68. CALCULATION OF NONLINEAR OPTICAL PROPERTIES OF CONJUGATED POLYMERS. **Bernard Kirtman**[1]; [1]Chemistry and Biochemistry, University of California, Santa Barbara, Santa Barbara, CA

The role of theoretical calculations in the understanding and design of conjugated polymers with desired nonlinear optical properties will be discussed. Specific aspects include discovery of new phenomena, development of rule of thumb as well as accurate structure/property relations, validation of models, and interpretation of experiments. The current state of the field will be assessed with regard to the predictive reliability of different methodologies along with limitations on the systems and/or properties that can be treated.

69. POLYMERIC FILMS FOR PRINTED ELECTRONICS. **Erik Brandon**[1], William West[2]; [1]Materials and Device Technology, Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA; [2]Electrochemical Technologies Group, Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA

Flexible electronics are enabling a variety of emerging technologies including flexible displays, electronic paper, low-cost radio frequency identification tags and electronic textiles. The development of flexible electronics opens the possibility to new roll-to-roll manufacturing processes, which are anticipated to reduce costs relative to conventional semiconductor batch manufacturing and to allow the integration of electronics on very large area structures. To fully enable many of these new applications will require the development of a host of new thin film materials. This includes new organic and polymer-based conductors, dielectric materials and semiconductors which can be deposited as films using low temperature methods such as spin coating, casting and stencil printing. Active devices such as thin film transistors (TFTs) and passive components such as resistors and capacitors can be fabricated using novel organic and polymeric materials. We have investigated flexible carbon particle/polymer composite films as a replacement for conventional vacuum deposited gold ohmic contacts in TFTs. These composite films exhibit remarkable performance when used to fabricate thin film transistors (TFTs) with poly(3-hexylthiophene) as the active semiconducting layer. These composite contacts are stencil printed and cured at 100° C. Furthermore, the P3HT can be cast from a toluene solution, thereby enabling low-temperature processing. We have also investigated novel magnetic and dielectric films based on a similar composite approach.

70. STRATEGIES FOR TRIPLET ENERGY HARVESTING FROM POLYMERS TO ORGANOLANTHANIDE COORDINATION COMPLEXES. **Aaron W. Harper**[1]; [1]Chemistry, University of Southern California, SGM 418, MC 1062, Los Angeles, CA

This presentation will discuss two classes of polymeric organolanthanide coordination complexes that employ lanthanide sensitization through multistep energy transfer from the polymer. In the first class, dendritic organolanthanide complexes show remarkable light harvesting and site isolation properties that are dependent on the generation of the dendrimer. The roles of each of these properties on the light-emitting properties of the complexes will be discussed in detail. In the second class, conjugated polymers have been prepared that coordinate to discrete organolanthanide complexes. Energy transfer from conjugated polymer to lanthanide involves careful consideration of the spatial and energetic organization of the polymer, ancillary ligands, and lanthanide. Details of the processes by which energy can be harvested from polymer to lanthanide will be presented, as well.

71. POLYMERIC ACTUATORS. **Michael J. Marsella**[1]; [1]Chemistry, University of California, Riverside, Riverside, CA

Chiral pi-conjugated organic systems may provide organic materials capable of exhibiting novel optical and electronic properties, as well as provide insight toward the rational design of self-assembled materials. Traditionally, chirality in conjugated polymers (CP) has been intrinsic to pendant chiral groups on the CP. An alternative design approach relies not on chirality centers, but chiral axes, planes, or helicity. In CPs, fewer examples of the latter three categories exist (relative to the former). Here, our focus is directed towards the synthesis of supramolecular conjugated polymers with main chain helical conformation, utilizing hexithiophene building blocks. Synthesis, structural characterization, and their potential to function as coli-like actuators will be discussed.

72. RECENT ADVANCES IN MOLECULAR IMPRINTING. **Kenneth J. Shea**[1]; [1]Chemistry, University of California, Irvine, 516 Rowland Hall, Irvine, CA

Molecular imprinting is a general protocol for creating receptor and/or catalytic sites in cross-linked network polymers. Imprinted polymers (MIPs) are mechanically and chemically robust functional thermosets that can be used as chromatographic packings, as the recognition element for chemical sensors and as sorbents for the separation and isolation of targeted organic compounds. The talk will include an introduction to molecular imprinting and a discussion of recent developments including: Imprinted polymers as surrogates for native biological receptors. Fabrication of imprinted thin films for the selective of complex organics molecules. Micro fabrication of imprinted polymers. Synthesis of imprinted polymers for binding small peptides.

73. "NEW BIOMIMETIC POLYMERS AND BIOMATERIALS". **Zhibin Guan**[1]; [1]Chemistry, University of California, Irvine, 2046D Frederick Reines Hall, Irvine, CA

We are currently working on two projects at the interface of materials synthesis and biology. For the first project – biomimetic materials synthesis, we draw inspiration from nature to design macromolecular materials having precise secondary structures for advanced mechanical properties. Specifically, a muscle protein, titin, is used as the model system to develop macromolecules having precise secondary structures. The remarkable combined strength and toughness of titin was proposed to derive from its modular structure comprising a linear array of domains, in which each domain is held together by secondary forces. We have synthesized titin-mimicking modular polymers having multiple domain structures by using 2-ureido-4-pyrimidone (UPy) to direct the formation of loops. The mechanical properties of the created polymers are studied both at single-molecule level using atomic force microscopy (AFM) and bulk level using Instron. Systematic studies are designed to understand the fundamental relationship between polymer secondary structures and polymer physical properties. For the second project –new biomaterials synthesis, we are developing unnatural biopolymers from natural building blocks for biomedical applications. Novel carbohydrate-derived side-chain polyethers have been created as excellent protein and cell resistant biomaterials. Carbohydrate-peptide hybrid biopolymers have been successfully developed as biocompatible and biodegradable biomaterials for gene and drug delivery. My group is collaborating with biomedical researchers to explore many potential biomedical applications of these new biomaterials.

74. SYNTHETIC STRATEGIES TO PREPARE POLYMERIC ANALOGS OF NATURAL MACROMOLECULES. **Heather D. Maynard**[1], Jungyeon Hwang[1], Debora Bontempo[1]; [1]Chemistry and Biochemistry, University of California, Los Angeles, 607 Charles E. Young Drive E., Los Angeles, CA

Polymers that are analogs of natural macromolecules should be useful in drug delivery, nanotechnology, and sensors. Using controlled/living radical polymerization, we have developed general strategies to provide rapid access to polymers of this description. For example, universal block copolymer scaffolds with sequences of orthogonally reactive groups have been prepared. With this approach, many biopolymers with diverse functionality could be generated from a single polymer precursor, without the need to establish monomer and polymer synthesis conditions each time. In another example, polymers with end groups that react efficiently with biomolecules have been synthesized. Synthetic strategies, characterization, and applications will be discussed.

75. MOLECULAR ARCHITECTURES AND INTERACTIONS INSPIRED BY BIOPOLYMERS. **James S. Nowick**[1]; [1]Chemistry, Organic and Bioorganic Chemistry, University of California, Irvine, 4126 Natural Sciences 1, Zot Code 2025, Irvine, CA

Proteins derive their unique functions from their ability to adopt well-defined conformations comprising regular features, such as helices, sheets, and turns. Our laboratory has sought to emulate the structures and functions of proteins by developing molecular templates and unnatural oligomers that fold and interact in predictable and well-defined fashions. This paper will describe these ongoing efforts.