

**2001
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Abstracts**

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2001
RESEARCH HONORS
PROGRAM ABSTRACTS



The College of Agriculture and Life Sciences at Cornell University is considered by many to be the best of its kind in the nation, if not the world. One reason for this reputation is that we attract the best and brightest students. CALS students are driven, resourceful, and well rounded.

Students in CALS are offered many opportunities to explore their interests in an environment that both stimulates and inspires them to excel in their chosen fields. These students have taken advantage of our wealth of academic resources and research facilities to conduct original research, from probing unanswered questions in the life sciences to exploring critical issues in the social sciences.

I am proud of our students and their achievements. They are the leaders and problem-solvers of tomorrow. I would also like to thank our dedicated faculty who supervised these research projects for nurturing and guiding our students to their fullest potential.

Susan A. Henry, Ph.D.

The Ronald P. Lynch Dean of Agriculture and Life Sciences



Secondary Metabolites and Pest Resistance in a Tropical Forage Legume

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Under the supervision of Alice N. Pell
Department of Animal Science

Freeze-dried leaf samples from 13 provenances of *Gliricidia sepium* that have varying susceptibilities to the phytoplasma disease gliricidia little leaf were analyzed to determine the content of secondary compounds and whether these compounds inhibited microbial growth. A Prussian blue assay for total phenolics demonstrated that, although all samples contained low levels of phenolics, the leaves of trees with minor to severe damage had higher amounts than those of asymptomatic and tolerant trees. All gliricidia samples contained only trace amounts of condensed tannins. Ethanol (95 percent) extracts of the leaves from all but the asymptomatic trees inhibited *Staphylococcus aureus* when the extracts were present at the concentrations found in the plant. When 50 percent dilutions were used from trees that had suffered minor damage, trees that were tolerant, and forage bank trees, bacterial inhibition was evident. No correlation was observed between secondary compound content or microbial inhibition and susceptibility to gliricidia little leaf disease, indicating that gliricidia may have alternative mechanisms of defense to herbivory and disease.



Digestibility of Diets for Sheep with High Levels of Dietary Fiber from Oat Hulls or Soy Hulls

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Determining the digestibility of a feed is an essential aspect of evaluating the nutritive value of a diet. Digestibility is traditionally calculated using the total collection method (TCM), but this process is time-consuming and unfeasible for the typical farm setting. Other methods include the use of both internal and external markers; internal markers have proven superior because they are not added to the diet and thus will be more likely to be distributed evenly. Van Keulen and Young (1977) used the acid insoluble ash (AIA) method, which measures the internal silica found in the feed and feces, to predict digestibility correctly.

One percent silica was added to each of the diets because a previous study by Thonney et al. (1985) demonstrated that such an addition makes the estimation of digestibility more precise. The first goal of this study was to show that the acid detergent insoluble ash (ADIA) method could be used to predict the digestibility of two feeds with different fiber sources as compared to TCM. In addition, the effect of fiber source of each feed on daily intake was examined. Both diets were constructed so that they contained approximately 19 percent indigestible neutral detergent fiber (INDF). It had previously been believed that diets with higher than 15 percent INDF would lead to a decrease in feed intake. Later studies by Thonney and Hogue (1997), however, found that intake increased linearly with higher [INDF] in soy hulls but decreased for lambs fed the oat hull diet containing INDF more than 15 percent. Therefore, [INDF] may be a less important factor in affecting intake than how the fiber is fermented in the rumen. This experiment aimed to demonstrate that two diets of identical [INDF] can have much different values of intake because of their different sources of dietary fiber, thus disproving [INDF] as an accurate predictor of feed intake.



Effect of Dietary Protein Level on Fiber Digestion in Holstein Heifers

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Four rumen-cannulated Holstein heifers with an initial weight of 205 kg were used in a Youden square design with five periods and five experimental diets to investigate the effect of different levels of dietary protein on fiber digestion. Heifers were fed individually at 95 percent *ad libitum* intake (83 g DM/kg BW^{0.75}) every two hours using automatic feeders, and water was available at all times. Diets consisted of 30 percent brome hay and 70 percent pelleted diet. Diets 1 to 5 contained 8.9, 12.0, 15.7, 18.6, and 21.5 percent crude protein (CP) and 34.0, 32.8, 32.5, 31.2, and 30.4 percent neutral detergent fiber (NDF), respectively.

Diets were formulated with the Cornell net carbohydrate and protein system (CNCPS). Diet 3, which served as the control, was formulated to be adequate in crude protein, relative to the carbohydrate available to the rumen. Diets 4 and 5 contained excess amounts of CP, and therefore NDF digestibilities were not affected. Concentration of ammonia in the rumen was 0.1 mg/dl in heifers fed diet 1, and NDF digestibility was 40.3 percent, a decrease of 22 percent ($P < 0.05$) compared to remaining diets. Rumen ammonia was 2.2 mg/dl in heifers fed diet 2 and was calculated by the CNCPS to be deficient in rumen nitrogen; NDF digestibility, however, was not significantly different compared to diets 3 through 5. Ammonia levels for diets 3 through 5 were 8.4, 14.2, and 26.8 mg/dl, respectively. Total tract NDF digestibility was approximately 52 percent for heifers fed diets 2 through 5 and was not different among diets. In vitro NDF digestibilities were measured and were similar ($P > 0.05$) among all diets, averaging 64 percent.

Digestibility of NDF was reduced in diet 1 and was associated with low concentrations of ammonia in the rumen. However, this depression was attained at extremely low ammonia levels that are not common in most feeding practices.



Anisomycin and Daunorubicin Cause Apoptosis of Bovine Ovarian Surface Epithelial Cells Via the Fas Pathway

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Fas antigen (Fas) is a cell surface receptor that, when bound to its natural ligand (FasL), induces activation of a caspase cascade that ultimately causes apoptosis. It has been proposed that change in function or structure of Fas may result in ovarian cancer. Ninety percent of ovarian cancer cases arise from ovarian surface epithelial cells (OSE). The expression of Fas and FasL was examined, and the Fas pathway in OSE treated with the anti-tumor agents daunorubicin (DNR) and anisomycin (ANI) was studied. Treatment of OSE with FasL, ANI, and DNR resulted in a large amount of cell deaths (36 ± 6%, 62 ± 6%, and 26 ± 4%, respectively). Treatment of OSE with FasL, ANI, and DNR in the presence of ZVAD, a caspase inhibitor, decreased deaths to 0 ± 4%, 30 ± 11%, and 6 ± 3%, respectively ($p < 0.05$). OSE treated with Fas:Fc, which blocks Fas/FasL interaction, reduced death of ANI-treated cells from 52 ± 6% to 32 ± 2% and that of DNR-treated cells from 28 ± 2% to 1 ± 6% ($p < 0.05$). Fas and FasL mRNA levels were measured using competitive RT-PCR assays. Expression of Fas mRNA did not significantly increase in cells treated with ANI or DNR ($p > 0.05$). Expression of FasL mRNA increased by 3.11-fold and 2.45-fold in ANI- and DNR-treated cells, respectively ($p < 0.05$). Cytochemistry showed increased expression of FasL protein expression but no increased expression of Fas. These data show that bovine OSE are susceptible to Fas-mediated killing, and DNR and ANI induce apoptosis at least in part by the Fas-mediated pathway. OSE also increase expression of FasL mRNA and protein to potentially induce their own apoptosis in situations of stress, such as in response to treatment with antitumor agents.



Atrial Natriuretic Peptide and Its Effects on the Maturation and Fertilization of the Bovine Oocyte

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The goal of many *in vitro* maturation and fertilization systems is to produce the highest possible proportion of viable embryos from oocytes harvested at immature stages from ovarian follicles. Previous reports have found that atrial natriuretic peptide (ANP) may stimulate oocytes cultured *in vitro* to proceed through maturation to meiosis II by removing the cAMP block that likely contributes to the prolonged arrest to meiotic maturation. The current maturation experiments were designed to determine the possible effect of ANP on a typical *in vitro* maturation system. Oocytes were cultured in four media: (1) a control, (2) in the absence of FSH, (3) in the control plus 10nM ANP, and (4) in the absence of FSH but with 10nM ANP added. Oocytes treated with ANP clearly had increased maturation rates when compared to oocytes treated without FSH. This indicates that ANP may indeed play a role in the resumption and completion of meiosis. The *in vitro* fertilization experiments were also designed with the idea that ANP may cause more oocytes to be fertilized *in vitro* and undergo cleavage. In the latter experiment, four treatments were applied: matured with and without ANP and then fertilized in the presence and absence of ANP. When overall outcome was assessed, the greatest proportion of oocytes ($P=.002$) that underwent cleavage as well as exhibiting the most four-cell embryos at 43 hours after sperm addition were those that were both matured and fertilized in the presence of ANP.

The greater number of four-cell embryos following the combined treatment indicates that exposure to ANP throughout produces oocytes that are more likely to be developmentally competent.



Investigation of the DQB Gene in the Horse (*Equus caballus*) with Characterization of Different Alleles

CHRISTINE SAVIDGE

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Molecules in class II of the major histocompatibility complex (MHC) bind to intracellularly processed fragments of exogenous antigens and are expressed as complexes on the surface of antigen-presenting cells (APCs). Engagement of T cell receptors of antigen-specific T lymphocytes with MHC class II molecules bearing the appropriate peptides is the first step in T cell activation. The DQB gene encodes for the β chain of the MHC class II molecule and is highly polymorphic, especially in the hypervariable region of exon 2. PCR primers were designed to amplify this hypervariable region so as to characterize the different alleles present in the experimental horse herd of the James A. Baker Institute for Animal Health. The new alleles sequenced were compared to previously published allele sequences; no perfect matches were found, suggesting that novel alleles have been discovered. Two different DNA fragments of DQB exon 2 were amplified from genomic DNA of horses expected to be homozygous for the entire MHC complex. This observation suggests that the assignment of homozygosity to the horses is either incorrect or that two DQB genes exist, as is the case in other domestic animals. Two distinct DQB sequences were detected in both genomic DNA and cDNA samples of horses expected to be homozygous for the D₂ and D₃ MHC haplotypes. The existence of these two sequences suggests the expression of two DQB genes. Horin et al. (2000) also suggested the existence of at least two MHC class II DQB genes. Their finding led to an investigation of the expression of the DQB gene.

Introns 1 and 2 were subcloned to identify allelic variations. Sequences were obtained from both ends of the two exons, but full-length sequences were not obtained.



Uptake of *Escherichia coli* O157:H7 from Cattle Manure by House Flies, *Musca domestica*

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Under the supervision of Donald A. Rutz and Phillip E. Kaufman, Department of Entomology, and James B. Russell, Department of Microbiology

It has been reported that both house flies, *Musca domestica* L., and fruit flies, *Drosophila melanogaster* Meigen, can disseminate enterohemorrhagic *Escherichia coli* O157:H7 (EHEC). Recent studies on the role of house flies in transmission of EHEC used bacteria levels far greater than those reported on contaminated farms. In the current experiments, house flies were exposed to bovine manure inoculated with serial dilutions of EHEC. House flies exposed for 24 hours to levels of EHEC greater than 10^2 colony-forming units (CFU)/g were surface contaminated with the bacterium. A total bacterial count of 5×10^3 CFU per fly crop was detected in flies that had fed on manure containing 10^8 CFU/g. EHEC was not detected in crops of flies exposed to manure without the addition of EHEC, and level of EHEC did not affect the number of feedings per fly. Differences in the number of CFU recovered from crops of male and female flies were not observed. The number of CFU recovered was higher at each increasing EHEC inoculum level.



Mapping the Macronuclear Chromosomes in *Tetrahymena thermophila*

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Several chromosome breakage sequences (CBS); non-chromosome breakage sequences (nCBS) containing a degenerate, nonfunctional CBS sequence; and genes specific to the macronuclear chromosomes of the ciliated protozoan *Tetrahymena thermophila* were mapped. Mapping was accomplished by separating the *Tetrahymena* macronuclear chromosomes by contour clamped homogeneous electric field (CHEF) gel electrophoresis and subsequent Southern blotting analyses. CBS-containing clones generally hybridized to two macronuclear chromosome bands as expected for a chromosome breakage site, and nCBS clones hybridized to only one macronuclear chromosome band. Unique genes also hybridized to a specific macronuclear chromosome band. Several CBS clones hybridized to the 50 kb CHEF gel band, indicating the presence of macronuclear chromosomes in a size range previously believed to consist solely of the *Tetrahymena* mitochondrial DNA.



Evolution of Gene Expression in Wild Soybean Allopolyploids

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The regulation of gene expression and dosage was studied in recently evolved polyploid species of *Glycine* subgenus *Glycine* (relatives of soybean) and their diploid progenitors. The presence and level of expression of transcripts of the nuclear-encoded, organelle-expressed gene glutamine synthetase (*ncpGS*) was examined. Reverse transcription polymerase chain reaction (RT-PCR) of total RNA extracts from the polyploids and parental diploids was performed to determine which parental genes are expressed in the polyploids. Northern hybridizations of total RNA were also performed to determine the dosage of *ncpGS* in the parental diploids and the polyploids. Silencing of one paralogue of *ncpGS* was not observed. Both polyploid species exhibited dosage effect of *ncpGS*, indicating that dosage level for this gene is conserved between *Glycine* polyploids and diploids.

Further research was conducted to determine the efficacy of genomics approaches to studying gene silencing in polyploids. Soybean genomics resources in the form of soybean cDNA dot blots were used to study silencing in *Glycine* subgenus *Glycine*. The blots were probed with methylated (i.e., putatively silenced) fractions of DNA to identify genes that exhibited differential silencing between polyploids and diploids. Twenty-nine genes that exhibited methylation only in the polyploids were identified and provide avenues of future research. The ability to identify differentially silenced genes in polyploids demonstrates the effectiveness of this new genomics approach.



Analysis of the Role of *par-1* in Early *Caenorhabditis elegans* Embryos: Determination of Temperature-Sensitive Period and Role of *par-1* and *par-3* in MEX-5 Expression

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Asymmetry plays an important role during early embryogenesis in *Caenorhabditis elegans*. The *par* genes are some of the main components of this process. To understand how one of the *par* genes, *par-1*, functions, experiments were carried out using *zu310*, a temperature-sensitive allele of *par-1*, and the effect of *par-1* mutations on the distribution of the downstream polarity protein, MEX-5, was examined. The effect of temperature on the viability and fertility of *zu310* homozygotes was determined. At 16° C, there is 98 percent viability and very little sterility; at 25° C, there is 0 percent viability. Next, temperature shift experiments using the same allele indicated that the temperature-sensitive period of *zu310*ts begins during oogenesis and ends near the two-cell stage.

PAR-1 and PAR-3 act together in establishing the asymmetry of the downstream component, MEX-5 (Schubert et al. 2000). In an effort to understand how PAR-1 and PAR-3 interact to regulate MEX-5, methods were developed for comparing MEX-5 concentrations in N2, *par-1*, and *par-3* one-celled embryos. Preliminary results rule out one model for this interaction, but more data are required for this to be conclusive.



P-element Mutagenesis of a G-Protein β Subunit in *Drosophila melanogaster*

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Heterotrimeric G proteins contain an α subunit and a dimer composed of a β and γ subunit. When a G protein coupled receptor is activated, the α and $\beta\gamma$ subunits dissociate and go on to activate downstream effectors. A putative $G\beta$ subunit encoding gene ($G\beta 65D$) containing characteristic WD-40 repeats is located on the left arm of chromosome 3 in *Drosophila melanogaster*. P-element-induced male recombination was used to mutate $G\beta 65D$ in order to study its function, and 12 putative deletions obtained from male recombination were analyzed using PCR amplification and gel electrophoresis. None of the seven putative deletion strains tested so far appears to contain a deletion large enough to be detected by the PCR primers being used, although five of the seven appear to have lost the P-element.



The Genetics of Reproductive Isolation Between Two Strains of European Corn Borer

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Gene trees for closely related species often disagree, depending on whether the locus chosen is involved in reproductive isolation. Shared ancient polymorphism and incomplete reproductive isolation (gene flow) may be responsible for this incongruence. Gene exchange will be prevented in genome regions surrounding loci for which differences result in hybrid unfitness or assortative mating. Thus the variability found at such loci may reflect more accurately genetic differentiation between strains or closely related species. Genetic differentiation of two pheromone strains (Z and E) of European corn borer (*Ostrinia nubilalis*) was examined. DNA polymorphism was analyzed for an enzyme coding locus, Tpi, that may be linked to a gene involved in pheromone recognition of this species. The genealogy obtained disagrees with those obtained using mtDNA and one other nuclear locus. The Tpi genealogy suggests that the two corn borer pheromone strains are distinct entities.



The Effect of Prenatal Glucocorticoid Exposure at Approximately 0.7 Gestation on Hepatic Phosphoenolpyruvate Carboxykinase (PEPCK) in the Fetal Baboon, Fetal Sheep, and Newborn Sheep

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Glucocorticoids (GC) are administered to pregnant women in preterm labor to accelerate fetal lung maturation and decrease infant mortality. No studies have been performed to discern the effects of this treatment on fetal and newborn carbohydrate metabolism, specifically hepatic enzyme activity. Phosphoenolpyruvate carboxykinase (PEPCK) is the rate-limiting enzyme in gluconeogenesis, and its transcription is increased in the presence of GC.

A single 48-hour course of betamethasone (BM) was administered to the pregnant baboon (2 doses of 170 $\mu\text{g}/\text{kg}$ intramuscularly [IM] at 24-hour intervals; $N = 7$) or vehicle IM ($N = 7$) at 0.73 gestation, and a caesarian section (C-section) was performed 12 hours after the last dose. This dose was chosen to equal that given to pregnant women on a weight-specific basis. Nine ewes received three courses of dexamethasone (DM), four doses of 2 mg IM every 12 hours at weekly intervals beginning at 0.71 gestation (103, 110, and 117 days gestation). Control ewes ($N = 10$) received the vehicle IM. Four ewes from each treatment group were allowed to lamb, and the twin newborns (24 ± 6 h) were euthanized. The remaining ewes in each group that were carrying both singles and twins underwent a C-section at 119 days gestation. At C-section the fetus was euthanized by exsanguination under halothane; liver from periportal (caudal region of the right lobe, surrounding portal vein) and perivenous regions (cranial region of the left lobe, surrounding hepatic vein) was removed, flash frozen, and stored at -80°C until PEPCK activity was analyzed using a spectrophotometric method, which

was specifically validated for both species. Protein content was determined by the Bradford method.

The total days of gestation for the DM-treated sheep were significantly higher ($p < 0.05$) than for the controls. The ratio of liver weight to body weight in fetal sheep whose mothers received prenatal synthetic GC was significantly reduced ($p < 0.05$) compared to controls in the fetal sheep but significantly increased ($p < 0.001$) in the GC-treated fetal baboons compared to controls. PEPCK activities in the BM-treated baboons were significantly higher than controls only in the periportal region ($p < 0.05$), whereas PEPCK activities in the DM-treated sheep were significantly higher in both periportal and perivenous regions ($p < 0.001$) versus controls. The newborn DM-treated sheep showed no difference in PEPCK activity or liver weight to body weight ratio compared to controls. PEPCK activity increased significantly when comparing the control fetus to control newborn ($p < 0.001$). No such increase was seen when comparing the DM-treated groups.

Prenatal GC administration affects liver growth in a species-specific, BM- or DM-specific, and/or dose-specific manner. Exposure to GC at about 0.7 gestation increases PEPCK activity in both fetal sheep and fetal baboons following exposure to GC and is shown to be specific to the periportal region in the baboon following a single course of GC treatment. This treatment also affects the maturation of fetal gluconeogenesis through birth. Further research is needed to determine the mechanism for this effect and how this may contribute to non-insulin-dependent diabetes mellitus later in life.



Patterns and Processes of Population Differentiation in the Montane Rock Rattlesnake, *Crotalus lepidus*

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Mitochondrial DNA sequences from the ND4 gene and adjacent tRNAs were used to investigate the historical biogeography of the rock rattlesnake, *Crotalus lepidus*, with particular attention given to populations of *C. l. klauberi* that inhabit an archipelago of sky islands in southeastern Arizona and southwestern New Mexico. The phylogeny suggests that the mountain populations of *C. l. klauberi* form a monophyletic group. The topology rejects the hypothesis that habitat connectivity can fully explain divergences among isolated mountain ranges; rather, a nested clade analysis of sky island haplotypes suggests an initial allopatric fragmentation between eastern and western mountain ranges, perhaps as a result of climatic shifts and shrinking mesic habitats, followed by range expansion and possible long-distance colonization.



Effects of Repeated Prenatal Dexamethasone Exposure on *Peroneus longus* Development in Fetal Sheep

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The catabolic effects of glucocorticoids on adult skeletal muscle have been well characterized. Less is known about the effects of these drugs on fetal development and the potential long-term effects of prenatal corticosteroid treatment for respiratory distress syndrome. The effects of prenatal dexamethasone (DM) treatment on the development of the *m. peroneus longus* (PL) in sheep were examined. Treatments were administered fairly late in gestation, after completion of myogenesis. Unlike adult muscle, the fetal muscle was not observed to atrophy in the presence of DM, nor were any other changes characteristic of treated adult muscle seen. No difference in body mass or PL wet muscle mass was measured between control and DM lambs. In addition, all muscle fibers retained similar size characteristics (area and minimum diameter) in both groups. Type I and Type IIa fibers also appeared in the same proportions in control and DM-exposed PL. However, the percentage of Type IIb fibers was significantly reduced in the DM animals (mean \pm SD $59.05 \pm 4.8\%$) versus control PL samples ($65.77 \pm 5.5\%$) ($p < 0.05$). These findings may be attributed to the prenatal exposure of experimental PL samples to DM. DM exposure seems to have resulted in retardation of differentiation of secondary myotubes into adult fast-twitch (Type II) fibers.



Activation of the Immediate Early Gene ZENK in Female Songbirds During Perception of Song: Effects of Social Rearing Condition and Species-Specific Song Complexity

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Female songbirds can distinguish between the songs of conspecifics and choose a mate based on song quality. Despite the importance of this behavior little is known about how female song preference develops and how the neural pathway responsible for song perception in the female songbird is organized. Both developmental aspects and interspecies differences in the song-induced activation of the immediate early gene ZENK within two brain areas involved in song perception—caudo-medial neostriatum (NCM) and high vocal center HVC shelf—were studied. First, zebra finches raised isolated from song were compared to those raised socially to test whether experience modifies the brain's responses to song. Second, female African marsh warblers, whose males typically have a large song repertoire, and female cape reed warblers, whose males typically have a small song repertoire, were compared to test whether differences in response to song in females have evolved with differences in capacity for song learning in males. Within NCM the isolated female birds show more ZENK expression than the social birds, and African marsh warbler females show greater ZENK production than the cape reed warbler females. No differences were seen in ZENK immunoreactivity in HVC shelf. These results show that experience with song can modulate ZENK production in some parts of the perceptual pathway of female songbirds and highlight a possible functional difference between NCM and HVC shelf.



Arctic Lichens Reveal Influences of Nitrogen and Phosphorus on Nitrogen Fixation

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Although global change is increasing the amounts of nitrogen (N) and phosphorus (P) that are available to ecosystems, little is known about how the additions of these nutrients will influence important ecosystem processes such as N fixation.

Rates of N fixation were surveyed using an acetylene reduction assay among four arctic lichens and two mosses from moist acidic tundra at Toolik Lake, Alaska. Abundances of N-fixing lichens were measured at the acidic tundra site and at a moist nonacidic tundra site at unfertilized (control), N-fertilized, and fertilized plots at both sites to determine whether N fixation varied across different habitats and nutrient inputs.

The focus was on two species with the highest rates of N fixation from the acidic tundra site, the lichens *Peltigera aphosa* and *Peltigera polydactyla*, to measure N fixation at control, N, and P treatments at both acidic and nonacidic tundra sites.

Peltigera aphosa is significantly more abundant in N-fertilized plots and nonacidic tundra than at acidic tundra, but there are no significant differences in N fixation rates between the sites. Among the treatments at both sites, N-fixing lichens are significantly less abundant in N-treated than in control plots. The estimated total N fixed in the four lichens, assuming optimal conditions of light and moisture, is 0.48 kg/ha/yr.

These measurements indicate that nitrogen inhibits N fixation while phosphorus stimulates the reaction, and lichens are major contributors to ecosystem N fixation and to the pool of available N at Toolik Lake.



Dynamic Modeling to Determine the Effect of Costs of Resistance on Efficacy of the High Dose-Refuge Resistance Management Strategy

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Transgenic insecticidal cultivars (TICs) are a relatively recent insect pest management option. One strategy to manage resistance to TICs is the high dose-refuge approach in which the toxin is expressed at a level high enough that only homozygous-resistant individuals are able to complete development within the TIC field. A nearby refuge of nontransgenic plants produces a large number of “susceptibles” that mate with any resistant individuals, ensuring that all offspring are hetero-zygotes. One of the assumptions of this control strategy is that no developmental asynchrony exists between resistant individuals in the TIC field and susceptible individuals in the refuge. A computer model was developed that assesses the effects of developmental asynchrony and duration of each life stage by different genotypes to determine the probability of a homozygous-resistant individual mating with a homozygous-susceptible individual, which is used as a measure of resistance management efficacy over time. By running the model the significance of costs of resistance can be evaluated at different refuge sizes and frequencies of resistant alleles.



Cladistics and Biogeography of the Snout Butterflies of the World (Lepidoptera: Nymphalidae: Libytheinae)

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The snout butterflies (Lepidoptera: Nymphalidae: Libytheinae) are a unique group of butterflies that are often characterized by their elongated labial palpi (DeVries 1987, Holland 1931, Howe 1975, Scott 1986, Shirozu et al. 1961). The 12 species in the subfamily are distributed worldwide (Okano 1987, Shields 1984, 1985). The subfamily has previously been divided into two genera, *Libythea* and *Libytheana*, based on structures on the male genitalia (Michener 1943), but neither the phylogeny within the Libytheinae nor the relationship of the Libytheinae to their sister taxon has been adequately resolved (Ackery 1984). A phylogeny of the Libytheinae using comparative morphology is presented. The morphology of these butterflies was investigated and a data matrix of the Libytheinae constructed using the software WinClada (Nixon 2000). The matrix was then analyzed using NONA (Goloboff 1993). The most parsimonious cladogram clearly explains the distributions of these butterflies and determines the sequence of historical vicariance events.



Macroinvertebrate Population Structures in Response to Freezing in Alpine Lakes of the White Mountains

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Three alpine lakes in the White Mountains of New Hampshire—Star Lake, Upper Lakes of the Clouds, and Lower Lakes of the Clouds—are unique habitats that contain macroinvertebrate populations adapted to the area's severe seasonal conditions. The three lakes are located between 4,800 and 5,600 feet above sea level. Approximately 15 species of aquatic macroinvertebrates have been recorded from the three lakes. Recent macroinvertebrate population surveys have revealed additional species, and more samples are currently being identified.

Previous and current research on the lakes has shown the physical structure and freeze patterns to be unique in each, thus creating different macroinvertebrate habitats. During the winter, two of the three lakes freeze solid, whereas the third (Lower LCs) retains an unfrozen section. Slight differences in water chemistry and vegetation contribute to the variable macroinvertebrate populations observed by previous researchers. In many cases, the macroinvertebrates may be affected by secondary factors that limit their survival in the lakes, but this will remain unknown until further investigation. Insects that persist have made special adaptations to their life histories, enabling them to survive in solid freezing lakes by physiological, behavioral, and morphological mechanisms. Variable population structures across the three lakes and macroinvertebrate survival tactics in response to freezing were the focus of the second year of investigation. The lakes were sampled four times—summer, fall (before ice over), winter, and spring (after ice-off)—to show their population structure throughout the year. To determine how macroinvertebrates survive over the winter months, sampling before, during, and after icing was done to show which species remain in the lakes and which escape lake freezing by other mechanisms.

The lake was visited four times over one year. “Onset” data recorders were placed into the lakes to measure and record the temperature over the study period. Population structures of the lakes were established by sampling the macroinvertebrate populations in locals throughout each lake on each trip. The macroinvertebrate distribution and seasonal movement were investigated by selecting sampling sites in locations containing possible sites of refuge at each of the four sampling times.



Cercopagis pengoi as a Food Resource for Alewife (*Alosa pseudoharengus*) and Rainbow Smelt (*Osmerus mordax*) in Lake Ontario

TARA M. BUSHNOE

Under the supervision of Lars G. Rudstam
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Cercopagis pengoi (*Cercopagis*) is a non-native predatory cladoceran that was first found in Lake Ontario in 1998 and has since spread to Lake Michigan and several of the Finger Lakes in New York State. The introduction of this predatory zooplankton has the potential to alter the food base for planktivorous fish, which could affect their population dynamics. *Cercopagis pengoi* was present in the stomachs of both alewife (*Alosa pseudoharengus*) and rainbow smelt (*Osmerus mordax*) collected from Lake Ontario in 1998 and 1999 but not in 1997, indicating a very fast increase in *Cercopagis* between 1997 and 1998. Alewives were found to feed on *Cercopagis* across Lake Ontario in 1998. *Cercopagis* was found in 61.9 percent of the alewife stomachs that contained food items but in only 6.3 percent of the rainbow smelt stomachs, likely owing to differences in vertical distribution of the two fish species. Alewives smaller than 65 mm did not consume *Cercopagis*, suggesting that their long tail spines offer protection from young-of-year (YOY) alewife predation. This may explain the dramatic increase in *Cercopagis* in 1998 even though this year had the largest YOY alewife year class on record since 1977. The proportion of fish feeding on *Cercopagis* in Lake Ontario did not increase with increased *Cercopagis* density and did not vary significantly from north to south or east to west.



Environmental Planning in Three Counties Around the George Washington Memorial Parkway

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Department of City and Regional Planning

The development of the George Washington Memorial Parkway (GWMP) and the federal management of adjoining parklands have influenced environmental planning in three counties (Arlington and Fairfax, Virginia, and Montgomery, Maryland) that border significant sections of the parkway. The GWMP is an interesting and early example of regional planning with an environmental focus. Plans for the parkway first emerged in the late 1920s from the drawing boards of the National Capital Park and Planning Commission (NCPC). Thus the parkway is also nationally significant because it is associated with a long and continuous planning effort for the Washington, D.C., area. From 1932, when the first stretch of parkway was built in Arlington County, Virginia, to 1965, when the westernmost Maryland section was built, the GWMP gradually brought people into contact with nature by linking together various parcels of remaining wetlands, forest lands, and cultural sites along the same road. County land use plans over time, national archives, and library data were analyzed to identify what, if any, environmental issues were given higher priority in the planning process in areas located closer to the GWMP.

In particular, to judge the impact of the road on planning, provisions for stream-side protection in each county's comprehensive plans were compared to determine whether they are protective enough of natural resources. Finally, a matrix of each county's GWMP experience along specific stream reaches was created, highlighting natural areas that continue to be the focus of conservation and open space planning efforts today.



Spatial Distribution and Connectivity of Salamander Habitats: Implications for Conservation of Pond-Breeding Amphibians

EVAN H. C. GRANT

Under the supervision of Barbara L. Bedford, Department of Natural Resources, Stephen D. DeGloria, Department of Crop and Soil Sciences, and Kelly Zamudio, Department of Ecology and Evolutionary Biology

What is the effect of fragmentation of the forests in Tompkins County, New York, on the population dynamics of *Ambystoma maculatum*? The conversion of land from forest to agriculture and ultimately the abandonment of this land to forest regrowth has resulted in a patchy habitat of forest cover. The spotted salamander, a common inhabitant of forests in this geographical region, relies on both upland forest habitat for its adult life stage and temporary wetlands (vernal pools) for breeding and larval development. Aerial photos, National Wetlands Inventory maps, community mailings, and word-of-mouth information were used to search Tompkins County for vernal pools. Data collected were combined in a geographic information system (GIS) along with a land use map to analyze the fragmentation of the landscape and apply known and estimated movements of amphibians to predict the suitability of the landscape for salamander dispersal. The county was divided into two functionally distinct landscapes along a topographic discontinuity. The northern landscape had a greater number of smaller patches and greater distances between patches, which does not facilitate dispersal between populations. The southern landscape had a larger amount of forest habitat in addition to smaller distances between forest patches, which can allow for distribution of physiologically constrained taxa such as amphibians. These results show that the fragmentation of the landscape, given the limited dispersal ability and specific habitat requirements of amphibians, can have profound effects on populations of these animals. Amphibian conservation efforts must focus on a landscape that supports these organisms, both their survival and their ability to exchange genetic information between population patches in a metapopulation.



The Influence of Non-Native Earthworms on Mycorrhizal Colonization of Sugar Maple

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Under the supervision of Timothy J. Fahey and Melany C. Fisk
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How do non-native earthworms affect mycorrhizal colonization rates of sugar maple (*Acer saccharum*) roots in a northeastern temperate forest system? It is well established that exotic earthworms eliminate material from the forest floor, changing the distribution, physiology, and demography of fine roots; currently, however, no data have been published on how the worms affect the distribution and abundance of mycorrhizal fungi. During the 2000 growing season live sugar maple roots were extracted from soil cores taken from the Arnot Teaching and Research Forest located in Cayuta, New York, where invaded and control areas occur, and the roots were analyzed for mycorrhizal associations. The forest floor in control areas had higher colonization rates than did surface layers in areas with active earthworm populations. The contribution of vesicles to mycorrhizal colonization in earthworm plots was greater, indicating a possible stress response. Invasion of new forest habitat by non-native earthworms might be an important component of change in ecosystem processes in many northeastern forests, and knowing how they affect nutrient uptake capacity of dominant forest species is essential to understanding forest dynamics.



Gender Differences in Hunter Satisfactions and Dissatisfactions in New York State

DIANE M. MARKOW

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Previous studies have shown that women are less likely to participate in hunting than men. Because women consider hunting a family activity and are generally more concerned about animal welfare than men, the satisfaction and dissatisfaction women receive from hunting may differ from those of men. Data collected by Enck and Decker (1991), which consisted of a mail survey of licensed deer hunters in New York State in 1989, were analyzed to (1) identify the primary satisfaction and dissatisfaction women derive from deer hunting, (2) determine whether and how these satisfaction and dissatisfaction differ from those of men, and (3) explore how these satisfaction and dissatisfaction are related to women's participation in hunting. Women place more importance than men on various aspects of hunting related to the welfare of prey animals, hunting with family members, and safe hunting practices. These differences were consistent with the findings of previous studies. No gender differences were found in the importance men and women placed on the aspects of hunting involving concern for the environment, although existing literature suggested that such a gender difference might exist. This research provides insight into the desires of women hunters, which can aid wildlife managers and recreation personnel in meeting or enhancing women's hunting experiences.



The Effect of Calcium (Ca) and Phosphorus (P) on Nodulation of the Leguminous Tree, *Inga edulis*, in Amazonian Agroecosystems

JESSICA MILGROOM

Under the supervision of Erick Fernandes
Department of Crop and Soil Sciences

As the Amazonian primary forest is rapidly being converted to farmland and pasture, efforts are being made to understand the ecology of reforestation and sustainable management of agroecosystems. Nitrogen (N)-fixing trees in small-scale agricultural systems play an important role in maintaining and restoring soil fertility via minimizing soil erosion and nutrient leaching and enhancing biological N fixation, litter decomposition, and root turnover. Trees in agricultural systems also provide fruits, fuelwood, and fodder for the farmer. *Inga*, a nitrogen-fixing leguminous tree, is native to the Amazon and ubiquitous both on and off the farm. The low levels of Ca and P in local soils can severely restrict root growth, nodulation, and N fixation of legumes on acidic soils. The effects of fertilizer treatments were studied: P, Ca, and P + Ca on nodulation of *Inga edulis* in a randomized blocks field experiment conducted 54 km north of Manaus, Brazil. The effectiveness of the root auger method for estimating nodulation of a nitrogen-fixing tree was also tested. Rhizobium strains were isolated from nodules to test for differences in compatibility among fertilizer treatments. This analysis presents the results of a survey to determine how farmers use *Inga* and the extent of their knowledge of the species, the effect of additions of P and Ca on nodulation, and the effect of additions of P and Ca on Rhizobium strains colonizing the nodules collected in the field.



Bioaccumulation Potential of Toxics in Muck Soils from the Montezuma National Wildlife Refuge in Central New York State

PAMELA C. TOSCHIK

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Bottomland muck soils at the north end of Cayuga Lake, New York, are a major component of a wetland acquisition and restoration project being conducted by the U.S. Fish and Wildlife Service, the New York State Department of Environmental Conservation, and Ducks Unlimited. Past agricultural and industrial uses (not necessarily on site) have contaminated soils with organochlorine pesticides and polychlorinated biphenyls (PCBs). Before flooding this area to create wetland habitat for migratory waterfowl and shorebirds, it was necessary to evaluate risks associated with potential mobilization and redistribution of these contaminants from muck soils into plants and invertebrates consumed by wildlife. The aquatic worm *Lumbriculus variegatus* was cultured for 28 days in aquaria containing soils collected from three contaminated sites and one unfarmed reference site at the north end of Cayuga Lake. Soils and worms cultured in the soils were analyzed for 27 organochlorine pesticides or metabolites and two PCB mixtures. DDT, dieldrin, chlordane, and their metabolites were higher in worms maintained in soil from the agricultural sites (ND-36.05 ppb wet weight) than from the reference site (ND-18.76 ppb). Levels of other organochlorine pesticides and PCBs in worms were low and did not differ among study sites (ND-18 ppb). DDT, chlordane, and their metabolites in soils were also higher for the contaminated (ND-67 ppb) vs. reference site (ND-1.6 ppb); other contaminants were not detected in soil from any site. The slope of the log dry weight concentration of p,p'-DDE in worms vs. soil was 0.0105, indicating that p,p'-DDE and perhaps other organochlorine pesticides were bioaccumulating in *L. variegatus*. Based on previous research, however, consumption of such prey poses minimal hazard to wildlife because contaminant concentrations were well below thresholds associated with adverse effects.



The Effects of Attendance on Students' Exam Scores: Supplemental Instruction Classes Offered by the Cornell University Learning Strategies Center (LSC)

RICHARD M. KATZ

Under the supervision of Russell C. Lloyd
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The Cornell University Learning Strategies Center (LSC) offers supplemental courses known as “oo” sessions to the undergraduate student community at Cornell University. To determine the effects of attendance at these sessions on exam grades received by students, a linear regression model was developed to measure the benefits received by students, comparing the effects noticed in individual LSC courses to those of the supplemental instruction program as a whole. Significant trends are identified, indicating that higher levels of attendance result in higher exam scores for the average student.

The Learning Strategies Center's “oo” sessions were studied to help quantify their benefits to Cornell students. It is hoped that results of this study will serve as internal feedback for LSC staff and as mathematical and statistical evidence for the Cornell administration to further confirm the benefits that the “oo” sessions provide, as well as to promote LSC services to the greater Cornell community.



The Role of Prior Probabilities in Unbalanced Data Sets in Data Mining

DENEY LAM

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In data mining, the problem of unbalanced data sets often arises in predictive modeling. In a data set with only two outcomes (classes), an unbalanced data set is one in which one of the two classes is rare. This rare class is usually the event of interest, or the target response. To develop an appropriate method for dealing with this issue, the role of the prior probabilities was considered. The choice of whether to specify or adjust the prior probabilities in the training sample to build a predictive model affects the misclassification rates. But depending on whether the goal is to obtain an optimal overall misclassification rate or to obtain an optimal misclassification rate for the rare class, the choice of how to specify or adjust the prior probabilities must be carefully analyzed. A method was developed for dealing with misclassification in unbalanced data sets taking the prior probabilities into consideration. The analysis was carried out on a simulated unbalanced data set using SAS and SAS Enterprise Miner and compared three commonly used predictive modeling techniques in data mining—multivariate normal discriminant analysis, decision trees, and logistic classification/regression.



A Universal Biosensor Assay for the Detection of Viable Pathogens Via Nucleic Acid Hybridization

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Biosensors based on the detection of messenger RNAs (mRNA) have been effective in detecting viable pathogenic organisms. These biosensors use short DNA oligonucleotides (DNA probes) that specifically hybridize with the target mRNA sequence. The DNA probes are incorporated into the biosensor by immobilization to the biosensor components (liposomes and membranes). For each pathogenic organism, new liposomes and membranes must be developed, which is a laborious and time-consuming process. Thus a reliable universal biosensor system was developed using generic components compatible with any mRNA sequence. Coupled with the ability to recover RNA sequences from an agarose gel, this system has the potential to simplify current laboratory blotting techniques used to detect specific nucleic acid sequences. Two projects were completed: RNA recovery from agarose gels and development of universal membranes.

Millipore's Ultrafree-DA is a centrifugal ultrafiltration device used for recovering DNA molecules from agarose gels. The system was tested for the recovery of RNA from agarose gels using *E. coli* mRNA as the model analyte. Absorption readings at 260 nm showed about 50 percent recovery of RNA from 1.5 percent agarose. Lesser recovery amounts were detected when a biosensor specific to *E. coli* was used. This biosensor assay was adapted to a dipstick assay so that the recovered RNA could be analyzed.

Specific biosensors use membranes that bear a specific DNA probe in the capture zone. Universal membranes were developed that contained only streptavidin in the capture zone. DNA probes specific to *E. coli* were biotinylated and added to the hybridization mixture (liposomes plus target mRNA). During the biosensor assay, any biotinylated probe was captured in the capture zone owing to the strong binding of streptavidin

to biotin. Highly comparable results were obtained using the universal membrane-biosensor and the *E. coli*-specific membrane-biosensor for the detection of *E. coli* target sequence, thus confirming the feasibility of a universal biosensor.



Temperature Effects on the Pathogenicity of *Rhizoctonia fragariae*, a Component of Strawberry Black Root Rot

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Strawberry black root rot (BRR) is a disease complex that affects replanted strawberry fields. The causes of BRR reportedly involve interactions among several fungal species (e.g., *Rhizoctonia* spp., *Pythium* spp.), root-lesion nematodes (*Pratylenchus penetrans*), and a combination of abiotic factors (e.g., temperature, soil moisture, herbicide injury). Because little is known of BRR's complex etiology, the disease is difficult to control without major intervention. Although growers currently rely on methyl bromide, a potent soil fumigant, for control, the chemical is being phased out of use because of its negative environmental effects, leaving no obvious, reliable alternative for control. *Rhizoctonia fragariae* is often associated with plants exhibiting symptoms of BRR. To learn more about how factors interact to cause BRR, the effects of inoculation of *R. fragariae* on health and productivity of plants exposed to different temperature regimes were evaluated.

Results of this experiment indicate that *R. fragariae* may initially associate symbiotically with strawberry roots. Foliar micronutrient levels, yield, and number of berries per plant were greater in treatments receiving inoculation of *R. fragariae*. Root health and biomass were significantly greater at cool temperatures. *R. fragariae* negatively affected root health, particularly at warm temperatures. However, the compromised root systems were not detrimental to plant health over the evaluation period. Once the role of temperature stress is understood, manipulations can be made in the field to reduce the negative impact of *Rhizoctonia*.



Capturing News in the Net: What Makes Online News Sites Credible?

DENIZ BIRINCI

Under the supervision of Geri K. Gay and Michelle L. Campo
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Perceptions of online credibility were examined using three independent variables: content, design, and interactivity. The research contributed to the ongoing debate about the nature of the relationship among traditional news media and the web by suggesting that people will be less likely to get their news from radio or newspapers as Internet usage increases. In contrast, television news seems to maintain a more positive correlation with online news. Using results from a survey of a diverse pool of students at a large Ivy League institution where the Internet is integrated into all aspects of daily life, the main finding was that online users associate credibility with high-quality content, simplistic design and ease of use, and minimal interactivity. Other findings about general news preferences, the Internet, and traditional media usage patterns were also revealed.



Value Creation and Destruction through Spin-off Transactions: Evidence from U.S. Domestic Transactions of 1995

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The success of spin-off transactions in terms of returns to shareholders results from several key factors. Twenty-eight domestic U.S. spin-off transactions that took place in 1995 were studied using recent data to shed some light on the field of spin-offs. Based on this study, it does not appear that spin-offs result in greater gains to shareholders than those realized by shareholders of the respective parent firms during the study period. This is not to suggest, however, that spin-offs cannot be successful. Several factors contribute to the success of these post-spin-off transactions. First, firms with the greatest value of options outstanding tended to perform the best after spin-off occurred. In addition, inside ownership of greater than 5 percent seemed to have a positive relationship with the returns to shareholders of the spin-offs. Finally, solid earnings growth of the spin-offs tended to hasten value growth for shareholders after spin-off. Firm size and aggressive restructuring through reductions in COGS and SGA expenses did not appear to have a significant effect on the success of the spin-offs. This study sheds light on several accepted notions regarding spin-off success and failure based on recent evidence and will be useful to the practitioner as he or she contemplates the spin-off decision in today's marketplace.



Predictors of Online Textbook Purchasing by Cornell University Students

BROOKE E. FOUCAULT

Under the supervision of Dietram A. Scheufele
Department of Communication

Several social and perceptual motivations for shopping online were proposed and tested. Using online textbook purchasing as a model, predictors of online purchasing were outlined based on motivation theories drawn from traditional online consumer motivation research, social motivation theory, social influence theory, and uses and gratifications theory. A social and perceptual dimension was added to much of the typical online motivation research that deals with availability and cost issues. Data were collected using a pencil-and-paper survey of 156 Cornell University students. Survey findings indicated that previous online purchase, positive social environment, faculty support, knowledge of online retailers, and perception that needs will be met online are all predictors of online textbook purchasing. Implications for online textbook retailers, specifically, and e-commerce, generally, are discussed.



A Market Analysis of Ocean Spray's Opportunity in the Single-Serve Beverage Category

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In the latter 1990s, Ocean Spray faced an oversupply in the cranberry market with a stagnant demand for cranberry products and an increase in competition in the cranberry industry. Ocean Spray's attempts to succeed in the single-serve market were hampered by a failed distribution system and lack of a marketing platform and product positioning.

The single-serve fruit juice beverage industry was explored to determine Ocean Spray's market potential. Journal articles, industry analysis reports, and interviews built the foundation for the competitive analysis. Potential target audiences for single-serve juice beverages were determined. Conclusions from five sets of focus groups assisted in formulating the recommendations to Ocean Spray. Furthermore, statistical data were compiled from a 78-question survey of 202 consumers in the young adult market segment. Additional research was used from Dartmouth Business School of the University of Massachusetts and journal article surveys.

To increase its volume in the single-serve category it is recommended that Ocean Spray enter this market category with vitamin- and nutraceutically enhanced beverages because the market for these products is beginning to grow in the United States. Ocean Spray should target the young adult market segment and promote its single-serve juices as refreshing and healthy drinks that replenish energy and strengthen the immune system.



Do Presidential Candidates' Web Sites Provide Heuristics?

TRINA KAY LEE

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The Internet is the first new medium that may possibly change political behavior since the introduction of television in the 1950s. Political candidates' web sites have the potential to provide heuristics—shortcuts individuals use to reach a voting decision—strategically. Current published studies examining the role of the Internet and politics lack the application of communication theory beyond interactive media concepts. Although the effects will not be known for years to come, political communication and political behavior theory can be applied to analyze political information on the web. The official web sites for the two major party candidates, George W. Bush and Al Gore, in addition to the leading third-party candidate, Ralph Nader, were saved four links from the home page and at more frequent time intervals from October 9, 2000, until election day.

To determine if web sites provide heuristics as a means of replacing or structuring information, the pages were coded for information content and heuristic characteristics. The latter included visual and contextual information regarding party affiliation, candidate demographics, associations, opinions of others, targeted audiences, and campaign messages. The sites were analyzed at T₁, October 9, and again at T₂, November 7, to determine what changes, if any, occurred to the web sites during the 30 days before election day. Limitations of this research included archiving techniques and lack of an existing heuristic coding scheme for web sites. The content analysis repeatedly showed that candidates' web sites could provide heuristics as a means of replacing and structuring information. Bush, Gore, and Nader each did a better job of providing different types of heuristics, whereas Bush's site was superior in its presentation and prioritization of campaign issues.



When Ads Attack: How Does Processing of Comparative Commercials Influence Brand Attitude and Purchasing Intention?

NICOLE M. NEROULIAS

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Although comparative advertising has been legal in the United States for almost three decades, little research has been conducted using the Elaboration Likelihood Model to determine the differences in intensity levels of comparative brand advertising and how humans cognitively process such commercials. After defining noncomparative, comparative, and attack levels of brand advertising, the effects that aggressive advertising has on consumers' cognitive processing, brand attitudes, and purchasing behaviors were examined. A unique experiment design was used in which advertisement condition is manipulated as thoughts, attitudes, and behaviors are measured. Viewers were found to be significantly more likely to centrally process an attack advertisement than a comparative advertisement but are more likely to purchase the sponsoring brand in the comparative condition. Attitude change, owing to this study's limitations, was not significantly different in the three conditions. These results indicate that there is a significant difference between comparative and attack advertisements, calling for further research on this new condition.



The Atlantic Bias: Comparison of the Broadcasting Systems in the United States and Great Britain and Their Influence on News Coverage

ADAM L. SCHWARTZ

Under the supervision of Dietram A. Scheufele
Department of Communication

American and British newscasts were analyzed to compare the dramatically different methods by which each country regulates its television news content. A content analysis of public and private news shows from both countries, including BBC1, ITV, Channel 4, PBS, ABC, and NBC, was conducted over a two-week period.

Shows were coded for the amount of time per story given to pro-liberal and pro-conservative statements. Attributed statements, which include sound bites from news sources; unattributed statements, those made by a reporter restating an opinion of a news source; and journalistic opinion statements, which include a journalist's interjection of personal beliefs into the story, were all analyzed. Bias was defined as an imbalance of time allotted to liberal and conservative viewpoints in a news story.

Analyses suggested that American television news exhibited a considerably larger bias than British shows, although the differences were not statistically significant. The study also found that publicly funded television stations such as BBC1 and PBS produced more conservatively biased stories than did private newscasts.



Changes in Sexual Activity among Adolescents in Broome County, New York—1993 to 1999

MINDY E. SCOTT

Under the supervision of Paul R. Eberts
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Trends in risky sexual activity among adolescents in Broome County, New York, from 1993 to 1999, were analyzed. Risky sexual activity is operationally defined by a combination of sexual activities including frequency of intercourse and low use of birth control and condoms. It is important to consider underlying experiences and behaviors associated with adolescent risky sexual activity when developing programs and policies to address risky behaviors. Findings suggest a decline in sexual activity and increased use of protection among nearly all age groups of adolescents in Broome County. The most important influences of risky sexual activity have changed from depression, romantic relationships, smoking, and alcohol abuse in 1993 to sexual abuse, use of heavier drugs (e.g., crack, cocaine, heroin), crime, and carrying weapons in 1999. Possible explanations for these changing behaviors and experiences associated with risky sexual activity are provided, and suggestions are proposed for the development of more effective sex education and prevention programs that target both the direct and indirect causes of risky sexual activity among adolescents.



The CALS Office of Academic Programs is pleased to have published for the first time abstracts from the undergraduate students who completed the Research Honors Program in spring 2001. These abstracts reflect a broad array of research that was conducted by CALS students in various program areas. These students have graduated with “Distinction in Research.”

In addition to recognizing these distinguished students, we pay tribute to the faculty members who contributed many hours to mentor these students to assure the highest-quality research and provide a rewarding experience. As a result of the mentors’ help, some of these research projects will be published in professional journals. Students benefit not only from experiencing the research process but from a close faculty-student relationship. We also recognize that faculty members contribute their facilities, funding, and personnel to enable these undergraduate students to conduct their research.

We thank the Research Honors Program area committees and their chairs for reviewing research proposals, advising students at the beginning of their research programs, and for reviewing the research theses at the end of each year. The program area chairs also make up a committee that guides the policies of the Research Honors Program for the college.

H. Dean Sutphin
Associate Dean and Director of Academic Programs

Donald R. Viands
Associate Director of Academic Programs

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