

the spirit of Greek mathematics as the beginning of the era of deductive mathematics, it is natural to charge that non-western contributions are "less mathematical". I claim that denigration of the contributions of non-western mathematicians, both in terms of their results and their methodologies, renders a disservice to an understanding of ways of thinking mathematically and will hinder us in our efforts to advance mathematical knowledge.

## MOLECULAR BIOLOGY

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### CUTICULAR HYDROCARBONS IN CARIBBEAN FRUIT FLIES <sup>MAS</sup>

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A population of Caribbean fruit flies, *Anastrepha suspensa*, was accidentally transported to Florida in 1965. They have since been a serious pest of many common tropical and subtropical fruits grown in Florida, including citrus fruits. The flies have become a threat to the production of citrus fruits, and every measure possible is being taken to prevent their reproduction. I propose that a sexual dimorphism exists between the cuticular hydrocarbon makeup of males and females. If there is such a dimorphism, then it is likely the result of the existence of sex-pheromones or sex-pheromone components. This would lead to the possibility of controlling *A. suspensa* via a pheromone-synthesis inhibitory compound. The cuticular hydrocarbons of *A. suspensa* males and females were analyzed using simple gas chromatography, mass spectrometry, and dimethyl disulfide derivatives. Possible sex-pheromone compounds were identified as alkadienes from this data in conjunction with bioassays of courtship behavior. Their biosynthetic pathway will be examined to better understand how alkadienes are formed in fruit flies.

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### IDENTIFICATION OF NOVEL E-SELECTIN LIGANDS EXPRESSED ON HUMAN AND BOVINE LYMPHOCYTES <sup>MAS</sup>

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Here, we describe novel E-selectin ligands expressed on human and bovine lymphocytes. Leukocyte extravasation into the underlying tissue involves a multi-step process requiring many molecular interactions. E-selectin, a member of the selectin family, is up-regulated and expressed on activated endothelial cells and mediates leukocyte rolling on the activated endothelium via E-selectin ligands expressed on the circulating leukocyte. In this report, we used an E-selectin/Fc chimera to analyze bovine  $\gamma\delta$  T cell and human lymphocyte E-selectin ligands.

E-selectin chimera specifically stained bovine and human leukocytes by FACS analysis. Immunoprecipitation of biotinylated  $\gamma\delta$  T cell lysates with chimera resulted in two ligands of 200kD and 250kD. Additionally, chimera immunoprecipitation of biotinylated human lymphocyte lysates resulted in three potential ligands of 120kD, ~220kD, and 260kD. E-selectin ligand immunoprecipitation was specifically inhibited by blocking the chimera with function blocking monoclonal antibody. Lymphocyte E-selectin ligands have proven to be difficult to define in the past, therefore, we have provided preliminary information regarding lymphocyte E-selectin ligand expression.

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### ELECTROPHORETIC CHARACTERISTICS OF THE LECTIN FROM GRASSHOPPER <sup>MAS</sup>

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Grasshopper lectin (GHA) is a C-type (calcium stabilized) glycoprotein that is purified from the insect's hemolymph by means of affinity chromatography and high performance liquid chromatography procedures. The protein is an immunomolecule and serves to opsonize fungal blastopores and perhaps other pathogens toward hemocytic clearance from the hemocoel. This work contributes to the physicochemical characterization of the molecule. Denaturing polyacrylamide gel electrophoresis (SDS-PAGE) is used to study the molecular weight of the homodimer and the (reduced) monomeric subunits. The amount of carbohydrate is estimated by performing SDS-PAGE on enzymatically deglycosylated GHA. The nature of the carbohydrate is examined with Western blotting and specific lectin probes. Results show GHA to be a 72 kD dimer composed of identical 36 kD monomers. Carbohydrate accounts for about 4% by weight of the molecule and is likely composed of 8-10 hexose units per monomer. The carbohydrate is attached via N-linked asparagine.

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### SOLUTION PROPERTIES OF THE PARTIALLY OXIDIZED TETRACYANOPLATINATE(II) AND Bis(OXALATO)PLATINATE(II) <sup>MAS</sup>

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Partial Oxidation of the tetracyanoplatinate(II) and the bis(oxalato)platinate(II) results in copper colored needle like crystals where the platinum atoms are stacked on top of one another like a roll of coins with considerable Pt-Pt bonding characteristics. The platinum atoms in these complexes are in non-integral oxidation states varying from +2.2 to +2.4. These needle like crystals have interesting anisotropic physical properties, most notably they conduct electricity along the Pt-Pt chain some 105 greater than perpendicular to the chain. While the solid state properties of these complexes have been well documented the solution properties

have only recently been studied to any great extent. The use of  $^{195}\text{Pt}$  nmr and UV-Vis spectroscopies determined the different species present in the reaction solutions. The bis(oxalato)platinate(II) solutions have been thoroughly characterized. These solutions contain various oligomeric platinum species including dimers, trimers, tetramers and pentamers where the platinum oxidation state decreases as the oligomers size increases. The tetracyanoplatinate(II) also consist of oligomeric platinum species in solution. In these solutions only the Pt(III) dimer has been characterized; however, there is some evidence of a paramagnetic trimer. Understanding the solution properties of these oxidation reactions are crucial for controlling the polymerization of the platinum complexes.

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### **cDNA SEQUENCE, AMINO ACID SEQUENCE, AND MOLECULAR MODEL OF GRASSHOPPER LECTIN (GHA) <sup>MAS</sup>**

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Grasshopper lectin (GHA) is an immuno-molecule with a role in defense and protection mechanisms of the insect. Molecular cloning and DNA sequencing procedures are used to characterize the lectin molecule. A cDNA library constructed in a lambda gt11 expression vector yielded an antibody-positive clone that contained a 300 bp cDNA that was labeled and used to isolate additional positive clones by hybridization to DNA lifts. An 879 bp cDNA fragment coding for the amino portion of the GHA protein was isolated, cloned, and sequenced. The carboxyl region of the protein was obtained through 3' RACE procedures to yield an entire open reading frame coding for a protein of 324 amino acids, followed by a 147 nt 3' NTR. A 1000 nt 5' NTR was identified by 5' RACE procedures. The deduced amino acid sequence shows familial homology when aligned with that of other C-type lectins. The GHA molecule is novel among the invertebrate lectins in that it contains two carbohydrate recognition domains (CRD), presumably having arisen by a gene duplication event. A 3D homology model of one CRD has been generated based on the crystalline structures of two related vertebrate lectins.

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### **HYDROCARBON IDENTIFICATION AND CHARACTERIZATION IN GALERUCELLA CALMARIENSIS, A BIOLOGICAL CONTROL AGENT, ON LYTHRUM SALICARIA, A NOXIOUS WETLAND WEED <sup>MAS</sup>**

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*Galerucella calmariensis*, a chrysomelide beetle native to Europe, has been introduced into North American wetland ecosystems as a biological control against *Lythrum salicaria* (purple loosestrife), a native of Eurasia. Frequently, exotic plants, removed from natural environmental limitations, aggressively invade and dominate

plant communities. Among other advances, biologists have propagated and released five natural enemies in an attempt to reduce the distribution and impact of *Lythrum*. *Galerucella* is a host-specific, defoliating beetle, which inflicts its greatest damage to plant vigor and seed production during larval stages. Field observations indicate that *Galerucella* aggregate throughout their life span, but particularly as teneral adults, prior to dispersal, a more thorough understanding of this behavior may prove expedient for integrating biological, chemical, and mechanical control efforts against *Lythrum*. Toward an end to isolate the aggregation pheromone(s), we have combined gas chromatography and mass spectrometry to characterize cuticular hydrocarbons. To date, 20 to 25 compounds have been identified. Further efforts have centered around isolating the aggregation pheromone(s) by developing an effective method for bioassaying responses to chemical attractants. Here, these measures are described in addition to applicable rearing details.

## NEUROSCIENCES

### THE ROLE OF NT-3 IN THE FORMATION OF THE DORSAL ROOT GANGLION <sup>MAS</sup>

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The goal of this study is to examine the mechanisms involved in the developing avian Dorsal Root Ganglion (DRG) prior to target-mediated programmed cell death. Previous research has shown the expression of Trk C on a discrete subset of migrating neural crest cells (st. 19). Prior to programmed cell death for post-mitotic neurons (st. 24, E4) Trk C is also expressed on the majority of cells in the developing DRG. We wanted to examine the function of NT-3 on the developing DRG's prior to target-mediated programmed cell death. First we injected NT-3 into embryos and found no increase in cell numbers in brachial DRG (limb-innervating). However, in Cervical DRG (non-limb bud innervating) there was a substantial increase (40%) due to the exogenous NT-3. In a separate set of experiments, we transected the wing buds as soon as they appeared. This resulted in a decrease in cell number in the developing brachial DRG compared to the contralateral DRG with an intact limb bud. Since NT-3 has also been shown to be expressed in the developing limb-buds during DRG differentiation (Hallbook and Lefcort, unpublished results), our results suggest a normal function for NT-3 in maintaining survival and/or promoting proliferation of DRG precursor cells. We are now investigating directly how NT-3 elevates DRG cell numbers and why limb bud ablation decreases cell numbers.