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IWU Student Research Conference

PROGRAM

First Annual

ILLINOIS
WESLEYAN
STUDENT RESEARCH
CONFERENCE

APRIL 6th, 1990

SCHEDULE OF ACTIVITIES

- 6:30-8:00 p.m. Poster viewing & reception
- 8:05-9:05 p.m. Oral presentations & judging
- 9:15 p.m. Presentation of conference
certificates & awards by
President Minor Myers, jr.

The Organizing Committee would like to thank:

Minor Myers, jr, President, IWU
Ellen Hurwitz, Provost & Dean of Faculty
Roger Schnaitter, Associate Dean of Academic Affairs
Judy Bischoff, Assistant Professor of Chemistry
Louis Verner, Associate Professor of Biology
Pamela Muirhead, Associate Professor of English
Benjamin Rhodes, Director of Planned Giving, Development Office
Laura Williams, Natural Science Division Secretary
Leslie Matuszewich
Student Senate

Organizing Committee Members

Gail Lima, Assistant Professor of Biology
Wayne Dornan, Assistant Professor of Psychology

STUDENT PARTICIPANTS

Christopher Ballak
Kathy Balsmam
Shari Becker
Wendy Billings
Mike Bryson
James Caccitolo
Chris Dunlap
Chris Exstrom
Tom Griffith
Janet Hadler
Tina Harrington
Marion Hefner
Kellie Jones
Kelly Kalus
Hans Lo
Peter Malen
Todd Mathus
Leslie Matuszewich
Todd O'Halloran
Amy Peterson
Melissa Peterson
Matt Renner
Santosh Sastry
Dave Sherwood
Andrea Smith
Jim Stowell
Allison Truckenbrod

STUDENT ABSTRACTS

* Indicates Faculty Supervisor

BILATERAL IBOTENIC ACID LESIONS OF THE BED NUCLEUS OF THE STRIA TERMINALIS IN INTACT MALE RATS: A PILOT STUDY

Christopher Ballak, Dept. of Psychology, IWU, Dr. Wayne Dornan*

The bed nucleus of the stria terminalis (BnST) is commonly thought of as a "relay station" integrating vomeronasal and olfactory information from the medial nucleus of the amygdala (MeA) to the medial preoptic area (MPOA). Recently, Malsbury and Mc Kay (Brain Research Bulletin, '89) reported a sex difference in the pattern of the substance P-immunoreactive (sP-ir) innervation of the medial division of the BnST (larger in males). Moreover, they suggest that the sexually dimorphic innervation of the medial BnST originates from the MeA. Interestingly, sP has been reported to facilitate male sexual behavior when bilaterally injected into the MPOA. Taken together, this suggests that the sP innervation of the BnST may be important in the regulation of male sexual behavior and that the BnST might be more than a relay station for the MeA. Numerous sP-ir cell bodies are present in the BnST, presently, however, nothing is known concerning whether this sP cell group is necessary for the expression of male sexual behavior. Therefore, the purpose of this study is two fold: First, we will examine the effects of ibotenic acid lesions of the BnST on male sexual behavior in order to determine if the BnST is only a relay station or if it is involved in the regulation of male sexual behavior. Second, following the destruction of cell bodies of the medial BnST, we will have effectively eliminated the influence of the sP sexually dimorphic innervation of the medial BnST this will elucidate whether this sP innervation is involved in the neural regulation of sexual behavior in the male rat. The results of this study will further the understanding of the role of sP in sexual behavior.

Adult Long-Evans male rats will be used. Each male will receive either a bilateral 0.3ul pressure injection of either ibotenic acid (10ug/1ul) or phosphate buffered saline into the medial BnST (AP = -0.82; ML = -1.2; DV = -7.1). All males will be tested prior to surgery and then again five - seven days following surgery. A variety of parameters of male sexual behavior will be measured. We postulate that an inhibition of male sexual behavior will be observed.

PRELIMINARY REPORT
THEOREMS OF THE ALTERNATE

Kathryn L. Balsman, Dept. of Mathematics, IWU, Melvyn Jeter*

In my paper, I am investigating theorems of the alternate. A theorem of the alternate is generally a statement specifying the relationships between the solutions of a homogeneous linear system of equations and the solutions of an associated system of linear inequalities (Pye, W.E. and Webster, P.G. 1989. Theorems of the alternative. Mathematics and Computer Education. 23(2)). Several points of view relating the theorems to linear programming and linear algebra will be presented. Also, several well-known versions will be derived relating to one another.

GENETIC AND FUNCTIONAL CHARACTERIZATION OF VITAMIN D-RESISTANT RICKETS

Shari Becker, Dept. of Biology, IWU, Dr. Pike-Baylor*

In this study the 1,25-dihydroxyvitamin D₃ receptor (VDR) in cells of patients with vitamin D-resistant rickets (VDRR) were analyzed for genetic and functional characteristics. The human VDR gene has been cloned and sequenced so the normal gene can be compared with the defective disease gene. The VDR of two patients with VDRR each showed a homozygous point mutation within the third exon, a mutation which substituted a glutamine for an arginine residue in a conservative area on the receptor in the steroid receptor superfamily. The mutant receptor (obtained via site-directed mutagenesis) bound vitamin D hormone with normal affinity, but displayed weak affinity for nuclei and DNA. The receptor was completely inactive in promoting transcription in a cotransfection assay employing a construction containing the CAT gene reporter fused downstream of the VDR-dependent osteocalcin gene promoter-enhancer. These results provide the genetic and functional basis for the disease phenotype of rickets in this inherited human disease.

DOES STORE ATMOSPHERE AFFECT SHOPPING BEHAVIOR?

Wendy Billings, Dept. of Business Admin., IWU, Mona Gardner*

This study takes an environmental psychology approach to store atmosphere and studies how the atmosphere affects consumer purchasing behavior within the store. The study tests the Mehrabian-Russell environmental psychology model in retail settings. This model proposes that an environment produces an emotional state in an individual which then mediates approach-avoidance behaviors. These behaviors may be appropriate for describing shopping behaviors in a retail environment. Thus, the main purpose of this analysis is to determine the extent to which subjects' approach-avoidance responses can be predicted from retail environments. This information may then be used to predict the effects of in-store changes on shopping behavior.

In addition, this study compares and contrasts the intended shopping behavior of college students with various educational backgrounds to determine if majors have an effect on the degree of approach-avoidance behavior exhibited in retail settings. It also compares and contrasts the intended shopping behavior of women and men.

To test the Mehrabian-Russell model, I instructed 55 Wesleyan students to visit two retail stores during various shopping times. While in the store each respondent completed questionnaire ratings, consisting of three major parts: respondents' emotional states, the General Measure of Information Rate, and subjects' intentions to behave in the store. Factor analysis and regression analysis are being used to determine which major emotional states are significant mediators of intended shopping behaviors within the retail stores.

WATERCOLUMN PHOTOSYNTHESIS AND RESPIRATION IN A MARINE COASTAL POND

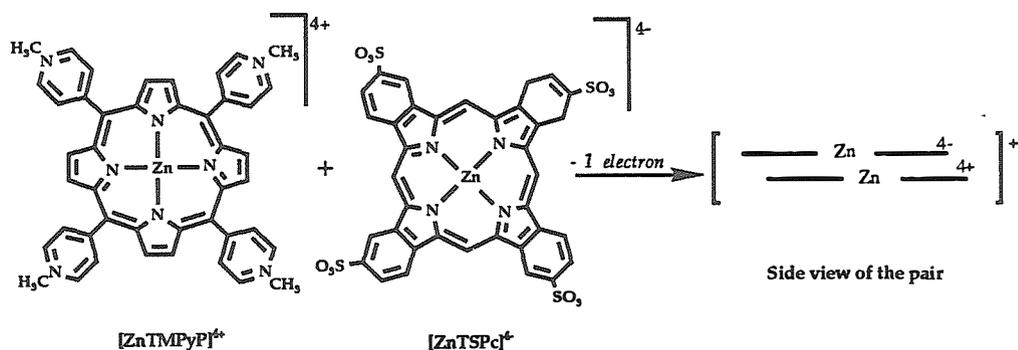
Michael A. Bryson, Dept. of Biology,
Woods Hole Oceanographic Institute

Measurements of watercolumn photosynthesis and respiration were conducted as part of a large-scale ecosystems project by B. Howes and C. Taylor on Little Pond, a marine coastal pond, in Falmouth, Massachusetts. Methods employed consisted of 300ml BOD *in situ* light and dark bottle incubations using either dissolved oxygen techniques (Winkler titrations) or radioactive 14-carbon assimilation. Field measurements were taken on six dates throughout the summer of 1989. Samples of inorganic nutrients, chlorophyll-a, particulate carbon and nitrogen, and temperature were also taken at the times of primary production measurements. Production/Respiration (P/R) calculations indicated that the watercolumn of Little Pond was productive throughout the season, and also that the production increased significantly during the first half of August due to a phytoplankton bloom. Results also indicated a fair agreement between the two methods used to measure photosynthesis.

**OXIDATION OF ELECTROSTATICALLY PAIRED
METALLOPORPHYRIN/METALLOPHTHALOCYANINE
DERIVATIVES: SYNTHETIC MODELS OF THE "SPECIAL PAIR" OF
BACTERIOCHLOROPHYLL-*b* MOLECULES IN THE
PHOTOSYNTHETIC REACTION CENTER.**

James Caccitolo, Dept. of Chemistry, IWU, John Goodwin*

A synthetic approach has been taken to create an isolated molecular system modeling the photoreactive "special pair" responsible for initial electron donation in photosynthesis. The electrostatically paired (tetra(methylpyridyl)porphinato)zinc(II) / (tetrasulfophthalocyaninato)zinc(II) ($[\text{ZnTMPyP}]^{4+} / [\text{ZnTSPc}]^{4-}$) system was chosen since the strong electrostatic attraction of the molecules results in a cofacial arrangement similar to that which allows the single electron oxidation of the natural system.



Using electronic spectroscopy, and analytical electrochemical techniques, the characteristic oxidation potentials, and visible spectra of the novel oxidized associated species may be compared with individually oxidized components. Initial results indicate that the interacting pair may undergo a *single-electron* oxidation to produce a cationic radical pair in which a one-electron vacancy is shared by the two molecules. This characteristic which is indeed seen in the natural bacteriochlorophyll-*b* pair, has thus far been unobserved in synthetic systems.

AN IMPROVED METHOD FOR ANALYSIS OF NICOTINE IN URINE BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

Christopher J. Dunlap, Dept. of Chemistry, IWU, David Bailey*

The problem of an interfacial emulsion in the methylene chloride extraction of nicotine from urine for analysis by high performance liquid chromatography (HPLC) was investigated. A change in the extraction solvent was examined as a possible solution to this problem. The extraction efficiency, solvent interference and solvent expense were considered. The solvent that best fit these parameters and did not form an emulsion was chloroform.

PHOTOCHEMISTRY OF NITROUS ACID AND NITRITE ION

Christopher L. Exstrom, Dept. of Chemistry, IWU, Tim Rettich*

In a study of aquatic nitrogen chemistry, Zafiriou and True reported decomposition of and hydroxyl radical (OH) formation from nitrite ion (NO_2^-) in seawater upon absorption of solar radiation. NO_2^- exists in an acid-base equilibrium with nitrous acid (HONO) [$\text{NO}_2^- + \text{H}_2\text{O} \rightleftharpoons \text{HONO} + \text{OH}^-$]. A comparison study of HONO and NO_2^- photochemistry was undertaken to evaluate the importance of the preceding equilibrium.

Aqueous HONO and aqueous NO_2^- were each photolyzed with 365 nm radiation. Benzene, toluene, benzoic acid, and terephthalic acid were each used as OH-scavengers (there have been no previous reports of using the latter two compounds as OH-scavengers). In the case of HONO, it was determined by ultraviolet/visible (UV/vis.) light spectroscopy that the scavenger compound was hydroxylated by OH resulting from HONO photochemical decomposition and subsequently nitrosated by HONO. In the case of NO_2^- , no hydroxylated aromatic compound was detected, and no decrease in NO_2^- concentration was observed. It was concluded that, at 365 nm, HONO yields OH upon photolytic decomposition and NO_2^- does not photolytically decompose to yield OH. Kinetic information for both thermal and photochemical decomposition of HONO was obtained.

The proposed mechanism for OH-scavenging by benzene was examined under varying pH conditions. H_2O_2 , a known OH producer, was photolyzed in the presence of benzene. UV/vis. spectroscopy indicated that one or more hydroxylated aromatic products formed, supporting the proposed OH-scavenging mechanism.

**THE INFLUENCE OF TEMPERATURE ON EGG DEPOSITION AND
DEVELOPMENT OF PHYSELLA GYRINA, A FRESHWATER
GASTROPOD**

Thomas S. Griffith, Dept. of Biology, IWU, Gail Lima*

Adults of Physella gyrina were reared in the laboratory at four temperatures (15° C, 20° C, 25° C, and 27° C) to show how temperature influences egg deposition and development. Developmental parameters measured included number of capsules deposited, size of egg capsule, number of eggs per capsule, egg size, duration of development, and size of newly hatched juveniles. All measurements were made using a Zeiss stereo dissecting microscope equipped with an ocular micrometer. Three adults in each of five dishes were maintained in spring water at the four temperatures under a 16L/8D photoperiod. Dishes containing the adults were checked every day for egg capsule deposition. Egg capsules were removed from dishes containing adults and placed in separate dishes within 24 hours of deposition. Generally fewer capsules were deposited at lower temperatures (15° C, 8 capsules) than at higher temperatures (25° C, 25 capsules). A similar relationship was observed for mean number of eggs, mean egg size, and mean size at hatching. The number of eggs deposited was greater at higher temperatures than lower temperatures, as was egg size and size at hatching. The number of days for juveniles to hatch was inversely related to temperature. The mean number of days to hatch at 15° C (\bar{X} =19.0 days) was less than at 27° C (\bar{X} =5.8 days). Based on the data, an increase in temperature causes an increase in the production of egg capsules. Developmental rate from egg to hatched juvenile increases with temperature as well. The data suggests that for the temperature range of 15° C to 27° C, 25° C was best for development.

A DEVELOPMENTAL TEST OF THE EBBINGHAUS ILLUSTION AND ITS APPLICATIONS TO A TWO PROCESS THEORY

Janet R. Hadler, Dept. of Psychology, IWU, Dr. Clavadetscher*

The Ebbinghaus Illusion was used to test developmental trends and determine if children's length judgments were affected by the same spatial context factors as adults. The data were also examined within the framework of a two process theory of comparative judgment. Fourteen college students and eleven 11-year-olds (fifth graders) scaled stimuli then judged Ebbinghaus figures. First each subject used a response wheel to scale triangles to match small, medium, and large circles. Results showed no significant difference in how the two groups match size. Second, subjects viewed Ebbinghaus type figures and used a response wheel to indicate perceived size of a focal circle when context items were present. These items were varied in a 3x2x2 factorial design of size, quantity, and similarity to the focal circle. In keeping with previous studies, results showed a regular effect of size: Focal stimuli were judged smallest with large context items and largest with small context items. Context number also had a small effect on size perception. Adults misperceived focal size more when context and focal items had similar shapes than when they were dissimilar. Shape similarity did not have the same effect on eleven year-olds.

The results indicate developmental differences in the fundamental patterns of size perception. The effect of shape similarity between context and focal stimuli is not the same on the two age groups. Interpretation of these results within a two process theory suggests that only one process may operate quite differently in adults and children. Failure to account for both processes could be the source of many discrepancies in the developmental research on visual illusions.

ATTITUDE RELEVANT DISTORTION REGARDING THE RECOGNITION OF CONTROVERSIAL MATERIAL

Tina Harrington, Dept. of Psychology, IWU, John Clavadetscher*

In many situations, people who cannot remember information perfectly nevertheless feel compelled to give a response. If full memory information is not available, where is the source of the confabulated "memory" reports? It has been theorized that recognition error is due to actual memory loss combined with confabulation based on a person's prior beliefs. Therefore, it was expected in this study that (1) recognition accuracy would decrease over time and that (2) the nature of the false recognitions would be consistent with the subject's prior attitudes on a controversial issue.

Subjects were given a questionnaire to assess their beliefs and attitudes on the choice regarding abortion. They read a brief story about a real abortion case and afterwards were asked to recognize to what extent (1) true, (2) modified, and (3) novel false material in a recognition test was present or not in the story. The forgetting curves for pro- and anti-choice subjects appeared different; whereas the pro-choice subjects showed a decrease in recognition accuracy over time, this trend was not clearly evident for the anti-choice subjects. Although data support the theory of decreased recognition accuracy over time due to memory loss data were not robust enough to conclude support or rejection for the theory that confabulation is biased by prior beliefs.

THE MONOCLONAL ANTIBODY AS A MEANS OF INVESTIGATING EARLY ECHINOID ONTOGENY

Marion D. Hefner, Dept. of Biological Sciences, IWU,
Carnegie-Mellon University*

This study was a part of a continuing effort to establish a spectrum of monoclonal antibodies to be used in the investigation of sea urchin development. Several antibodies had been raised against mid gastrula stage embryos. Two of the antibodies had previously been subcloned, and had been raised against *Lytechinus variegatus*, the others had not been subcloned and had been raised against *Strongylocentrotus purpuratus*. The antibodies in my study were known to be at least somewhat specific for the primary mesenchyme cells (PMCs). Examining the affinities of these antibodies for PMCs, as well as for other tissues, were the goals of my experiments.

I have tested the activity of several monoclonal antibodies using the techniques of Western blotting and immunofluorescence. Each antibody under investigation was applied to stages of development for three species of sea urchins: *Arbacia punctulata*, *L. variegatus*, and *S. purpuratus*. Primary conclusions affirm that the antibodies in question are PMC specific; however, those of the set which had not been previously subcloned and purified must be in order to be of future practical use. Furthermore, the affinities and staining patterns suggest that all recognize and bind to the same membrane specific protein exclusive to PMCs believed to be MSP130. Evidence suggests that some of the antibodies may bind to different epitopes on the peptide. Furthermore, some data indicates that the properties of this protein may be less conserved than previously thought.

**THE EFFECTS OF INTRACEREBRAL INJECTIONS OF SUBSTANCE P,
AND A SUBSTANCE P FRAGMENT (5-11) INTO THE
MEDIAL PREOPTIC NUCLEUS ON LORDOSIS BEHAVIOR
IN THE FEMALE RAT**

Kellie Jones, Dept. of Biology, IWU, Wayne Dornan*

Recently, an increasing number of studies has revealed the importance of neuropeptides in the neural regulation of reproductive behavior in both male and female rats. One peptide of particular interest to us is substance P (sP). Bilateral injections of three different doses of sP into the dorsal midbrain central gray (dMCG) produce a rapid and sustained (3 h) facilitation of lordosis behavior in ovariectomized (OVX) estrogen-primed females (Neuroendo. 45:498,1987). sP-immunoreactive fibers and receptors are found within the medial preoptic nucleus (MPN). There is evidence from Akesson et al. (Brain Res. 451: 381, 1988) that almost half of the estrogen-concentrating cells within the ventromedial nucleus of the hypothalamus (VMH) project to the MPN. Whether or not these cells are the same which produce sP is presently unknown. Nonetheless, it is tempting to speculate that the sP innervation of the MPN may play a role in the peptidergic regulation of sexual receptivity in the rat.

In this study, substance P, a sP fragment (sP 5-11) an analog which is resistant to enzymatic degradation, or acidified saline were injected bilaterally into the MPN, in OVX, estrogen-primed females, and the lordosis quotient, along with the lordosis intensity scale (LIS) were recorded using a steroid regime that produces a slow increase in sexual receptivity. On tests 1 and 2, when receptivity was relatively low, bilateral injections of 2 different doses of sP (100 ng,1ug/cannula), had no effect on the lordosis response. On test 3, however, when the receptivity was maximal, SP (5-11) 1mg/cannula produced a marked decrease in lordosis responding. The present results indicate that the effects of bilateral injections of sP on lordosis behavior is dependent on the level of sexual receptivity.

THE CHALLENGE TO THE JUDICIARY OF THE NINETIES: MANAGING APPEALS IN THE FEDERAL COURTS

Kelly Kalus, Dept. of Political Science, IWU, John Wenum*

The overwhelming number of litigants populating American courtrooms today has placed a significant burden upon the judiciary to produce well-thought, reasoned decisions in light of a rapidly increasing caseload. In effect, it can be argued that such an increase in caseload has restricted judges from fully effectuating their duties and, more drastically, has led to a bureaucratization of the federal court system. Consequently, there has emerged a changing public perception with respect to the concept of justice and the federal judicial system--a change having dangerous implications.

With my primary focus at the federal appellate level, I will examine the nature and the scope of this problem as well as the attempts which have been made to improve the situation. Finally, I will formulate my own proposal based on the findings of my research for resolution of the appellate dilemma.

AN EXAMINATION OF THE FOUR DIFFERENT CONTROLS OF THE AMES TEST

Hans Lo, Dept. of Biology, Illinois State University*

The Ames Test is one of the most widely used and inexpensive methods to test whether certain chemicals are mutagenic. In an Ames test experiment, normally $1-2 \times 10^8$ of a his⁻ mutant strain of Salmonella typhimurium is grown in a low histidine agar culture. Various concentrations of the anti-mutagen and/or the mutagen are placed in the culture. The number of colonies are counted after two days of incubation. The presence of each colony indicates that a reversion mutation has taken place in the bacterial histidine operon.

The purpose of our project is to examine and critique four different control procedures for the Ames Test. Through these investigations, we also hope to find out what the maximum concentration of the antimutagen can be without significantly interfering with the spontaneous mutation rate. In all the four controls, S. typhimurium strain TA98 is used, no mutagen is present, and various concentrations of the anti-mutagen retinol is placed in the culture medium. The procedure for the spontaneous mutation test, is exactly the same as a regular test except that the mutagen is absent. The result of this test supposedly indicates the number of spontaneous revertants. The second control is the retinol toxicity test in which 500-1,000 TA98 are grown in a high histidine medium. The result of this test will help draw a line beyond which higher concentrations of retinol will exert significant toxic effect on the bacteria. The procedure for the reconstruction test is the same as the spontaneous test except that 500-1,000 revertant TA98 are also added to the culture. The addition of revertant TA98 ensures that the decrease in the number of colonies with the increase of antimutagen concentration is mostly due to the presence of retinol. The last control is the filler cell test, in which 500-1,000 TA98 cells are mixed with $1-2 \times 10^8$ of strain SV50 and all bacteria are grown in a high histidine medium. Due to the higher number of bacteria in this test, the result shows a more accurate toxicity effect of the retinol than the toxicity test.

**THE EFFECTS OF IBOTENIC ACID INDUCED LESIONS OF THE
MEDIAL AMYGDALA ON MALE RAT SEXUAL BEHAVIOR:
A PILOT STUDY**

Peter Malen, Dept. of Biology, IWU, Wayne Dornan*

The amygdala, a sexually dimorphic site of androgen concentration, has been proposed to be an area responsible for integration of chemosensory information allowing for conditions of optimal sexual performance in the male rat. The medial nucleus of the amygdala (MeA) receives this behaviorally-relevant information from the accessory olfactory bulb (AOB) via the olfactory tract. The medial preoptic area (MPOA), "the final common pathway" in the control of male sexual behavior, is relayed this information from the MeA via two pathways, the stria terminalis (ST), and the ventral amygdalo-fugal pathway (VAP). Electrolytic lesions of the MeA, VAP, or the ST induce profound deficits in male copulatory behavior. Immunocytochemical studies have reported large numbers of substance P (sP) cell bodies and fibers within the MeA and ST. Indeed, the overlapping distribution of sP and androgen accumulating neurons within the MeA suggest the possibility that sP neurotransmission originating from the MeA may be of primary importance in the integration of olfactory information from the AOB. The MeA can be divided cytoarchitectonically into the medial nucleus posterodorsal (MePD), and medial nucleus posteroventral (MePV). Substance P immunoreactive (sP-ir) cell bodies are highly concentrated within the MePD. Consequently, the purpose of this study is to examine the effects of neurochemical lesions induced by the neurotoxin ibotenic acid of the MePD on male rat sexual behavior. We suspect a decrease in sexual behavior will occur, and we theorize that this deficit will be caused at least in part due to the destruction of the sP-ir pathway.

Sexually experienced adult male rats will be randomly divided into two groups. Group 1 will receive bilateral injections of .3ul (10ug/1ul) ibotenic acid into the MePD. Group 2 will receive bilateral injections of phosphate buffered saline and serve as a sham group. A variety of parameters of male sexual behavior will be measured 5-7 days following surgery to determine the effects of the ibotenic acid-induced lesions on male sexual behavior.

SHELL MINERALOGY AS A POTENTIAL INDICATOR OF DEVELOPMENTAL STAGES IN SEVERAL MARINE GASTROPOD SPECIES

Todd L. Matus, Dept. of Biology, IWU, Gail Lima*

Gastropod shell mineralogy of preserved specimens of planktotrophic species, *Crepidula plana* and *Crepidula fornicata*, and a nonplanktotrophic species, *Busycon canaliculatum*, were analyzed by differential staining with Feigl's stain. Feigl's stain provides evidence for distinct differences between aragonite and calcite, two polymorphs of CaCO_3 , that comprise the framework for shell deposition. Previous studies have shown that larval bivalve shells are primarily composed of aragonite, whereas juvenile and adult shells are calcitic. Therefore, a change from aragonite to calcite would indicate metamorphosis from the veliger to the juvenile. Preliminary results indicate similar shell mineralogy patterns in gastropods, thus supporting the previous bivalve studies. Additionally, the results show that the amount of time necessary for Feigl's staining varies according to the shell composition; more specifically, completely aragonitic shells stain at a much faster rate than do shells with a combination of calcite and aragonite. I anticipate subsequent work using scanning electron microscopy and X-ray diffraction analysis will verify these preliminary results.

INTRACEREBRAL INJECTIONS OF MORPHICEPTIN INTO THE MEDIAL PREOPTIC NUCLEUS INHIBIT MALE RAT COPULATORY BEHAVIOR

Leslie Matuszewich, Dept. of Psychology, IWU, Wayne Dornan*

A richly interconnected, sexually dimorphic circuit which includes the medial amygdala (MA), the bed nucleus of the stria terminalis (BnST), and the medial preoptic-anterior hypothalamic area (MPOA) has been reported to be an important pathway for the expression of male sexual behavior in rodents. One of the fundamental questions that remains to be answered is the identity of the neurotransmitter (s) within this circuit that regulates male sexual behavior. There is much speculation in the literature about the possible effects on male copulatory behavior associated with selective activation of opioid receptors. Presently, however, it is not clear which receptor type within the MPOA mediates the inhibition of male copulatory behavior following central administration of opioid agonists. Therefore, in this study we examined the effects of the highly selective mu receptor agonist, morphiceptin, on male rat copulatory behavior.

Adult male Long-Evans rats were used. Each male was anesthetized with Somnotol and received a pair of stereotaxically implanted 22-gauge stainless steel guide cannulae, aimed 2mm above the medial preoptic nucleus (MPN) (AP = +2.2; ML = -0.5; and DV = -6.3). One week following surgery, the males were tested for mating behavior (baseline). One week following baseline tests, all animals received bilateral injections of 1000, 500, 10 or 0 ng of morphiceptin into the MPN. A variety of parameters of male sexual behavior were then measured. All three doses, 10ng, 500ng and 1000ng, produced a dramatic delay in the initiation of male copulatory behavior. In some rats, a complete suppression of copulatory behavior was observed. No other parameters were affected. Pretreatment with naloxone (1mg/kg) 20 minutes prior to intracerebral injections of morphiceptin completely blocked the inhibitory effect of morphiceptin on male copulatory behavior. Taken together these results indicate that the inhibition of male copulatory behavior observed following administration of systemic or central injections of opioid agonists is partly mediated via mu receptors located within the MPN.

THE COMBINED EFFECTS OF Ca^{2+} AND Mg^{2+} IONS AND ORGANIC
MOLECULES ON DISCHARGE OF NEMATOCYSTS IN THE SEA
ANEMONE AIPTASIA PALLIDA

Todd O'Halloran, Dept. of Biology, IWU, Gail Lima*

It is known that both calcium and magnesium ions are present in the whole nematocyst in large quantities, calcium is given off from the nematocyst during the discharge, and that removal of calcium from the nematocyst causes discharge. It has also been found that organic molecules, specifically EGTA, citrate, proteins and N-acetylated sugars cause nematocyst discharge. But no direct link has ever been shown between the two.

It is proposed that a link exists between the discharge of nematocysts with organic molecules and the giving off of Ca^{2+} and Mg^{2+} by the nematocyst during discharge.

It is also proposed that this link is simple. The organic molecules are detected by the anemone and this triggers nematocyst discharge by removing calcium from its bound position within the nematocyst capsule. This in turn causes a rapid influx of water and then discharge.

Ca^{2+} and Mg^{2+} were measured with aequorin and 12-crown-4 ether, respectively, and the results analyzed to show a direct link between the induced discharge of the nematocyst and the release of Ca^{2+} and Mg^{2+} .

Preliminary data for magnesium are promising, magnesium seems to be given off in large quantities during discharge. Present data for calcium are inconclusive.

COEDUCATION AT ILLINOIS WESLEYAN UNIVERSITY

Amy L. Peterson, Dept. of History, IWU, Paul Bushnell*

The beginnings of the coeducation of institutions of higher learning brought dramatic changes to the American college in the latter half of the 19th century. The increasing number of women entering coeducational colleges affected both the academic as well as the social climate in the 50 years preceding the turn of the century. The role of women was evolving.

When Illinois Wesleyan University opened its doors to women in 1870, only 29% of the institutions of higher learning in the country were coeducational. During the period from 1870 to 1900, the number of women entering and graduating from Illinois Wesleyan steadily increased. The number of female faculty members at the University was also on the rise. The early educational opportunities for women at Illinois Wesleyan University fit well the pattern that was emerging across the nation.

IBOTENIC ACID-INDUCED LESIONS OF THE MEDIAL ZONA INCERTA DECREASE LORDOSIS BEHAVIOR IN THE FEMALE RAT

Melissa Peterson, Dept. of Psychology, IWU, Wayne Dornan*

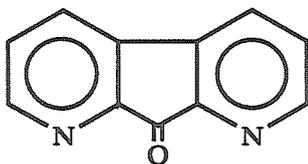
The hormonal induction of lordosis behavior in the laboratory rat has been shown to be dependent, at least in part, on the integrity of projections from the ventromedial hypothalamus (VMH) to the midbrain central gray (MCG). One area of the brain that has received little attention with respect to lordosis behavior in the female rat is the medial portion of the zona incerta (mZI). Recently, however, anatomical as well as electrophysiological evidence indicate that the mZI may play an important role in the neural regulation of female sexual behavior. The purpose of this study was to assess the effects on sexual receptivity in ovariectomized estrogen and progesterone primed female rats following bilateral injections of the selective neurotoxin, ibotenic acid, into the mZI.

All animals were ovariectomized (OVX) under ether anesthesia at least one week prior to surgery. Animals were randomly divided into two groups. Group 1 received bilateral injections of .3ul (10ug/1ul) ibotenic acid dissolved in phosphate buffered saline (ph 7). The injection was given over 60-90 seconds and the syringe was left in place for five minutes following injection. Group 2 was injected with .3ul PBS (sham injected). Five to 9 days following surgery, all animals were given a SC injection of 10ug estradiol benzoate (EB) in sesame oil and 1 mg of progesterone (P), 53 hours and 4 hours respectively, before each test. Lordosis quotient, along with the lordosis intensity scale were then determined for each female. All animals used were given two postoperative tests separated by a 5-6 day period. Ibotenic acid lesions of the mZI produced a marked decrease in sexual receptivity in OVX, EB and P primed females. These lesions, however did not abolish sexual receptivity. This is the first report to demonstrate that mZI neurons play a role in mediating sexual receptivity in the female rat.

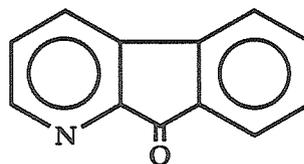
SYNTHESIS OF MONOAZAFLUORENONE FOR POTENTIAL USE IN LATENT FINGERPRINT DETECTION

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It has recently been reported that the organic compound diazafluorenone (DFO) is a useful agent for the detection of otherwise invisible fingerprints. The usefulness of DFO as a fingerprinting agent stems from its ability to react with amino acids (present in fingerprints) to form a product that fluoresces under ultraviolet light. It seems reasonable that the compound monoazafluorenone (MFO), with a very similar chemical structure, might also display such characteristics.



DFO



MFO

The synthesis and purification of MFO have been attempted by two separate synthetic methods.

NP-COMPLETE PROBLEMS IN LINEAR ALGEBRA

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This research project aims at proving NP-Complete results. Before defining NP-Completeness, background information about computability, Turing machines, time complexity etc. is provided.

The introductory part lays the basic definitions and the terminology is introduced. The next part deals with strings and encoding schemes. Turing machines and problems solvable in polynomial time are discussed before moving on to nondeterminism. The class NP is defined and the relationship between the two classes is dealt with. The class NP-Complete is then defined. A few problems shown to be NP-Complete.

This class of problems is important because, when it is shown that a problem is NP-Complete, we may wish to stop trying to find an efficient algorithm for it. Instead, we may try to find an algorithm for a special instance or come up with an approximation algorithm.

Key terms: Decision problem, string, formal language, encoding scheme, intractable problems, incomputable problems, Deterministic Turing Machine (DTM), polynomial time, Class P, Nondeterministic Turing Machine (NDTM), Nondeterministic Polynomial time, Class NP, polynomial transformation, NP-Completeness.

EFFECTIVE COPULATION AND COPULATION TIME ON FEMALE
REPRODUCTIVE DEVELOPMENT IN *Diabrotica virgifera*

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It has been established that the western corn rootworm (WCR--*Diabrotica virgifera*) requires a prolonged copulatory period of 3-4 hours for maximal insemination to occur. In addition, it has been suggested that mating speeds ovarian development in the WCR. This study was performed to determine the relationship between copulation and reproductive development in the SCR. Using 11-day post-emergence virgin WCR beetles, five groups of varying copulatory durations were established: (1) unmated; (2) 15 minutes in copula; (3) 1 hour in copula; (4) 2 hours in copula; and (5) mated until completion. The effects on reproductive development were examined utilizing the following criteria: reproductive status, size of ovaries, egg laying patterns and total female weight. The results suggest substantial increases in weight, ovarian status, ovarian size and frequency of egg laying with longer copulatory periods.

SYSTEMATIC RELATIONSHIPS OF RHINOLOPHID BATS, BASED ON HYOID MORPHOLOGY

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The hyoid region of three species of bats within the family Rhinolophidae was dissected and compared with similar data obtained from Griffiths (personal communication). A cladistic analysis was performed using these data to analyze inter-familial and inter-generic relationships within the families Rhinolophidae, Megadermatidae, Nycteridae, Rhinopomatidae and Emballonuridae. Two possible intra-familial cladograms have been produced. Within the rhinolophids, Hipposideros diadema was found to be the most distantly related of the species and Triaenops persicus and Rhinonycteris aurantius appear to be most closely related. However, because of an uncertainty of character polarity of the origin of the geniohyoid, it is unclear whether Rhinolophus hildebrandti is more closely associated with T. persicus and R. aurantius or with Hipposideros armiger. Four possible cladograms were produced for inter-familial relationships, of which one has been chosen that is the most parsimonious reflection of a true phylogeny. Megadermatids, nycterids and rhinopomatids are closely united. Emballonurids are more distantly linked to the previous three families, while rhinolophids appear to be the most distantly related of the five families.

SYSTEMATIC AND RANDOM INFORMATION LOSS DURING INTERHEMISPHERIC TRANSFER

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Studies of cerebral assymetry indicate that the memory characteristics of the two hemispheres vary depending on the type of information to be remembered. These findings indicate that the hemispheres encode information in fundamentally different ways. In addition, it appears that these differences lead to an information loss when material is transferred from one hemisphere to the other. Numerous studies indicate that when subjects are given simple recognition of decision-making tasks, performance is better when the stimulus and probe are presented to the same hemisphere as compared to the cross hemisphere condition. These results demonstrate an information loss but the type of loss is unclear.

This information loss could be either systematic or random in nature. If information loss is systematic, the same piece of information is lost during each colossal transfer. This kind of information loss is analogous to when a document is translated from one language to another and "something is lost in the translation". Increasing the number of transfers will not recover the lost information. In contrast, random information loss involves a different piece of information each time. For example, if 10% of the information is lost randomly during each transfer then probabilistically only 1% of the information would be lost after two transfers. Thus, increasing the number of transfers would improve performance by allowing for recovery of lost material.

This study was done with left-handers and right-handers separately. The data seems to suggest that in right-handers, information loss is random. Left-handers, in contrast, appear to be characterized by a systematic information loss. This seems to be consistant with data from studies of cerebral assymetry.

ANALYSIS OF THE HYOID MUSCULATURE OF MEGADERMATID BATS

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The hyoid musculature of one species of the family of Megadermatid bats, Megaderma spasma, was dissected and described. An analysis was performed of the "free-floating" basihyal condition of this species. Interestingly, this condition parallels the free-floating condition found in the New World family Phyllostomidae.