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The Amide Linkage The Amide Linkage **Amide Bond Activation** *Amide Bond Activation* From Alchemy to Chemistry in Picture and Story **Structural, Spectroscopic and Reactivity Studies of Low-coordinate Transition Metal Amide Complexes Amide Bond Activation** Essentials of Glycobiology **Vegetable Oil-Based Polymers** Principles of Human Nutrition *Synthesis of Internal Amide Bond Short Interfering RNAs (siRNAs) and Investigation of Their Gene Silencing Properties* **Methods in Protein Structure Analysis Molecular Biology of the Cell** Pharmacology and Physiology for Anesthesia E-Book **Structural Properties of N-alpha-chiral Peptoids Studies Pertaining to Amide Bond Activation, Small Molecule Therapeutics, Cyclic Allenes, and Chemical Education** Methods in Protein Structure and Stability Analysis: Vibrational spectroscopy **Synthesis of Novel Oligomeric Bis-benzimidazoles for Their Biological Evaluation** *Membrane Protein Structure Structure in Protein Chemistry* **Synthetic Peptides** Gamma-Glutamyl Transpeptidases **Advances in Amino Acid Mimetics and Peptidomimetics The Proteins Composition, Structure, and Function Cell Structure & Function** Metal and Metalloid Amides *Introduction to Enzyme*

and Coenzyme Chemistry (Wcs) Chemistry 7e Chapter 16 *Structure and Function of Intrinsically Disordered Proteins* **Strained Organic Molecules** Optimizing the "Drug-Like" Properties of Leads in Drug Discovery **Peptides Powerful TRNA Design, Synthesis, and Structure-bioactivity Relationships of Peptide and Peptidomimetic Opioids** The Art of Chemistry **Protein Structure and Function** *Advances in Amino Acid Mimetics and Peptidomimetics* **Organic Structural Spectroscopy Peptide and Protein Design for Biopharmaceutical Applications Biochemistry Explained**

Amide Bond Activation Comprehensive resource on the pivotal role of the amide bond in organic synthesis This book provides the reader with insight into the advances that have taken place in the field of amide bond activation. It focuses on both the fundamental structural properties of the amide bond and the synthetic reactions mediated by transition-metals. By discussing amide bond activation in terms of modern organic synthesis, the reader is provided with a thorough overview of the area and its crucial role in forging carbon-carbon and carbon-heteroatom bonds. Sample topics discussed within the work include: Cross-coupling of amides Amide bond activation by twisting and nitrogen pyramidalization Electrophilic amide bond functionalization Transition metal-catalyzed radical reactions of amides Amide bond esterification, hydrolysis and transamidation Classical bridged lactams and anomeric amides Computational studies of amide C-N bond activation Cross-coupling of esters by C-O activation The book is immensely valuable to synthetic chemists in academia and the pharmaceutical industry who wish to gain an in-depth understanding of the concept of amide bond activation. Pharmacology and physiology are the foundation of every anesthesia provider’s training and clinical competency. Pharmacology and Physiology for Anesthesia: Foundations and Clinical Application, 2nd Edition, delivers the information you

need in pharmacology, physiology, and molecular-cellular biology, keeping you current with contemporary training and practice. This thoroughly updated edition is your one-stop, comprehensive overview of physiology, and rational anesthetic drug selection and administration, perfect for study, review, and successful practice. Contains new chapters on Special Populations (anesthetic pharmacology in obesity, geriatrics, and pediatrics), Oral and Non-IV Opioids, Thermoregulation, Physiology and Pharmacology of Obstetric Anesthesia, Chemotherapeutic and Immunosuppresive Drugs, and Surgical Infection and Antimicrobial Drugs. Incorporates entirely new sections on Physics, Anatomy, and Imaging. Includes new information on consciousness and cognition, pharmacodynamics, the immune system, and anti-inflammatory drugs. Features user-friendly tables, figures, and algorithms (including 100 new illustrations), all presented in full color and designed to help explain complex concepts. Helps you understand the molecular mechanism of drug actions and identify key drug interactions that may complicate anesthesia with dedicated sections on these areas. Benzimidazoles are heterocyclic compounds. Symmetrical and unsymmetrical benzimidazoles/oligomers are minor groove DNA sequence selective binding compounds. Distamycin A and netropsin are examples of naturally occurring DNA binders. Hoechst 33258 (Bis-benzimidazole) is a synthetic minor groove A-T sequence selective reagent and has in vivo activity by inhibiting the topoisomerase II enzyme. The targets in this research work were to synthesise extended analogues of Hoechst with structural modifications (amide bond) or amide-linked dimers with a view to identifying new potential ligands. To synthesise a library of novel bis-benzimidazoles (analogues of Hoechst) several methods were used. For C5-C2 direct linkage aldehyde synthesis via ester, Weinreb amide reduction, condensation of acids with diamine by Eaton's reagent were applied. Cyclization of amide-linked benzimidazoles (amide bond between carboxylic acid of C5

benzimidazole and diamine), an indirect method of bis-benzimidazole synthesis was also used to prepare a library of novel bis-benzimidazoles giving a series of novel intermediates. Higher molecular weight oligomeric structures (Linked by amide bond either between C5-C5 or C5-C2) were prepared by using (EDCI / HOBt) or (HBTU / DIPEA). A library of novel amide-linked, oligomeric analogues of Hoechst were also synthesised by coupling bis-benzimidazole building blocks bearing reactive groups at positions 2 or 5. Amine (by the reduction of a nitro precursor) or carboxylic acid (from ester hydrolysis) was coupled with monomeric amino or carboxylic acid benzimidazole derivatives using different peptide coupling reagents. Further structural modifications were performed either by reduction of an ester on a bis-benzimidazole or by the reaction of hydrazine with the ester or acid to have an additional flexible spacer (amide bond) with reactive amine to address the issue of solubility. SPR (Surface Plasmon Resonance) was employed to evaluate more than 30 different analogues in comparison with Hoechst 33258 in terms of their DNA binding affinity using three different oligonucleotides having A2T2, A3T3, A4T4 sequences. The data revealed that compounds with charged specie at peripheral groups are better binders in the grooves of DNA. Biochemistry Explained employs an innovative approach which has proven highly successful in the author's own classes. The author establishes a thorough understanding of the foundations of and common linkages between molecular structures and reactions, so that eventual interpretation of complex biochemical pathways and reactions is easy. All of the major molecular structures and biochemical pathways are explained, and, for the most part, these center on mammalian biochemistry. The text is supported by biochemical nomenclature and questions to bear in mind while reading. Higher learning sections are also provided for advanced students. Written in an informal, conversational style, this textbook will serve as an invaluable resource for any student who

is struggling with the standard texts and for postgraduate students who need to refresh their knowledge. The amide bond represents a privileged motif in chemistry. The recent years have witnessed an explosion of interest in the development of new chemical transformations of amides. These developments cover an impressive range of catalytic N–C bond activation in electrophilic, Lewis acid, radical, and nucleophilic reaction pathways, among other transformations. Equally relevant are structural and theoretical studies that provide the basis for chemoselective manipulation of amidic resonance. This monograph on amide bonds offers a broad survey of recent advances in activation of amides and addresses various approaches in the field. The Proteins: Composition, Structure, and Function, Second Edition, Volume II deals with fundamental properties of proteins, both in solution and in the solid state. This volume consists of five chapters that specifically cover the advances in understanding the structure and function of the protein molecule. The opening chapter presents interpretative procedures of experimental methods for determining protein conformation using X-ray crystallography, followed by an examination of the acid-base dissociations of proteins. The discussion then shifts to the investigation of interactions between protein molecules and other macromolecules, which is of significant importance in providing a chemical basis for many biological processes. A chapter considers first the synthesis, purification, and chemical properties of the polyamino acids. This chapter further describes their physicochemical properties in the solid state, in solution, and at interfaces, and lastly discusses their biological properties as high molecular weight substrates for proteolytic enzymes and as synthetic antigens, and their interaction with proteins and nucleic acids, with viruses, bacteria, blood components, and other biological systems. The use of polyamino acids in the study of the genetic code and the preparation and properties of polypeptidyl proteins are also

covered. The concluding chapter focuses on X-ray analysis of protein structure. Organic chemists, biochemists, and researchers in protein-related fields will find this book invaluable An authoritative reference to an important and ubiquitous chemical linkage The amide linkage is one of the most fundamental and widespread chemical bonds in nature, underlying the properties of a vast array of organic molecules, polymers, and materials, including peptides and proteins. Arthur Greenberg, Curt Breneman, and Joel Liebman's peerless text provides comprehensive coverage of the experimental, structural, and computational findings that shed light on the chemical and physical properties of the amide linkage, as well as its emerging applications in materials and biotechnology. Chapters in The Amide Linkage highlight how this chemical bond factors in the design of enzyme inhibitors, cyclic peptides, antibacterial agents, and emerging nanotechnology applications. This one-of-a-kind study also: * Discusses selected aspects of chemical reactions, structure, bonding, and energetics of the amide bond, including amide rotational barriers, stereochemistry, complexation, spectroscopy, and thermochemistry * Presents specific applications to supramolecular and stereospecific synthesis * Discusses key aspects of peptide and protein chemistry-such as molecular recognition, conformation, and folding-in terms of the amide linkage * Includes chapters contributed by numerous eminent chemists and biochemists Organic, medicinal, polymer, and physical chemists, as well as biochemists and materials scientists, will find The Amide Linkage to be an invaluable addition to their professional libraries. Sugar chains (glycans) are often attached to proteins and lipids and have multiple roles in the organization and function of all organisms. "Essentials of Glycobiology" describes their biogenesis and function and offers a useful gateway to the understanding of glycans. The amide bond represents a privileged motif in chemistry. The recent years have witnessed an explosion of interest in the development of new

chemical transformations of amides. These developments cover an impressive range of catalytic N-C bond activation in electrophilic, Lewis acid, radical, and nucleophilic reaction pathways, among other transformations. Equally relevant are structural and theoretical studies that provide the basis for chemoselective manipulation of amidic resonance. This monograph on amide bonds offers a broad survey of recent advances in activation of amides and addresses various approaches in the field. Praise for From Alchemy to Chemistry in Picture and Story "The timeline from alchemy to chemistry contains some of the most mystifying ideas and images that humans have ever devised. Arthur Greenberg shows us this wonderful world in a unique and highly readable book." —Dr. John Emsley, author of The Elements of Murder: A History of Poison "Art Greenberg takes us, through text and lovingly selected images, on a 'magical mystery tour' of the chemical universe. No matter what page you open, there is a chemical story worth telling." —Dr. Roald Hoffmann, Nobel Laureate and coauthor of Chemistry Imagined "Chemistry has perhaps the most intricate, most fascinating, and certainly most romantic history of all the sciences. Arthur Greenberg's essays-delightful, learned, quirky, highly personal, and richly illustrated with contemporary drawings (many of great rarity and beauty)-provide a kaleidoscope of intellectual landscapes, bringing the experiments, the ideas, and the human figures of chemistry's past intensely alive." —Dr. Oliver Sacks, author of Awakenings From Alchemy to Chemistry in Picture and Story takes you on an illustrated tour of chemistry's fascinating history, from its early focus on the spiritual relationship between man and nature to some of today's most cutting-edge applications. Drawing from rare publications and artwork that span over five centuries, the book contains nearly 200 essays and over 350 illustrations-including 24 in full color-that tell the engaging story of the development of this fundamental science and its connection with human history. Join

Arthur Greenberg as he combines the "best of the best" from his previous works (as well as several new essays) to paint a colorful picture of chemistry's remarkable origins! This book arises from a workshop organized by the American Association of Pharmaceutical Scientists entitled "Optimizing the Drug-Like Properties of Leads in Drug Discovery," which took place in Parsippany, NJ in September 2004. The workshop focused on the optimization of the drug-like properties of leads in drug discovery. The volume outlines strategies and methodologies designed to guide pharmaceutical and biotechnology companies through the drug discovery and development process. Studies of receptors, ion channels, and other membrane proteins require a solid understanding of the structural principles of these important biomolecules. Membrane protein structure is, however, a very challenging field. The structures of only three types of transmembrane proteins have been determined to moderate or high resolution during the last two decades, a period during which the amino acid sequences of hundreds, if not thousands, of membrane proteins have been reported. As a result, the creation of structural models to serve as guides for studies of receptors, channels, and other membrane proteins has become crucially important. This book has been assembled in order to share the experiences and findings of expert researchers in protein structure and structure-prediction methods as well as membrane biophysics and lipid physical chemistry, whose work establishes the basis for the development of suitable model structures. The reviews presented here emphasize fundamental ideas and provide an entry to the diverse and complex literature. The four major sections deal with the general nature of the membrane protein structure problem, biochemical and molecular biological approaches to protein topology, direct structural methods, and model and physicochemical approaches. The work will be of interest to physiologists, cellular and molecular biologists, biophysicists, and biochemists working on the function of

membrane proteins such as receptors, ion channels, and transporters, as well as senior graduate students and independent investigators. Strained Organic Molecule, Volume 38 considers the vast field of strained organic molecules. The book discusses energy and entropy; cyclopropane and cyclobutane; and unique strained groupings or building blocks. The text also describes the aesthetics, rearrangements, and topology of polycycles; kinetic and thermodynamic stability; and tetrahedral tetracoordinate carbon. The inverted tetrahedra, propellanes, buttaflanes, and paddlanes; planar methane and its derivatives; and five- and six-coordinaste carbon are also considered. Chemists will find the book invaluable. The first synthetic peptides were produced a century ago. In the ensuing period, they have developed as valuable research tools that are readily available to all researchers. However, since most researchers do not make their own peptides, they are often unfamiliar with not only the synthetic chemistry but also with important and useful aspects of design, analysis, handling, and applications. This volume is the second edition of a volume that was first published 10 years ago. It is written by experts in the field who provide detailed descriptions as well as practical advice for producing and using synthetic peptides. The various chapters cover peptide design considerations, the synthetic chemistry, the evaluation of the synthetic product, and the modern applications of synthetic peptides. This includes the basic principles of peptide structure, analysis and chain assembly as well as the latest in selective disulfide bond formation, new strategies for the production of large peptides, and sequencing peptides by mass spectrometry. This book was designed with the intent of providing useful information both for the novices to the field as well as more seasoned practitioners. Its contents will help prevent problems commonly encountered and allow scientists to optimize their use of synthetic peptides. The existence and functioning of intrinsically disordered proteins (IDPs) challenge the classical

structure-function paradigm that equates function with a well-defined 3D structure. Uncovering the disordered complement of proteomes and understanding their functioning can extend the structure-function paradigm to herald new breakthroughs in drug development. Structure and Function of Intrinsically Disordered Proteins thoroughly covers the history up to the latest developments in this field. After examining the principles of protein structure, the classical paradigm, and the history of structural disorder, the book focuses on physical techniques for the identification and characterization of IDPs. It discusses proteomic and bioinformatic approaches and shows how IDPs behave under crowding conditions in living cells. The next several chapters describe the structure, correlating biological processes, and molecular mechanisms of IDPs. The author also explores the evolutionary advancement of structural disorder in proteomes and possible ways of extending the structure-function paradigm to encompass both ordered and disordered states of proteins. He concludes with discussions on the involvement of IDPs in various diseases and how to establish rational drug design through detailed characterization of IDPs. Although drug discovery rates have leveled off, new insight generated by the study of IDPs may offer fresh strategies for drug development. This work illustrates how these proteins defy the structure-function paradigm and play important regulatory and signaling roles. Transfer RNAs (tRNAs) accurately translate genetic information from mRNA to protein with two essential single-stranded regions: the three base anticodon pairs with the mRNA codon and the 3′ end is attached with the cognate amino acid. Many enzymes are involved in tRNA transcription, maturation, and its use in translation. Two enzymes related to tRNA are studied in this dissertation. The first is a trans-editing protein, called ProXp-ala, and the second is RNase P. Aminoacyl-tRNA synthetases (aaRSs) are responsible for attaching amino acids to their corresponding tRNAs. The products, aminoacyl-tRNAs (aa-tRNAs), are then shuttled to the

ribosome so that the amino acids can be incorporated into the elongating peptide chain by base pairing between the mRNA codons and the tRNA anticodons. To maintain the high fidelity of aminoacylation, aaRSs rely on structural features in their catalytic domains to accurately select both the amino acid and tRNA. Since tRNAs are relatively large molecules and bear various distinctive structural elements, aaRSs rarely make mistakes when selecting tRNAs. However, given the similar chemical properties and comparatively smaller sizes of the amino acids, errors can occur in their selection, especially for the smaller and isometric amino acids. ProRS is known in vitro to mischarge Ala onto tRNAPro. The bacteria, Caulobacter crescentus (Cc) encodes the enzyme ProXp-ala to deacylate the mischarged Ala-tRNAPro in a trans-editing manner. Previous studies illustrate that ProXp-ala recognizes two acceptor stem features of tRNAPro: the discriminator base A73 and the unique base pair C1:G72. Chapter 2 describes collaborative studies on the C1:G72 feature and identification of Arg80 and Lys50 as the residues likely contacting C1:G72 from NMR experiments. Follow-up deacylation and binding assays suggest Arg80 is the major player involved in reading that feature of tRNAPro. In addition, our data suggest that interaction between A76 and Lys45, a residue conserved among INS superfamily, is a third key element enabling recognition of tRNAPro by ProXp-ala. Biochemical studies on aa-tRNAs are complicated by the intrinsically fragile ester bond linking the aminoacyl group and tRNA. A strategy to overcome this problem is usually to substitute the ester bond with a stable amide bond via either chemical synthesis or enzymatic method involving NTase, the enzyme that adds the conserved CCA terminus to some tRNAs. Chapter 3 describes work to adapt the enzymatic method to Ala-tRNAPro with not only amide bond replacement but also with the introduction of dA76. Three overlapping mechanisms have been proposed to contribute to the ability of ProXp-ala to differentiate Ala-tRNAPro from Pro-

tRNAPro: conformational selection, size exclusion, and chemical selection. Direct high-resolution structural evidence is needed to understand the recognition mechanism. Chapter 4 describes the structural studies of both free ProXp-ala and the RNA-bound complex. We solved the crystal structure of ProXp- ala in a space group different from that in the previously available structure. Structural variations between the structures are consistent with the conformational selection mechanism. Moreover, I continued efforts to solve the solution structure of ProXp-ala extending assignment of the sidechain atoms. In addition, we observed some promising intermolecular NOEs which can be helpful to restrain the structural model of ProXp-ala in complex with RNA. Chapter 5 describes my work on RNase P, the enzyme that cleaves the 5′ leader of precursor tRNA (pre-tRNA) after tRNA transcription. RNase P is constituted by a catalytically active RNA, RPR, and different numbers of proteins, RPPs: one in bacteria, five in Archaea, and ten in Eukarya. The RPR of Pyrococcus furious (Pfu), is catalytically active without its five RPPs and can serve as a good model to investigate the RNA structural and functional changes mediated by protein. I describe work to obtain distance restraints from double electron electron resonance (DEER) experiments in order to refine a model of Pfu RNase P. The failed trials of the RPR fragment, P12, and its binding partner, L7Ae, and the structures of RNase P from human, yeast, and type M Archaea published from Dr. Lei's group led us to instead investigate the structural changes in Pfu RPR induced by the protein L7Ae by florescence resonance energy transfer (FRET) and cryogenic electron microscopy (Cryo-EM). Protein research is a frontier field in science. Proteins are widely distributed in plants and animals and are the principal constituents of the protoplasm of all cells, and consist essentially of combinations of a-amino acids in peptide linkages. Twenty different amino acids are commonly found in proteins, and serve as enzymes, structural elements, hormones, immunoglobulins, etc., and are involved

throughout the body, and in photosynthesis. This book gathers new leading-edge research from throughout the world in this exciting and exploding field of research. Peptides serve as effective drugs in the clinic today. However the inherent drawbacks of peptide structures can limit their efficacy as drugs. To overcome this researchers are developing new methods to create 'tailor-made' peptides and proteins with improved pharmacological properties. Design of Peptides and Proteins provides an overview of the experimental and computational methods for peptide and protein design, with an emphasis on specific applications for therapeutics and biomedical research. Topics covered include: Computer modeling of peptides and proteins Peptidomimetics Design and synthesis of cyclic peptides Carbohydrates in peptide and protein design De novo design of peptides and proteins Medical development applications An extended case study – the design of insulin variants Design of Peptides and Proteins presents the state-of-the-art of this exciting approach for therapeutics, with contributions from international experts. It is an essential resource for academic and industrial scientists in the fields of peptide and protein drug design, biomedicine, biochemistry, biophysics, molecular modelling, synthetic organic chemistry and medicinal/pharmaceutical chemistry. Gamma-Glutamyl Transpeptidases (γ-GTs) are members of the N-terminal nucleophile hydrolase superfamily, enzymes that cleave the γ-glutamyl amide bond of glutathione to liberate cysteinylglycine. The released γ-glutamyl group can be transferred to water (hydrolysis) or to amino acids or short peptides (transpeptidation). γ-GT plays a key role in the gamma glutamyl cycle by regulating the cellular levels of the antioxidant glutathione, hence it is a critical enzyme in maintaining cellular redox homeostasis.γ-GT is upregulated during inflammation and in several human tumors, and it is involved in many physiological disorders related to oxidative stress, such as Parkinson's disease and diabetes. Furthermore, this enzyme is used as a marker of

liver disease and cancer. This book covers current knowledge about the structure-function relationship of γ-GTs and gives information about applications of γ-GTs in different fields ranging from clinical biochemistry to biotechnology and biomedicine. A fascinating collection of the pictures, figures, and diagrams that chemists create to explain their craft In A Chemical History Tour, Arthur Greenberg took readers on a wild romp through the history of chemistry, introducing the unique characters, sometimes bizarre theories, and novel experiments that ultimately produced the modern science. Now Greenberg returns with more tales of chemistry glory, lovingly chronicling the extraordinary artwork that alchemists and chemists have produced in their pursuit of understanding the nature of matter in The Art of Chemistry: Myths, Medicines, and Materials. The Art of Chemistry employs 187 figures (including 16 full-color plates) to illuminate 72 essays on the mythical origins, wondrous experiments, and adventurous explorers in the annals of chemistry. Greenberg divides his delightful study into eight sections: Spiritual and Mythological Roots Stills, Cupels, and Weapons Medicines, Purges, and Ointments An Emerging Science Two Revolutions in France A Young Country and a Young Theory Specialization and Systemization Some Fun Each section tracks chemistry's incremental progress from myth to modern science, featuring the figures and diagrams that early chemists used to explain their craft. Along the way, readers will meet the deadly basilisk and the fabulous phoenix that populated the lore of pre-modern chemistry, learn the contributions to chemistry of the American natural philosopher Benjamin Franklin, and encounter Antoine Lavoisier, the father of modern chemistry and perhaps France's greatest economist. Greenberg also examines our fundamental connections with science through two personal essays, one on an adolescent friend who improbably (but perhaps inevitably) became a world-renowned entomology professor and the other on his quest to discover his own chemical heritage. The

Art of Chemistry is sure to inform and entertain anyone interested in our eternal quest to know the natural world. Peptidomimetics have found wide application as bioavailable, and often potent mimetics of natural peptides. They form the basis of important classes of enzyme inhibitors, they act as receptor agonists and antagonists, and they have even been used to mimic DNA structure. Recent advances in the use of solid-phase organic synthesis have paved the way for the preparation of libraries of these structures to allow the rapid optimization of theri biological properties and hence therapeutic potential. We are also beginning to gain a greater understanding of the structural features of this class of compounds that influence their ability to permeate membranes, and their rate of clearance and metabolism. This volume brings together many of these critical issues by highlighting recent advances in a number of core peptidomimetic-based research. Peptidomimetics are compounds which mimic the biological activity of peptides while offering the advantages of increased bioavailability, biostability, bioefficiency, and bioselectivity against the natural biological target of the parent peptide. Examples of peptidomimetics have been isolated as natural products, synthesized as libraries from novel subunits, and designed on the basis of X-ray crystallographic studies and through an intricate knowledge of the biological mode of action of natural peptides. They offer challenging synthetic targets and are increasingly important medicinal agents and biological probes. As a consequence, peptidomimetics embrace much of what is modern medicinal and organic chemistry. This volume highlights some recent and exciting developments in the area. The MPSA international conference is held in a different country every two years. It is devoted to methods of determining protein structure with emphasis on chemistry and sequence analysis. Until the ninth conference, MPSA was an acronym for Methods in Protein Sequence Analysis. To give the conference more flexibility and breadth, the Scientific Advisory Committee of the lOth MPSA

decided to change the name to Methods in Protein Structure Analysis; however, the emphasis remains on "methods" and on "chemistry. " In fact, this is the only major conference that is devoted to methods. The MPSA conference is truly international, a fact clearly reflected by the composi tion of its Scientific Advisory Committee. The Scientific Advisory Committee oversees the scientific direction of the MPSA and elects the chairman of the conference. Members of the committee are elected by active members, based on scientific standing and activity. The chairman, subject to approval of the Scientific Advisory Committee, appoints the Organizing Committee. It is this latter committee that puts the conference together. The lectures of the MPSA have traditionally been published in a special proceedings issue. This is different from, and more detailed than, the special MPSA issue of the Journal of Protein Chemistry in which only a brief description of the talks is given in short papers and abstracts. In the I Oth MPSA, about half the talks are by invited speakers and the remainder were selected from submitted short papers and abstracts. Each title in the 'Primers in Biology' series is constructed on a modular principle that is intended to make them easy to teach from, to learn from, and to use for reference. 1. 1. 4 Nutritional deficiency and excess which form the metabolic enzyme structure of the individual. It is not possible to live for more than 2-3 minutes without oxygen. However, life can continue with 1. 1. 5 Social, population and environmental out water for between 2 and 7 days depending influences on nutrition upon the ambient temperature and the amount of exercise being taken. Survival without any food at The reliable provision of food requires an orga all, but with water, may be for 60-120 days, nized society. A society that is disorganized depending upon the body stores. Females and through war, epidemics of infections or natural those with considerable subcutaneous fat survive disaster is less able to produce or deliver food for longer than slightly built males. than a well-structured stable society with a suffi There are

individual responses to nutritional ciency of healthy workers. It is important that deficiency and excess. Though in general weight food is grown which is appropriate for the partic increase in association with overall excessive eat ular population's social, cultural and religious ing and weight loss is associated with inadequate beliefs. The influences on nutrition (Figure 1. 1) dietary intake. The failure to provide the essential include: amino acids, fats, vitamins and trace elements leads to specific lesions which may progress to • food availability and intake morbidity and death. Enzymes are giant macromolecules which catalyse biochemical reactions. They are remarkable in many ways. Their three-dimensional structures are highly complex, yet they are formed by spontaneous folding of a linear polypeptide chain. Their catalytic properties are far more impressive than synthetic catalysts which operate under more extreme conditions. Each enzyme catalyses a single chemical reaction on a particular chemical substrate with very high enantioselectivity and enantiospecificity at rates which approach “catalytic perfection”. Living cells are capable of carrying out a huge repertoire of enzyme-catalysed chemical reactions, some of which have little or no precedent in organic chemistry. The popular textbook Introduction to Enzyme and Coenzyme Chemistry has been thoroughly updated to include information on the most recent advances in our understanding of enzyme action, with additional recent examples from the literature used to illustrate key points. A major new feature is the inclusion of two-colour figures, and the addition of over 40 new figures of the active sites of enzymes discussed in the text, in order to illustrate the interplay between enzyme structure and function. This new edition provides a concise but comprehensive account from the perspective of organic chemistry, what enzymes are, how they work, and how they catalyse many of the major classes of enzymatic reactions, and will continue to prove invaluable to both undergraduate and postgraduate students of organic, bio-organic and medicinal

chemistry, chemical biology, biochemistry and biotechnology. The second edition of Structure in Protein Chemistry showcases the latest developments and innovations in the field of protein structure analysis and prediction. The book begins by explaining how proteins are purified and describes methods for elucidating their sequences of amino acids and defining their posttranslational modifications. Comprehensive explanations of crystallography and of noncovalent forces-ionic interactions, hydrogen bonding, and the hydrophobic effect-act as a prelude to an exhaustive description of the atomic details of the structures of proteins. The resulting understanding of protein molecular structure forms the basis for discussions of the evolution of proteins, the symmetry of the oligomeric associations that produce them, and the chemical, mathematical, and physical basis of the techniques used to study their structures. The latter include image reconstruction, nuclear magnetic resonance spectroscopy, proton exchange, optical spectroscopy, electrophoresis, covalent cross-linking, chemical modification, immunochemistry, hydrodynamics, and the scattering of light, X-radiation, and neutrons. These procedures are applied to study the folding of polypeptides and the assembly of oligomers. Biological membranes and their proteins are also discussed. Structure in Protein Chemistry, Second Edition, bridges the gap between introductory biophysical chemistry courses and research literature. It serves as a comprehensive textbook for advanced undergraduates and graduate students in biochemistry, biophysics, and structural and molecular biology. Professionals engaged in chemical, biochemical, and molecular biological research will find it a useful reference. The growing need to find a sustainable, environmentally-friendly replacement for petroleum-based materials is fuelling the development of bio-based polymers from renewable resources. Amongst the most promising of these are vegetable oil-based polymeric materials. Vegetable oil-based polymers provides a comprehensive review of the research in this

important field. After an introduction to classification and polymerization, Vegetable oil-based polymers goes on to review the factors involved in polymer biodegradation. The extraction, purification and application of vegetable oils are then explored, along with vegetable oil-based polyesters and poly(ester amide)s, polyurethanes and epoxies. The book then reviews polyamides, polyolefins and vegetable oil-based hyperbranched polymers. It concludes with an analysis of vegetable oil-based polymer composites and polymer nanocomposites. Vegetable oil-based polymers is an indispensable guide for all those involved in the research and development of biopolymers as well as the wide range of industries looking for more sustainable polymer materials. Provides a comprehensive review of recent research in the area of vegetable oil-based polymeric materials Discusses vegetable oils and their derivatives, biodegradable polymers and the fundamentals of polymers Explores the extraction, purification and application of vegetable oils, along with vegetable oil-based polyesters and poly(ester amide)s, polyurethanes and epoxies In recent years, research has shown the importance of peptides in neuroscience, immunology, and cell biology. Active research programs worldwide are now engaged in developing peptide-based drugs and vaccines using modification of natural peptides and proteins, design of artificial peptides and peptide mimetics, and screening of peptide and phage libraries. In this comprehensive book, the authors discuss peptide synthesis and application within the context of their increasing importance to the pharmaceutical industry. Peptides: Synthesis, Structures, and Applications explores the broad growth of information in modern peptide synthetic methods and the structure-activity relationships of synthetic polypeptides. The history of peptide chemistry Amide formation, deprotection, and disulfide formation in peptide synthesis Solid-phase peptide synthesis a-helix formation by peptides in water Stability and dynamics of peptide conformation An overview of structure-function studies of peptide

hormones Neuropeptides:peptide and nonpeptide analogs Reversible inhibitors of serine proteinases Design of polypeptides Current capabilities and future possibilities of soluble chemical combinatorial libraries Epitope mapping with peptides Synthesis and applications of branched peptides in immunological methods and vaccines Appropriate for courses in organic spectroscopy or organic spectroscopic techniques in senior undergraduate and graduate programs. This text authoritatively covers currently used techniques for determining the structure of organic and biological compounds ideal for any practicing or future organic or biochemist. The fundamentals of all four principal spectroscopic methods are covered in depth, each by an experienced author who is a practicing expert in that area. The material is easy to grasp, beginning at the most elementary level and progressing to the level required for organic research. Highlights include the most thorough and current treatment of NMR available, ample problem material, and two new chapters devoted to multiple pulse and two-dimensional methods. This dissertation describes the development of reaction methodologies that utilize unconventional building blocks in chemical synthesis. One major effort involves the nickel-catalyzed net hydrolysis of traditionally inert amide C-N bonds to give carboxylic acids. Additionally, the development of synthetic routes to afford structurally complex bioactive compounds are reported. Specifically, these include the synthesis of a small library of furanoindoline compounds for structure-activity relationship studies related to the treatment of Alzheimer's disease and an alternative synthesis of the nucleobase found in the FDA-approved COVID-19 antiviral remdesivir. Finally, investigations into strained heterocyclic allenes are described. These studies have allowed for highly reactive cyclic allene intermediates to be utilized strategically in the regioselective and enantiospecific synthesis of a diverse array of densely functionalized heterocycles. Furthermore, a synthetic approach toward the synthesis of alstilobanine A is reported,

where the key step hinges on a cycloaddition of an azacyclic allene intermediate. Each of the new strategies presented are expected to expand the synthetic toolbox by leveraging unique reactivity. Chapter one describes the development of a nickel-catalyzed net hydrolysis of amides. The methodology strategically employs a nickel-catalyzed esterification using 2-(trimethylsilyl)-ethanol, followed by a fluoride-mediated deprotection in a single-pot operation. The selectivity and mildness of this transformation are demonstrated through competition experiments and the net-hydrolysis of a complex valine-derived substrate. This strategy addresses a limitation in the field with regard to functional groups accessible from amides using transition metal-catalyzed C-N bond activation. Chapters two and three detail the synthesis of bioactive compounds. Chapter two specifically describes the synthesis of a small library of furanoindoline analogs for structure-activity relationship studies on the inhibition of neutral sphingomyelinase-2 and acetylcholinesterase, enzymes implicated in Alzheimer's disease. The syntheses employ a key interrupted Fischer indolization reaction where the furanoindoline product is elaborated to generate a number of analogs. Identification of the dual inhibitors represents a promising new therapeutic approach to Alzheimer's disease. Chapter three describes an alternative approach to the unnatural nucleobase fragment found in remdesivir (Veklury®), an FDA-approved antiviral for the treatment of COVID-19. The route relies on the formation of a cyanoamidine intermediate, which undergoes a Lewis acid-mediated cyclization to yield the desired nucleobase. The approach is strategically distinct from prior routes and could further enable the synthesis of remdesivir and other small-molecule therapeutics. Chapters four and five are concerned with the investigation of cyclic allene intermediates. Chapter four describes an experimental and computational study of azacyclic allenes, including the synthesis of several substituted azacyclic allene precursors, subsequent allene generation, and trapping in

cycloadditions. Additionally, the computational studies performed provide insight into the underlying reasons for the observed regioselectivities and enantiospecificities. Chapter five details experimental studies of oxacyclic. Specifically, the development of a precursor to 3,4-oxacyclohexadiene and subsequent allene trapping in (4+2), (3+2), and (2+2) cycloadditions is disclosed. Additionally, the first asymmetric synthesis of a silyl triflate cyclic allene precursor was achieved, as well as enantiospecific trapping of the allene. These studies highlighted the potential for cyclic allenes to be valuable building blocks the asymmetric synthesis of heterocycles. Chapter six illustrates the development of an alternative precursor toward strained cyclic allenes and alkynes. Our studies of strained cyclic allenes revealed that, in some cases, silyl triflate precursors were inaccessible. This study shows that silyl tosylates can serve as alternative precursors to strained cyclic allenes and alkynes. Chapter seven details a strategy for the total synthesis of alstilobanine A, a monoterpene indole alkaloid. Our approach hinges on a key (4+2) Diels-Alder reaction between an acetoxy-substituted azacyclic allene intermediate and a pyrone. This cycloaddition forms two key C-C bonds and sets three of the four stereocenters found in the natural product. Current efforts to synthesize the natural product are detailed. If successful, these studies should provide efficient access to alstilobanine A and demonstrate the utility of cyclic allenes in complex molecule synthesis. Finally, chapter eight is a contribution to chemical education. The chapter outlines a new course centered around transition-metal catalysis in modern drug discovery. The course was designed to illustrate the central role of organic chemistry in driving small-molecule drug development and was taught by graduate students with mentorship from a faculty member. Additionally, experts in the fields of catalysis and drug discovery served as guest lecturers throughout the duration of the course. This chapter reflects on the experience of creating and developing the course, and aims to motivate the creation of

future courses that unify fundamental concepts with applications and career outcomes.

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