 2005 recipient of the Outstanding Service Award is Dr. Elizabeth Cooper. As a member of the Academy for many years, Dr. Cooper has made numerous contributions to the organization. She served as section chair for Biology, editor of the Proceedings from 1998 to 2003 and Recording Secretary from 1998 to 2004. Although never in the spotlight, she gave considerable energy to many of the very necessary routine operations of the Academy.

In 1990, Dr. Cooper was the first recipient of the Paul Pair Endowed Chair. She was honored with the President's Council Award for Instructional Excellence in 1992 and the Distinguished Faculty Award in 1995 from the Arizona Community College Board Foundation. Her work at Glendale Community College was honored as Innovation of the Year in 1987, 1995 and 1996.

After 29 years as a member of the Biology faculty at Glendale Committee College, Dr. Cooper will be retiring this year. A creative and well-respected instructor, she has never tired in her search for new methods to improve student learning and success and her willingness to try new approaches. Her legacy is the large number of students she has inspired to love and learn biology over the course of her career.

Karen Conzelman
Outstanding Service Award Committee

BUD ELLIS SCHOLARSHIP

Rhiannon Boersma is senior at Douglas High School in Minden, NV, where she is in the top 5% of in her class of 469 students and has gained ACT scores that place her among the top 5% of students in the nation. In particular, her math and science skills are in the top 1% of students in the nation in plane geometry and in overall science aptitude. This is particularly remarkable given that she will be graduated from high school at the age of fifteen.

She has received the enthusiastic support of her instructors and employers. Rhiannon plans to attend the University of Nevada, Reno concentrating her studies in premedical courses in hopes of becoming a plastic surgeon.

Stephen Shuster
Bud Ellis Scholarship Committee

REPORT OF THE GRADUATE GRANTS-IN-AID COMMITTEE

This year's winners are Okate Bilante from Glendale Community College and Christina La Croix from Midwestern University.

Okate Bilante is the winner of the \$200 grant for an undergraduate student working on a research project. He is a student at Glendale Community College in Glendale, Arizona. His project is studying platelet-derived growth factors C and D. Specifically, he will examine the expression of these proteins in Glioblastoma Multiforme, the most aggressive form of brain cancer. He will obtain the raw materials for his study from Barrow Neurological Institute and carry out the research activities at Glendale Community College's new Biotechnology Laboratory.

Christina La Croix is the winner of the \$300 graduate student grant. She is a medical student at Midwestern University in Glendale, Arizona. Her research project is investigating the effectiveness of Osteopathic Manipulative Therapy (OMT) for the treatment of Parkinson's Disease (PD). Christina's study will investigate the effectiveness of OMT on symptoms of PD. The research will be conducted in the Osteopathic Specialty Clinic and the Barrel Research Center at Midwestern University.

Congratulations to both of you.

Aregai Tecle
Grants-in-aid Committee

TREASURER'S REPORT 2004

Operating and Short Term Reserve Fund (Vanguard Prime Money Market Fund)	
Account Value on 12/31/03	\$17,821.48
Dividend Deposits	197.53
Transferred from General Fund	0.00
Account Value on 12/31/04	\$18,019.01

Goethe Educational Endowment Fund (Vanguard Index 500 Mutual Fund)	
Account Value on 12/31/03 (167.675 shares at \$ 102.67/share)	\$17,215.19
Transferred Donations +2.442 shares Total: 170.117 shares	
Dividends + 3.111 shares Total: 173.228 shares	
Account Value on 12/31/04 (173.228 shares at \$ 111.64/share)	\$19,339.17

General Fund	
December 31, 2003 Balance	\$6,724.88
Transferred to Goethe Educational Endowment Fund	- 257.00
Deposits	+\$11,715.00
Expenses	- 5,722.42
Transferred to ASU General Fund	- 1,700.00
Transferred to Operating and Short Term Reserve Fund	-0.00
December 31, 2004 Balance	\$10,760.46

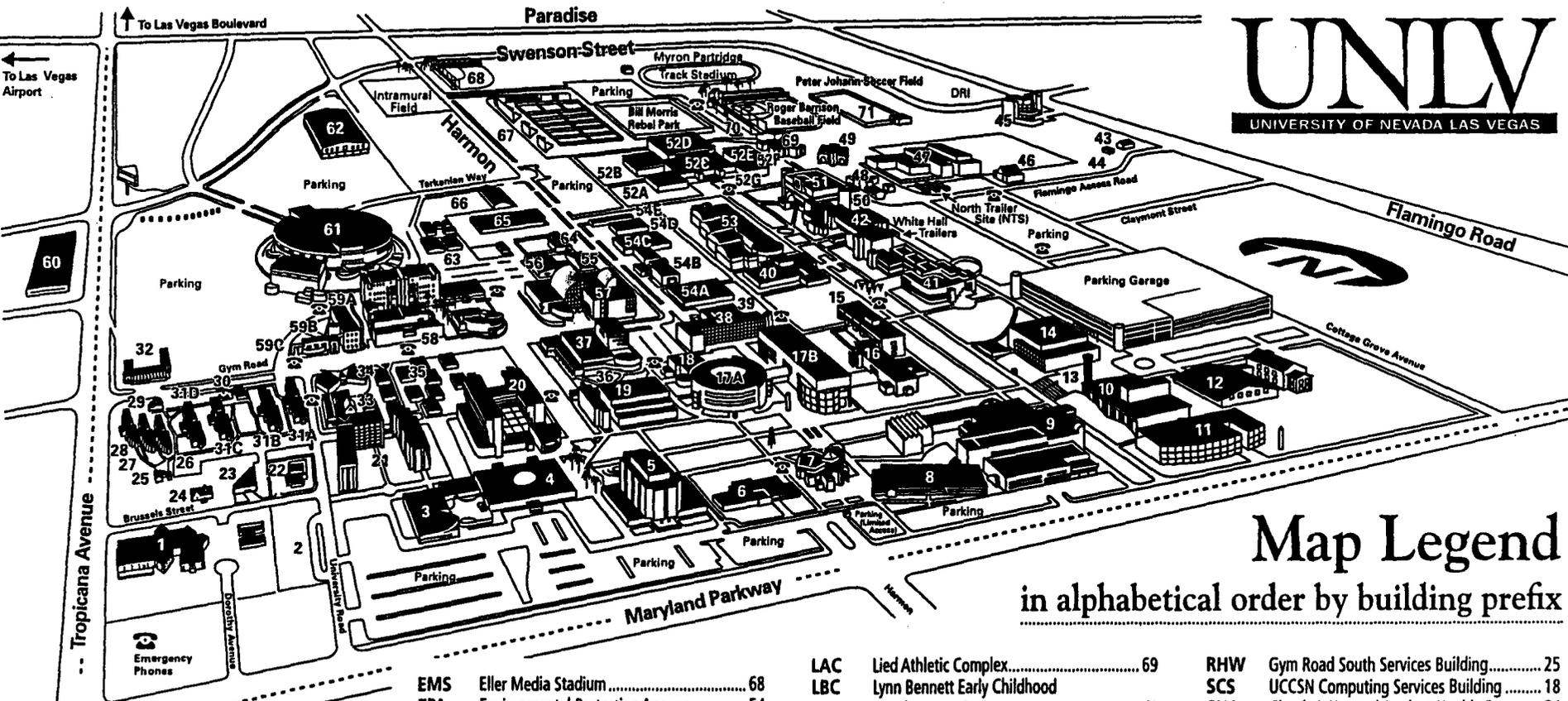
ASU General Fund	
December 31, 2003 Balance	\$1,170.26
Transfer from General Fund	+1,700.00
Expenses	- 2,534.81
December 31, 2004 Balance	\$ 335.45

<u>Market Value of Assets (as of December 31, 2004)</u>	\$ 48,454.09
--	---------------------

General Fund Details

<u>Deposits</u>		<u>Expenses</u>
\$ 4,590.00	Membership Dues	
	Journal:	
1646.00	Subscriptions	
812.00	Sale of Back Issues	
1,750.00	Reprints/Page Charges	
	Printing	\$ 2,177.36
	Typing	1,375.00
	Postage	213.64
	Newsletter:	
	Printing	0.00
	Postage	0.00
	Scholarships:	
	Scholarships	0.00
	Committee Expenses/Postage	0.00
	Grants-in-Aid, High School:	
	Grants	0.00
	Printing/Postage	0.00
	Grants-in-Aid, Graduate	0.00
	Grants-in-Aid, Undergraduate	200.00
	Annual Meeting:	
2,660.00	Registration Fees	
0.00	Sponsor donations	
	Proceedings, Printing	512.39
	Proceedings, Postage	0.00
	Coffee Breaks	1,104.75
	Friday Reception	116.77
	Saturday Luncheon	2,025.25
	Meeting Rooms	0.00
	Awards	
	Outstanding Service	50.00
	Outstanding Teacher	50.00
	Printing/Postage	0.00
	Plaques	34.59
	Best Student Papers	200.00
	Supplies	13.72
257.00	Goethe Endowment Fund Contributions	
	AZ Corporation Commission	10.00
	NAAS Dues	29.95
	Supplies	0.00
	Postage/Office	143.81
	Printing/Office	0.00
\$ 11,715.00	TOTALS	\$ 8,257.23

Karen Conzelman
Treasurer



Map Legend

in alphabetical order by building prefix

ABBREVIATION	BUILDING NAME	BUILDING NUMBER
ARC	Paul B. Sogg Architecture Building.....	1
BDC	Bennett Professional Development Center...	49
BEH	Frank and Estella Beam Hall.....	20
BGC	Boys and Girls Club.....	46
BHS	Rod Lee Bigelow Health Sciences.....	51
BKS	Bookstore.....	3
BMC	Beam Music Center.....	11
BPB	Robert L. Bigelow Physics Building.....	53
BSL	William S. Boyd School of Law.....	17
CBC	Classroom Building Complex.....	58
CEB	William D. Carson Education/HEA.....	16
CDC	Central Desert Complex.....	35
CHE	Chemistry.....	40
CSB	Campus Services Building.....	62
CWH	Claudine Williams Residence Hall.....	28
DAY	Dayton Complex Residence Hall.....	32
DIN	Hazel M. Wilson Dining Commons.....	33

EMS	Eller Media Stadium.....	68
EPA	Environmental Protection Agency.....	54
FDH	Flora Dungan Humanities.....	5
FMA	Facilities Management Administration.....	66
FND	Foundation Building.....	12
FRA	Maude Frazier Hall.....	6
FTC	Frank & Vicki Fertitta Tennis Complex.....	67
GRA	Archie C. Grant Hall.....	8
HAB	Housing Administration Building.....	29
HCH	Artemus Hall Concert Hall.....	14
HEA	Holbert H. Hendrix Education Auditorium ..	16
HFA	Alta Ham Fine Arts Building.....	9
HOU	Houssels Building.....	24
HRC	Harry Reid Center.....	37
HUH	Mitzi Hughes Residence Hall (UCC-A).....	31
HWB	Herman Westfall Building.....	65
IGI	Stan Fulton Building-International Gaming Institute.....	45
JBT	Judy Bayley Theatre.....	10
KRH	Kitty Rodman Hall.....	26

LAC	Lied Athletic Complex.....	69
LBC	Lynn Bennett Early Childhood Development Center.....	48
LFG	Lilly Fong Geoscience.....	38
LLB	Lied Library.....	57
LRC	Limnological Research Center (Rebel Recycling).....	44
MFH	Margie & Robert Fairman Hall (UCC-D).....	31
MPE	Paul McDermott Physical Education Center.....	52
MSB	Robert Miller Soccer Building.....	71
MSM	Marjorie Barrick Museum of Natural History.....	37
MSU	Donald C. Moyer Student Union.....	4
PAR	Paradise Campus.....	60
PES	Paradise Elementary School.....	47
PRO	Reprographics/Copy Center.....	56
PSB	Claude I. Howard Public Safety.....	64
RAB	Research Administration Building.....	63
RHB	Residence Hall, Building B (UCC-B).....	31
RHC	Residence Hall, Building C (UCC-C).....	31

RHW	Gym Road South Services Building.....	25
SCS	UCCSN Computing Services Building.....	18
SHS	Claude I. Howard Student Health Center....	34
SIR	Sports Injury Research Center.....	52G
SSC	Student Services Complex.....	59
SWC	Sidewalk Café.....	15
TAC	Richard Tam Alumni Center.....	7
TAY	William Taylor Hall.....	43
TBE	Thomas Beam Engineering Complex.....	41
TEC	Technology Building/Radiation Protection Laboratory (RPL).....	39
TMC	Thomas & Mack Center/Cox Pavilion.....	61
TON	Tonopah Residence Complex.....	21
UCC	Upper Class Complex.....	31
UNH	University Hall.....	55
WBH	William S. Boyd Residence Hall.....	27
WBS	Earl E. Wilson Baseball Stadium.....	70
WHI	Juanita Greer White Hall.....	42
WRI	John S. Wright Hall.....	19
WRL	Eugene Warner Residential Life.....	30