Hyatt Regency Orange County
January 3-5, 2019

Cover image courtesy of Dr. Crystal D. Rogers, Department of Biology, CSU Northridge — *Chicken cranial neural tube explant.*
### ABOUT THE EVENT

The annual CSU Biotechnology Symposium program is designed to broaden exposure to cutting-edge biotechnologies, product-focused innovation, and the spectrum of career paths available in the life sciences. The symposium brings CSU students, faculty and administrators together, along with biotech professionals working in academia, government and industry. Faculty and administrators system-wide, along with alumni, community college colleagues, use the event to catch up, initiate collaborations, share ideas and swap lessons learned. CSUPERB is excited to welcome you to the 31st Annual CSU Biotechnology Symposium!

### PROGRAM AT-A-GLANCE

**Thursday, January 3**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 AM - 9:30 PM</td>
<td>Registration &amp; Information Desk Open</td>
<td>Grand Foyer</td>
</tr>
<tr>
<td>10:00 AM - 12:30 PM</td>
<td>CSU Affinity Network on Cancer Education and Research (CANCER) Doorstep Meeting</td>
<td>Grand Ballroom A</td>
</tr>
<tr>
<td>Speaker: Dr. Paolo Sassone—Corsi, UC Irvine</td>
<td>Meeting is open to all symposium participants; Pre-registration required.</td>
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<tr>
<td>1:00 - 4:00 PM</td>
<td>CSU I-Corps™ Teams Orientation &amp; Preliminary Lessons Learned (for I-Corps Teams, Mentors &amp; Advisors only)</td>
<td>Garden 2</td>
</tr>
<tr>
<td>1:00 - 5:00 PM</td>
<td>Graduate Research Fellowship Program (GRFP) Proposal Writing Workshop</td>
<td>Garden 3</td>
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<tr>
<td>Workshop Presenters: Sally Pasion (SFSU), Koni Stone (Stanislaus), Matt Cover (Stanislaus), Fauna Yarza (UCSF), Jessica DeSilva (Stanislaus) &amp; Nancy Au (Stanislaus)</td>
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<tr>
<td>1:00 - 4:15 PM</td>
<td>New Faculty Workshop: Help! What does success look like for probationary CSU faculty?</td>
<td>Pacific Room (2nd Floor)</td>
</tr>
<tr>
<td>Speaker: Dr. Anissa J. Brown, NIH National Institute of General Medical Sciences</td>
<td>Workshop is open to CSU faculty and administrators; Pre-registration required.</td>
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<td>4:15 - 5:45 PM</td>
<td>The &quot;Wow Me&quot; Elevator Speech Workshop is open to all symposium participants. Pre-registration required.</td>
<td>Garden 4</td>
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<td>4:15 - 6:00 PM</td>
<td>Writing CSUPERB Grant Proposals Workshop is open to CSU faculty. Pre-registration required.</td>
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<td>6:30 - 9:45 PM</td>
<td>Team Science Workshop Workshop is open to all symposium participants. Pre-registration is required. Featured Speakers: Patrick Krug (CSU Los Angeles), Sairaourazari, Kristina Lovato &amp; Suzie Weng (CSU Long Beach), Monica Lounsbery (CSU Long Beach), and Stanley Maloy (San Diego State University)</td>
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<td>Breakout Session: Bioengineering Workshop Workshop is open to CSU faculty. Pre-registration is required. Featured Speaker: Francisco Valero-Cuevas (University of Southern California).</td>
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<td>Breakout Session: Shared Computing Resources for the CSU Workshop is open to CSU faculty. Pre-registration is required. Featured guests: Jan Gravesen (IBM - California), Christopher Meyer (CSU Fresno), Ganesh Raman (CSU Chancellor's Office), Paul van der Mark (Florida State University).</td>
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Friday, January 4

7:30 AM - 8:15 PM
Registration & Information Desk Open
Grand Foyer

8:30 - 9:15 AM
Plenary Session: Tips for Making the Most Out of the Symposium
Grand Ballroom A

9:30 - 10:15 AM
Plenary Session: Looking Forward, A Conversation with Biotechnology Leaders
Grand Ballroom A
Soraya Coley (President, Cal Poly Pomona)
Dina Lozofsky (Biocom)
Clifford Samuel (Gilead Sciences)

10:30 AM - 12:30 PM
Plenary Session: Don Eden Graduate Student Research Award Talks
Grand Ballroom A

12:30 AM - 1:30 PM
Lunch:
Optional Table Topic Discussions
Grand Ballrooms B-D & Hall

1:45 - 2:45 PM
Plenary Session: Faculty Short Talks and Student Lightning Talks
Grand Ballroom A
Featuring:
Christal Sohl (San Diego State University)
Allison Serrano (undergraduate, CSUFullerton)
Lizett Gonzalez (graduate student, CSU Dominguez Hills)
David Stachura (CSU Chico)
Lynsey Hillberg (undergraduate, CSU Stanislaus)
Nancy Nguyen (graduate student, CSU Sacramento)
Qiao-Hong Chen (CSU Fresno)
Josue Ceron (undergraduate, San Francisco State University)
Liza Pomytkina (graduate student, Cal Poly Pomona)

Friday, January 4 (continued)

3:00 - 5:00 PM
Friday Poster Session:
Posters Numbered #1 - 143
Grand Ballroom E-G

5:15 - 7:15 PM
Student Workshop: Career Networking Session
Garden 1-3

5:15 - 7:15 PM
Faculty Workshop: Effective STEM Education - Course-based Undergraduate Research Experiences (CURES)
Pacific Room (2nd Floor)
Featured Speakers: Nate Jue, Corin Stown & Aparna Sreenivasan (CSU Monterey Bay), James Youngblom (CSU Stanislaus), Anya Goodman & Chris Kitts (Cal Poly San Luis Obispo), Stanley Maloy (San Diego State University & Editor-in-Chief of Journal of Microbiology & Biology Education) & David Rhoads (CSU San Bernardino)

6:30 - 8:00 PM
Dinner
Open seating, dinner served any time between 6:30 - 8:15 pm
Grand Ballrooms B-D & Hall

Saturday, January 5

7:30 AM - 6:30 PM
Registration & Information Desk Open
Grand Foyer

8:30 - 10:30 AM
Plenary Session: Reports from the Cutting-Edge - Immunotherapy
Grand Ballroom A
Michelle Hermiston (UC San Francisco)
Arlen Mardiros (Kite Pharmaceuticals)
Brandon Rosen (Arcus Biosciences)
Saturday, January 5 (continued)

10:45 - 11:45 AM  CSUPERB Faculty Research Award Talk
               Grand Ballroom A

11:45 AM - 1:00 PM  Lunch:
                  Optional Table Topic Discussions
               Grand Ballrooms B-D & Hall

1:00 - 3:00 PM  Saturday Poster Session:
                Posters Numbered #144 - 289
               Grand Ballroom E-G

3:15 - 4:45 PM  CSU I-Corps: Final Lessons Learned
               Featured Speaker: Nina Robson (CSU Fullerton)
               Grand Ballroom A

3:15 - 5:15 PM  Graduate School Information Session
               Kick-off Speaker: Leonila Lagunes (Bardwell lab, UC Irvine & CSU Fullerton alum)
               Garden 1-3

5:00 - 6:30 PM  Plenary Session: Faculty Short Talks and Student Lightning Talks
               Featuring:
               Kimberly Mulligan (CSU Sacramento)
               Nathan Lanning (CSU Los Angeles)
               Grace Prator (undergraduate, CSU Chico)
               Leah Torres (undergraduate, Cal Poly San Luis Obispo)
               Katie Brennan (CSU Fullerton)
               Irving Ramirez (undergraduate, Sonoma State University)
               Danielle Slemons (graduate student, San Diego State University)
               Sami Khuri (San Jose State University)
               Lannah Abasi (undergraduate, CSU Northridge)
               Priyanka Chaudhri (graduate student, CSU Fresno)
               Andrea Swei (San Francisco State University)
               Grand Ballroom A

6:30 - 9:00 PM  Plenary Session: Closing Awards Banquet
               Grand Ballroom B-E
               2019 Andreoli Faculty Service Awardee: Michael Goldman (San Francisco State University)
               2019 Howell-CSUPERB Research Scholars
               2019 Crellin Pauling Student Teaching Awardees: Dream Le (CSU Long Beach) & Michael Friedman (San José State University)
               2019 Glenn Nagel Undergraduate Student Research Award
               2019 Don Eden Graduate Student Research Award
Poster Numbers by Discipline

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<th>Poster Category</th>
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<td>144-150</td>
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<tr>
<td>Biochemistry</td>
<td>8-40</td>
<td>151-180</td>
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<tr>
<td>Bioengineering</td>
<td>41-54</td>
<td>181-194</td>
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<tr>
<td>Clinical</td>
<td>55-59</td>
<td>195-197</td>
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<tr>
<td>Computational (Bio, Chem, Math, Eng, etc.)</td>
<td>60-67</td>
<td>198-204</td>
</tr>
<tr>
<td>Diagnostics/Imaging/Analytical</td>
<td>68-74</td>
<td>205-214</td>
</tr>
<tr>
<td>Disease (Pathogens)</td>
<td>75-87</td>
<td>215-227</td>
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<tr>
<td>Molecular Biology (Include Regulation and Genomics)</td>
<td>88-117</td>
<td>228-260</td>
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<tr>
<td>Other</td>
<td>118-124</td>
<td>261-269</td>
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<tr>
<td>Product-focused Innovation</td>
<td>125-126</td>
<td>270-272</td>
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<tr>
<td>Programmatic (Core, Stem Cell, Bridges, PSM)</td>
<td>127</td>
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<tr>
<td>Proteins (Include Proteomics)</td>
<td>128-133</td>
<td>274-278</td>
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<tr>
<td>Synthetic Chemistry</td>
<td>134-143</td>
<td>279-289</td>
</tr>
</tbody>
</table>

Student Research Awards by Poster Number

Presidents' Commission Scholars
- # 5, 26, 67, 242, 271, 289

Doris A. Howell Women's Health Foundation-CSUPERB Research Scholars
- # 284

2019 Glenn Nagel Undergraduate Research Award
- Finalists and Nominees
  - # 173, 193, 232, 233, 261, 264, 281, 287, 153, 164, 168, 185, 211, 244, 257, 269, 282, 286

2019 Don Eden Graduate Research Award
- Finalists and Nominees
  - # 23, 25, 34, 40, 85, 2, 21, 29, 43, 58, 77, 90, 104, 118, 135

Friday Poster Session
- Posters #1-143
- (Poster presenters should be at posters 3:00-5:00 PM.)
Saturday Poster Session
Posters #144-289
(Poster presenters should be at posters 1:00-3:00 PM)

GRAND BALLROOM E-G

2019 Posters by Poster Number

Legend: Poster Number, Poster Title, Presenting Author Last Name(s), Faculty PI Last Name, Campus. Posters #1-143 will be presented on Friday; #144-289 on Saturday. Complete author lists can be found at www.csuperb.org/symposium/2019posterlist

Friday Poster Session

1. Therapeutic Effect of Photobiomodulation Therapy in Canines Following Dental Prophylaxis - Watson, Brundage, Pomona
2. Improvement of Chilling Efficiency, Meat Quality, and Microbial Safety of Broiler Carcasses Using Sub-zero Saline Solution Chilling - Villani, Morgan, Lee, Bennett, Hurley, Kang, San Luis Obispo
4. Synthesis and evaluation of germacrene, a potential biodiesel compound, in Arabidopsis thaliana - Cerda, Cox-Georgian, Basu, Northridge
5. The Arabidopsis thaliana glutaredoxin AtGRX660 controls lateral root development and shoot organ size - Carpinelli, Cowling, Rosales, Escobar, San Marcos
7. A Mobile Application to Detect Grapevine Pierce’s Disease with Neural Networks - Smizer-Muldoon, Osagie-Amayo, Cruz, El-Kereamy, Ampatzidis, Bakersfield
8. Biochemical and Biophysical Analysis of Apolipoprotein (apo)E3/apoE4 heteromerization - Athari, Tu, Nansanyarwami, Long Beach
10. The effect of t-Darpp Thr-39 phosphorylation on Protein Kinase B (AKT) activation in Herceptin-resistant breast cancer - Singh, Avanes, Momand, Los Angeles
11. A screen to identify new modulators of the Bone Morphogenetic Protein signaling pathway - Castro, Elke, Eivers, Los Angeles
12. Characterizing NP mutant interactions to reveal novel antiviral targets - Atkins, Gallardo, Newcomb, San Bernardino
14. Structural Diversity by Point Mutation in Heptapeptides: Multi-Dimensional NMR Studies - Bentley, Hernandez, Garcia, Krishnam, Malira, Fresno
15. Nanoscale Modifications to the RsaA S-Layer Protein Enhance Lead binding in Whole Cells - Templeton, Coblentz, Cappuccio, Humboldt
16. Lysine 52 contributes to the protein stability of the helix bundle of apolipoporphin III - Tran, Weers, Long Beach
17. Using the Aerobic Enzyme, Citrate Synthase, to Understand Biogeographic Dispersal Potential in Echinoid Larvae - Pouw, Chanian, Reas, Long Beach
18. Investigating transcytosis of apolipoprotein AI in bovine aortic endothelial cells - Meyer, Nguyen, Nansanyarwami, Long Beach
19. Recombinant Expression of Epidermal Growth Factor and Fibroblast Growth Factor in Pichia pastoris for commercial production - James, Tanner, Brooks, Fresno
20. There’s More to Your Gut than Instincts- Investigating the Bacterial Protein BaiH - Rand, Cao, McCulloch, Pomona
21. Probing the lipid binding and self-association properties of apolipoprotein A-I using chimera proteins - Patel, Patel, Long Beach
22. Investigating the role of N-terminal domain exposure of Bax in the Regulation of Intrinsic Apoptosis at the Mitochondria - Friedeck, Dejieno, Fresno
23. Mitochondrial copper binding in LPP rat copper overload - Beuve, Lichtmaneager, Under, Fullerton
24. Optimizing Dephospho-tetrahydromethanopterin (dH4MPT) purification for use in Dihydromethanopterin reductase B (DmR) assay - Aguilar, Riscohe, Fullerton
25. The effects of varying DNA flap length from 20 to 50 deoxynucleotides on the mechanism of single-strand annealing in Saccharomyces cerevisiae - Pregosin, Odaoda, Camberos Felix, Fachhaber, Northridge
27. Mechanisms of G Protein-Selectivity in Muscarinic Acetylcholine Receptor Family - James, Abrol, Northridge
29. Inhibition of Glyoxalase 1 results in marked increase in intracellular glutathione and reduced cell viability in breast and prostate cancer cell lines - Cordova, Ahmad, Gordon, Chen, Mathewson, Mason, Bueno, Kenney, Anderson, Soeytono, Tannes, Northridge
31. Isotope Labeling Native Spider Silk Proteins with NMR-Active Nuclei for Advanced NMR Characterization of Molecular Structure and Dynamics - Vittalba, Sorin, Ondorf, Addison, Holland, San Diego
32. The effect of distance between repeating DNA sequences on DNA repair pathway and nuclease selection following a double-strand break in S. cerevisiae - Camberos Felix, Guezman, Jr., Mardosian, Nazbandyan, Pregosin, Odaoda, Sanchez, Tran, Fachhaber, Northridge
33. Identifying pH Sensitive Tumorigenic Proteins Using A Genetic Screen in Drosophila melanogaster - Orozzo, Gritto-Hill, San Jose
34. Determining the Role of Phosphorylation in RNA Binding Protein Function - Pina, Keppelpolia, Fullerton
35. Designing peptidomimetic inhibitors for the Botulinum Neurotoxin Type A Light Chain - Thompson, Palomino, Rodriquez-Beitran, Saltzameda, Fullerton
37. Detection of covalent heme binding in a bacterial manganese-oxidizing protein - Li Qian, Johnson, Fullerton
38. Hookah and Vaping: Safe Nicotine Delivery Systems? - Bethishou, Dunham, Skelchko, Stone, Stanislaus
39. Synthesis of Model High Denisty Liproprotein Particles for Examining the Relationship Between HDL Particle Size and Apolipoprotein A-I Exchange Rate - Ershahn, Oka, Borja, East Bay
40. Humanization of a MUC16 Specific Monoclonal Antibody for the Treatment of Pancreatic Cancer - White, Brooks, Brooks, Fresno
41. Evaluating Computationally-Efficient Spatial Features in SfMig Array-Based Gesture Recognition - Phan, Zhang, San Francisco
42. A 3D Paper-Based Point-of-Care Diagnostic Device for the Detection of Human Immunodeficiency Virus (HIV-1) Particles - Strong, Tord, Lore, Escavilla, Mercado, Martinez, Martinez, San Luis Obispo
43. Expression and Localization of Mitochondria in Human Adipose-Derived Stem Cells is Affected by Substrate Stiffness - Burch, Javier, Kumar, Day, Luna Lopez, San Mercoz
44. Platform for multiplexed, on-chip microfluidic cell culture optimization with automated image acquisition and impedance monitoring - Foley, Myers, Shavey, Hawkins, San Luis Obispo
45. Microfluidic Studies of a new class of titanium alloys for dental applications - Benoun, Pacheco, Bae, Rawi, Pomona
74. Cord-Based Microfluidic Chips as a Platform for ELISA and Glucose Assays - Elomaa, Gallegos, Gomez, Los Angeles
75. Characterizing Shifts in Microbiome Biogeography Mediated by Inflammatory Skin Disorders - Truong, Peterson, Kumar, Heas, Swamara, Crawford, Sacramento
76. Evaluation of structure-function of a mechanosensitive channel in Trypanosoma cruzi - Tiwari, Foster, Dave, Jimenez, Fullerton
77. Synthesis, Optimization and Analysis of Hexavalent Sulfoglycodendrimers as Anti-Viral Agents - Vierra, McReynoldes, Sacramento
78. H5N1 Influenza Viruses Alter Macrophage Function in a Replication-Dependent Manner - Back, Sato, Oine, Chico
79. Cross-Protective Response Against H1N1 and H3N2 Influenza Challenge Following Vaccination of Mice with Liposomes Containing only the Adjuvant Pam3CAG - Faneuff, Kunihiro, Adler-Moore, Pomona
80. A novel anti-cancer immunotherapy, VAX014, is oncolytic and induces tumor regression in a mouse model of melanoma - Relli, Tsuji, Giacalone, McGuire, San Diego
81. Evaluation of the Pam3CAG adjuvant in Herpes Simplex Virus Type 2 gD3pep Liposomal Vaccine - Gonzalez, Adler-Moore, Pomona
82. Rab8, a small GTPase, plays a regulatory role in Drosophila hemocyte activation during immune response - Harris, Roehandel, Buckley, Pomona
83. The effects of tonB and entA unmarked knockouts on the virulence of Acinetobacter baumannii LAC-4 in a Galleria melonella bacterial infection model - Vivas-Intina, Madrid, Ewing, Xu, Los Angeles
84. Comparison of multiple antibiotic resistance in coliforms at Southern California beaches with differing wave action during dry and wet weather - Hernandez, Arend, Dillon, Long Beach
85. Exposure to hormonal contraceptives increases efflux and antibiotic resistance in Escherichia coli strains - Clee, Van Otterloo, VanderKelen, Yep, San Luis Obispo
86. Curcumin-Mediated Modulation of Bacterial Communities in Inflammatory Skin Dysbiosis - Tran, Valdez, Crawford, Sacramento
87. The role of cannabinoid receptor (CB2 or CB3-2 R) and sex during an acute infection with Candida albicans in mice - Janikian-Urena, Buckley, Pomona
88. cdiA: A necessary gene for hematopoietic progenitor cells - Laurie, Sladchura, Chico
89. Creation of dyrk1b Mutants for Analysis of Potential Roles in Craniofacial Development - Medina, Thomas, Zitser, Nissen, Perez Espinal, Pope, Rodriguez, Steele, Humboldt
90. Transcriptome analysis reveals that Yeast Casein Kinase 2 is involved in nutrient sensing and starvation response of Candida albicans - Loboa, Abanaka, Park, Los Angeles
91. Contraction of Myotonic Dystrophy Type 2-Causing CCTG DNA Repeats - Papp, Hernandez, Kim, San Marcos
92. The farnesoid X receptor-fibroblast growth factor 19 (FXR-FGF19) axis is suppressed by prematurity and regulated by postnatal age in neonatal pigs - Smith, Jiang, Thymann, Sangild, Maj, Manjari, Burin, San Luis Obispo
94. Silencing the Lipoprotein Lipase Gene in Skeletal Muscle Cells Affects the Expression of Enzymes of Glycolysis and Fatty Acid Metabolism - Mogul, Pashanyan, Medh, Northridge
95. Regulation of a dynamically-localizing polyester by three Caulobacter crescentus transcription factors - Rocha, Schreiner, Stott, Vu, Bueno, Avitus, Murray, Northridge
96. Iron-limitation and siderophore formation increase cat gene amplification mutant frequencies in Acinetobacter baylyi - Awmed, Gholbey, Resam, Sacramento
97. Development of Cell-Type Specific Cassettes for Stable Integration and Expression of Fluorescent Proteins and Gene Editing Tools in Human Neural Cells - Johnes, De La Cruz, Anthoney, Steele, Humboldt
98. Analysis of Dyrk1a in Zebrafish Development and Behavior - Zitser, Ashour, Godinez, Medina, Thomas, Sinclair, Burgess, Nissen, Los Angeles
99. The evolutionary relationship between microbiome composition and the host, Drosophila melanogaster - Heydary, Courville, Shahre程序, Fullerton
100. Loss of Lgi1 affects MAPK and mTOR signaling and cellular migration and anchorage independent growth of murine neural progenitor-like cells - Romero, King, Gonzalez, LaCourse, Ottis, Alvarez, Dominowicki, Sproules, Humboldt
101. Analyzing cell cycle and proliferation during neural crest cell development in avian embryos - Altman, Guisinger, Rogers, Northridge
102. Deubiquitinating Usp22 maintains Regulatory T cell identity by stabilizing Foxp3 - Prator, Cortez, Shifrut, Shaked, Manon, Chico
103. Novel Antagonists of Growth Factor Receptor-bound Protein 2 (GRB2) Decrease Proliferation of Chronic Myeloid Leukemia (CML) Cells - Aguilar, Griffin, Arpin, Stachura, Chico
104. Transcriptome analysis demonstrates that low-molecular weight thiols have different functions in heterotrophic and autotrophic bacteria - Thomas, Rawat, Fresno
105. The first draft de novo genome sequence for the hemiclonal fish, Poeciliopsis monacha - Viramontes, Madrid, Ewing, Xu, Los Angeles
106. Cadherin-11 is required for the specification and cell survival of neural crest cells - Menache, Camacho, Rogers, Northridge
107. Effect of Piezo2 gain of function mutations on muscle spindleafferent sensitivity to stretch in adult mice - Klier, Masri, Than, Ma, Patapoutian, Wilkinson, San Jose
108. Use of a 3D cell culture-based assay to study breast cancer cell invasion - Llorda, Liu, Pomona
109. The genetic architecture and tempo of hybrid fitness recovery - Saini, Ross, Fresno
110. Development of a novel tetracycline-inducible Cas13a toolset for targeted degradation of cellular RNAs - Nisson, Perez Espinal, Pope, Rodriguez, Steele, Humboldt
111. Examining Bacterial Flagella with Atomic Force Microscopy - Mera, Karp, Anguiano, Valpandao, Azubi, Chen, San Francisco
112. Understanding the Biological Mechanisms Behind ROS Production Caused by PM 2.5 Using siRNA Gene Silencing - Raval, Kaur, Dejean, Fresno
113. Identification and Characterization of Rare-Earth Transport in Methylobacterium extorquens - Avalia, Cali, Vu, Subbuyal, Wingett, Lien, Skovran, San Jose
114. ASSOCIATED UVRAG - Antikyan, Bilico, Hahn, Malone, Northridge
115. PEAK1-Dependent Factors from Tumor Stroma Drive Tumor Growth and Therapy Resistance via Enrichment of Stem-Like Breast Cancer Cells - Güth, Hamalian, Zervantonakis, Lin, Agajanian, Molnar, Geller, Shiing, Sorger, Brugge, Northridge
116. Effects of Different Wavelengths of Light on Zebrafish Fecundity - Cai, Miel, Belmotte, Thapa, Agglo, Wolf, Smith, Stachura, Chico
117. Transcriptional regulation of the formate branch point and poly-hydroxybutyrate production in Methylobacterium extorquens - Nguyen, Luu, Rahghamaren, Good, Martinez-Gomez, Skovran, San Jose
118. Population Dynamics of Antimicrobial Peptides and Bacteria - Talledo, Snoussi, Del Rosario, Ha, Košmrlj, Tahirian-Araghi, Northridge
119. A novel and engaging approach to Introductory Chemistry Laboratories: A Zoo Inquiry Project - Karmelino, Donnelly, Pence, Fresno
120. Using ultrasonic monitoring and acoustic analyses to detect and monitor bat biodiversity in Sequoia and Kings Canyon National Parks - Steward, Reece, Fresno

WWW.CALSTATE.EDU/CSUPERB
121. Quantification of the transfer mechanism of potentially harmful heavy metals to the inhaled aerosol particles generated by an electronic cigarette - Rastian, Curtis, Fullerton
122. A suicide ideation therapist-chatbot using entity and parts of speech co-reference model - Minhlan, Cruz, Bakersfield
123. Investigation of the kinetics of continuous fermentation - Koen, Butler, San Luis Obispo
124. Developmental Exposure to Bisphenol-A Causes Axon Outgrowth Defects in Drosophila melanogaster - Tinsley, Nguyen, Casiquin, Celobitas, Danogierz, Palacios, Stem, Velch, Mulligan, Sacramento
125. Disruption of Matting-Type Switching in Brewing Saccharomyces cerevisiae Strains by CRISPR/Cas9 for Cell Fusion - Chow, Lee, Shannon, Kang, Stanford
126. Radio-Frequency Power Harvester for Sensors - Russell, Normantas, Gonzaleas, Sonoma
127. Novel methods for rapid establishment and scale up of IPSC - Briggs, Lakehrnprapi, MiocArhur, Dargiz, Mohied, San Marcos
128. Construction and investigation of C-terminal and chimeric Vibrio cholerae SpeG proteins - Lu, Lim, Lim, Gawie, Sills, Boede, Ranello, Mix, Kuhn, San Francisco
129. Differential effect of acidic pH on stability and amyloid formation in wild-type and G26R apolipoprotein A-1 - Tran, Roberts, Sacramento
130. Investigating the Oligomeric State of CsgE - Kaur, Rabi, Jyaseinighe, San Marcos
131. Investigation of HdeA mutants to better understand the mechanism of acid chaperone activation - Geddes-Buehler, Crowhurst, Northridge
132. Use of NMR techniques to describe the interactions of the chaperone protein HdeA with its substrate HisJ - Benson, Crowhurst, Northridge
133. Use of NMR to probe changes in the flexibility of acid-stress chaperone HdeB from its inactive to active state - Abeel, Crowhurst, Northridge
134. Investigative Mechanistic Studies of Lewis Base Catalyst-Controlled Regioselective Chlorination of Arenes and Heterocycles - Dinh, Janke, Brown, Madman, Addison, Gustafson, San Diego
135. Synthesis of an Advanced Intermediate towards Macrocyclic Ketone Mimic of Zampanolide - Jiang, Davis, Chen, Chen, Fresno
137. Mimicking secondary sphere interactions around biological enzyme active sites using single chain polymeric nanoparticles - Gupta, Nguyen, Chua, Radlauer, San Jose
138. Synthesis towards Lactam Mimics of Zampanolide - Gonzalez, Chen, Chen, Fresno
139. Uncovering the Molecular Target of an Antipyocyanin Compound Using a Photoaffinity Labeling Approach - Aboulhosn, Ratt, Karym, San Francisco
140. Synthesis of the Correct Enantiomeric Form of Micromide, a Highly Potent Anti-Cancer Agent from Cyanobacteria - Nelson-Hall, Molina, Wang, Bergdahl, Hecht, San Diego
142. Anti-tumor activity of terpyridine complexes and polypyridine ligands targeting active transport processes - Terzian, Metgar, Kelton, Northridge
143. Drug encapsulation by surface supporting porous crystalline structures - Dui, Ding, Tian, Long Beach
144. Synergistic effects of linked chalcones on Caenorhabditis elegans - Cortez, Escheveria, Aujla, Gist, Kim, Arpin, Calderon-Uma, Fresno
145. A microbial fuel cell-based system for on-site treatment of winery wastewater - Ramirez, Westover, Hughes, Kainuma, Simpson, Gloryner, Cohen, Sonoma
146. Waste Water Quality Improvement by Algae Treatment - Kang, Aline, Moitra, Fresno
147. Long-term nitrogen inputs cause a change in microbial abundance in semi-arid soils of Southern California - Grant, Voortitis, San Marcos
148. Enhancing reference genomes for cross-cultivar functional genomics in apples - Cook, Horneas, Der, Fullerton
149. Characterizing the expression of candidate genes for herbicide resistance in the agricultural weed hairy fleabane (Erigeron bonariensis) - Chaudhari, Arramanis Ochofo, Waselkov, Fresno
150. Design of High-Affinity Metal-Controlled Protein Dimers - Mariconi, Husford, Love, San Diego
152. Thinking Beyond the Transmembrane Box of Biogenic Amine GPCRs: Structural and Functional Hotspots - Quinn, Abrol, Northridge
153. Study of the chemical and signaling bases of ambient particulate matter induced oxidative stress in alveolar macrophages - Olivas, Flores, Waterston, Hasson, Dejan, Fresno
156. Lipoprotein Lipase regulates ATP-Binding Cassette A1 transcription independently of Peroxisome Proliferator-Activated Receptors - Christian, Feoob, Medh, Northridge
158. Development of aptamer-based contrast agents with lower toxicity - Kadeer, Heidarian, Heitz, East Bay
159. Determining the physiological significance of a Rab GAP (GTPase accelerating protein) found at peroxisomes in yeast - Mosb, Delgado, Nickerson, San Bernardino
160. Gyp is a membrane-anchored Rab GAP (GTPase accelerating protein) whose correct targeting to peroxisomes depends upon chaperone Msp1 - Quin, Lin, Nickerson, San Bernardino
161. HspA1A, a 70-kDa heat-shock protein, contains several distinct lipid-binding sites - Daniels, Bres, Nikolaides, Fullerton
162. Elucidating the Molecular Structure, Dynamics and Assembly of Amino Acids and Peptides at Nanoparticle Interfaces - Cao, Swanson, Addison, Holland, San Diego
163. Cysteine Trisulfide Protects Cells Against Electrophile-Induced Death - Henderson, Long, Fukuto, Lin, Sonoma
164. Investigation of Canine Ceruloplasmin – Why is it acting like a much larger protein than it is? - Alm, Kim, Linder, Fullerton
165. The role of kinase activity in the biosynthesis of threonylcarbamoyl adenosine in bacteria - Pannagaram, Luthra, Bayouz, Swarjo, San Diego
166. Determining the role of linker region phosphorylation in Polyypyrmidine Tract Binding Protein 2 splicing activity - Hitch, Medley, Kopp, Fullerton
167. Construction of Plasmids Encoding Fluorescently-labeled RAD10 and YEN1 to Study Temporal and Spatial Relationships during DNA Repair in S. Cerevisiae - Katakachi, Hidi, Fischerhofer, Northridge
168. Enabling the enzymology of human kinases through an expanded genetic code - Vojvoda, Ravatt, Lee, Junco, Qiao, San Luis Obispo
169. IDH1 Allosteric Inhibitors’ Potency Vary Depending on the Enzyme’s Native Activity - Matteo, Luna, Schiffer, Sohli, San Diego

Saturday Poster Session

145. A microbial fuel cell-based system for on-site treatment of winery wastewater - Ramirez, Westover, Hughes, Kainuma, Simpson, Gloryner, Cohen, Sonoma
146. Waste Water Quality Improvement by Algae Treatment - Kang, Aline, Moitra, Fresno

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170. Water-Induced Changes in Molecular and Mechanical Properties of Spider Silk - Trescott, Alabdali, Onofrei, Addison, Holland, San Diego
171. Transport of Chemotherapeutic Agent Paclitaxel by Apolipoprotein E3 containing Nanodiscs - Benedicito, Ly, Nanyasanwasi, Long Beach
172. Effect of Girdin Depletion on Activating Transcription Factor 6 Processing During Endoplasmic Reticulum Stress - Nguyen, Hussain, Villegas, Bhandari, Long Beach
173. Identification and characterization of a novel phosphoregulatory site on cyclin-dependent kinase 5 - Roach, Ngo, Limso, Okio, Bhandari, Long Beach
174. Can the helix bundle of apolipophorin III reform after cleavage into two fragments? - Guiller, Horn, Vixes, Long Beach
176. Understanding G Protein Selectivity of Dopamine Receptors Using Computational Biophysical Methods - Porillo, Abol, Northridge
177. Investigating cosolvent effects on cholinesterases to aid in drug solubility - Novales, Schweins, Long Beach
178. Termination of Bone Morphogenic Protein Signals at the level of Mad linker phosphorylations - Poole, Muradyan, Evers, Los Angeles
179. Overexpression, Purification and Crystallization of the Queuine Salvage Protein DUF2419 - Zarghan, Bayouz, Ludwina, Swazi, San Diego
180. Development of an in vivo biomedical tool to detect changes on Human Skin - MD, Coto, Azadi, San Francisco
181. Quantification of Pericellular Macrophages During Arteriogenesis in a Diet Induced Obese Mouse Model - Landon, Hubbard, Cardenio, San Luis Obispo
182. Wireless Biomechanical Pulse for in vivo Transplanted Tissue Monitoring - Bray, Jiang, San Francisco
183. Evaluation of an artificial pulse for Left Ventricular Assist Devices - Ortiz, Marquez-Maya, Montes, Vu, May-Newman, San Diego
186. Effects of DOD Piezolectric 3D Bioprinting on the Printability of Hydrogels - Meza, Li, Northridge
187. A new class of titanium alloys for structural implants - Bae, Pacheco, Gomez, Patel, Svidensky, Ravi, Pomona
188. Using “Click” Chemistry for the Development of Novel Bioactive Materials - Le, Zweng, Hunter, Knox, Costanizo, Oza, San Luis Obispo
189. Topological design and additive manufacturing of porous metals for bone implant - Soleto, Olmedo, Molthan, Li, Northridge
192. Bioengineered Tissue for Surgical Repair - Padron, Nguyen, Vu, Anderson-Fears, Ayala, Long Beach
193. Visualization of the scattering of high-intensity focused ultrasonic waves at bonephantoms - Brown, Scheidt, Northridge
194. Determining the organizational and functional effects of hyperandrogenism in a letrozole-induced mouse model of polycystic ovary syndrome - Amayo, Thackray, Kelley, San Diego
195. Improving Balance and Gait Using Dual-Task Intervention in Community-Dwelling Older Adults - Tuttle, Krishnan, Cho, White, Ottaf, Long Beach
196. Adolescent male rats exhibit adult-like methamphetamine sensitization in one trial paradigm, while female rats do not. - Sortman, Franco, Nunez, Moreno-Barriga, Iniguez, Zavala, Long Beach
197. Biradical Stability in Bergman Cyclization Products from Benzannelated Eneylines - Wollonsen, Gherman, Spence, Sacramento
198. A bioinformatics approach for Dengue and Zika virus substrate discovery - Salani, Barr, Wolkowicz, San Diego
199. Computational study of the reactivity and chemoselectivity of non-heme iron halogenases - Lindsay, Gherman, Sacramento
200. Computational modeling of DEET analogs to gain insight and develop potent insect repellents - Morelli, Krishnan, Matsumi, Fresno
201. Molecular evolution and functional diversification of the human BCL2-associated athanogene-1 - Nguyen, Chaves, Nikolaides, Fullerton
202. In silico modeling studies and pharmacokinetics–pharmacodynamic computational screening of novel nucleoside analogues - Phree, Nguyen, Awad, Channel Islands
203. A Computational Approach Towards Developing a Green Synthesis Route for Organic Heterocyclic Scaffolds for Pharmaceuticals - Gillette, Abiad, Torres, Petli, Fullerton
204. Visualization of Human Intestinal Epithelium and immune Cell Markers Using Immunofluorescence & Immunohistochemistry - Silva, Barneyo, Gonzalez, Pahar, Porter, Los Angeles
206. Real-Time Monitoring of α-Synuclein-Induced Cell Membrane Disruption Using Scanning Ion Conductance and Surface Plasmon Resonance Microscopies - Parres-Gold, Wong Su, Chieng, Wang, Los Angeles
207. Analyses of Trace Element Composition in a Metastatic Breast Cancer Model using X-Ray Fluorescence - Pyreddy, Sethriveetan, Gheras, Bush, Fresno
208. Development of a novel biochemical assay for peroxisome biogenesis and cargo transport - Vuong, Nickerson, San Bernardino
209. 3D Multilayered Paper- and Thread-Based Microfluidic Devices for Bioassays - Naris, Guvera, Gonzalez, Gomez, Los Angeles
210. Optimization of the Selection and Screening of DNA Amplers - Garrett, Chen, Liu, Pomona
211. Reducing Waste of Biological Reagents: Polymer-Based Solid Dispersions of Enzymes - Mitchell, Strong, Plastina, Martinez, Martinez, San Luis Obispo
212. Automation of chromatOF and software development for non targeted analysis of contaminants - Sharma, Kehly, Holt, Dooler, Richardot, San Diego
214. Antimicrobial Resistance in Bacillus Strains Found in Probiotics - Flores, Kaze, Sistrom, Van Laer, Fresno
215. Pyrvinium pamoate inhibits Candida albicans growth and morphogenesis - Zujeva, Micles, Park, Los Angeles
216. How does ROP23 contribute to Toxoplasma pathogenesis? - Rodriguez, Guillon, Eisel, Bay
217. Generation of influenza NP-FLAG virus to facilitate NP interaction studies - Berumen, Rodriguez, Newcomb, San Bernardino
218. Escherichia coli strains that accumulate glycogen display increased growth in urine - Andrews, Yep, San Luis Obispo
219. Cooperation and Competition for Short and Long Chain Fatty Acid Metabolites within Polymicrobial Biofilm Infections - Hsu, Nguyen, Cummings, Davis, Crawford, Sacramento
220. The generation of a markerless twelve-gene cluster knockout for the hydroxamate siderophore cluster in hypervirulent Acinetobacter baumannii LAC-4. - Leal, Ewing, Xu, Los Angeles
221. Augmenting the Barrier Function of Alveolar Type II Cells with the Cytokines Tumor Necrosis Factor-α, Interferon-γ, Interleukin-17, and Interleukin-22 - Coello, Porter, Los Angeles
222. Determining the tradeoffs between mating and immunity in male and female Drosophila melanogaster - Ekohnath Ria, Cheek, Fullerton
223. Probiotic inclusion in a high-fructose high-fat diet does not prevent the onset of liver injury in a pig model of pediatric non-alcohol fatty liver - Hernandez, Melnyk, Smith, Columbus, VanderKelen, Kitts, Bumr, Fajin, Mej, San Luis Obispo

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224. Isolation and Characterization of Avian Influenza Viruses in Northern California - Bianchini, Burnis, Bogiatto, Donatello, Cline, Chico

225. An Inexpensive Quantitative Method for Testing Anti-Fungal Drug Activity Using the Invertebrate - Pomytkina, Adler-Moore, Pomona

226. Distribution, Characterization, and Whole Genome Sequencing of Carbapenem-Resistant Bacteria in Los Angeles Area Soils - Lopez, Farsas, Ruiz Rueda, Northridge

227. Mitochondrial-nuclear genetic incompatibility causes hybrid developmental delay - Talukdar, Roses, Fresno

228. Characterizing the Promoter Region of Recombination Signal Binding Protein for Immunoglobulin Kappa J region - Salazar, Jocel-Perez, Malone, Northridge

229. Testing the role of a consensus sequence for Chvl-dependent gene regulation in the nitrogen-fixing bacterium Sinorhizobium mellotii - Ortega, Dela Cruz, Chen, Fullerton

230. cAMP Pathway Dependent Mechanism Stimulates Insulin Secretion via Regulation of miR-375 and ICER Gene Expression - Nielsen, Fries, Teazis, Keller, Chico

231. A protease and a lipoprotein jointly regulate microbe-plant symbiosis - Cerón, Chen, San Francisco

232. Characterize Influenza NP-NS1 interaction as novel antiviral target - Gazzis, Newcomb, San Bernardino

233. Differential expression of Nicotiana glutinosa genes in defense against Pterospermum infection - Weir, Dor, Szcz, Fullerton

234. Lipid Droplet Dynamics during Phagocytosis in Drosophila Hemocytes - Myers, Quidapide, Brennan, Fullerton

235. Complementation of the f01A and f01C deletion in Escherichia coli by Ricketsia genes encoding dihydroxyacetone reductase and dihydroxyfatty synthase - Schaff, Hill, Shreli, Zhong, Humboldt

236. Enrichment of precursor cells of gene amplification mutants prior to selective pressure in Acinetobacter baylyi - Herrmann, Diffanturion, Quinones-Soto, Reams, Sacramento

237. Functional studies of Retinoic Acid Induced 14 during microenvironment remodeling and progression in pancreatic cancer - Runia, Gonzalez, Cox, Adamian, Hong, Bhakta, Hoover, Boyce, Kelber, Northridge

238. Localization and role of a mechanosensitive channel in the procyclic form of Trypanosoma brucei. - Hernandez, Nguyen, Dave, Jimenez-Ortiz, Fullerton

239. Short photoperiod reduces RNA binding protein Mex3a; however, does not alter expression ofendoribonuclease Dicer in oocytes of Siberian hamsters (Ph - Song, Chin, Young, Long Beach

240. Dementia and Notch Implicate the Gamma Secretase Complex in the Developmental Response to Ethanol - Darwish, Belhorma, French, San José

241. The Role of Epigenetics in Plant Adaptation Across an Elevational Cline in Arabidopsis thaliana - Fabunan, Toner, Waters, San Diego

242. The Effect of Valproic Acid on CRISPR-Cas9-mediated genome editing - Huang, Yamamoto, Johnston, San José

243. Characterization of the Ssp Regulon of Escherichia coli in Long-Term Stationary Phase - Gonzalez Carron, Kram, Dominguez Hills

244. The Effects a High Fat Diet has on Drosophila melanogaster's Fecundity and Metabolic Gene Expression - Aronga, Reyes, Makay, Eldon, Long Beach

245. Neurobehavioral Analysis of the Trapped in Endoderm 1 GPCR Pathway - Tran, Mu, French, San José

246. Developing Tissue Sampling and RNA Extraction Methods to Study Genetic Mechanisms of Thermal Tolerance in the Marine Snail Chlorotoma funebralis - Ayala-Valdez, Bedolla, Gleason, Sacramento

247. Development and Stable Integration of Tetracycline Inducible Tools for Genome Editing and Genome Regulation in Cultured Human Embryonic Kidney Cells - Rodriguez, Pope, Mueller, Villa, Steele, Humboldt

248. Sympathetic neurotransmitters decrease muscle spindle afferent sensitivity to muscle stretch in adult mice. - Hennisch, Sanchez, Wilkinson, San José

249. Site Specific Mutagenesis in E. coli Plasmids using CRISPR - Mocko, Green, Youngblom, Starklaus

250. Gryso-mediated Supercoiling Modules the Expression of the Caulobacter crescentus scIP Promoter - Requena, Heasley, Kumar, Murray, Northridge

251. Dissecting the relationship between Sox10 and the neural crest gene regulatory network in two vertebrate species - Camacho-Avila, Rogers, Northridge

252. Developmental Ethanol Exposure Slows Down the Aging Process in Drosophila Melanogaster - Bethorma, Darwish, Northridge

253. Coupling of two cell-based counter screens to reveal potential antivirals against Dengue virus - Stemons, Carter, Smith, O'Connell, Towle, California

254. Pyrrolquinoline quinone is required for lanthanide-dependent methanol dehydrogenase expression in Methylobacterium extorquens - Hoober, Nguyen, Valentine Crisostomo, Kaur, Skovran, San José

255. Targeted induction of MCOLN2 and MCOLN3 Gene Expression using Drug Compounds - Sanchez, Cuajungco, Fullerton

256. Regulation of transilien synthesis polymers et ca and kappa in response to DNA replication stress - Eruaga, Huang, Myamoto, Fullerton

257. Metastatic Breast Cancer Secretomes are Enriched for an LCN2 Axis and Induce Differential Stromal Remodeling within the Lung and Brain - Aguayo, Meade, García, Nadeles, Hamilton, Ulrich, Banner, Kelber, Northridge


259. The Role of E4BP4 in Apoptosis of Human Leukemia Cells in Culture - Mitchell-Velasquez, Gomez, Medh, Northridge


261. The Environmental Neurotoxicant Polychlorinated Biphenyl-95 Phenocopies a Common Autism Risk Gene in Drosophila melanogaster - Murphy, Nguyen, Snyder, Ghenta, Welch, Mulligan, Sacramento

262. Gas phase infiltration of porous materials via Atomic layer Deposition – a great opportunity for functional biomaterial development - Yang, Fairchild, Gu, San Diego

263. Using biotechnology to choose bat deployment sites: the role of structural and acoustic complexity - Graves, Reece, Fresno

264. Heterozygous loss of kismet, the Drosophila ortholog of an autism-risk gene, affects axon outgrowth and courtship phenotypes in adult fruit flies - Welch, Hu, Low, Murphy, Nguyen, Mulligan, Sacramento

265. Monitoring Foaming Bacteria's (Gordonia amarae) Growth in a Partially Nitrifying Water Reclamation Plant - Avezapahangul, Nguyen, Long Beach

266. The effects of dredge deposition on avian and beach macroinvertebrate biodiversity in Morro Bay, California - Meheen, Reece, Fresno

267. The Role of Androgen Receptor in Regulation of Sexual Dimorphism in Hippocampal Morphology of Juvenile Mice - Song, Chiu, Kim, Tsai, Long Beach


269. Development of a Handheld Medical Device for Saliva Screening - Karwa, Berman, Luna, Toehmien, Mandell, Long Beach

270. Development of An Affordable Pneumatic Hand Prosthesis and Control System - Schonger, Oberreiner, Maritime

271. The design and validation of CRISPR guide RNAs specific for the Rho locus - Keng, Swen, Kim, Johnston, San José

272. Empowering Lower Division Undergraduates to Engage in Cross-Disciplinary Research - Arroyo, Chen, Resche, Robin, Fullerton

273. A Potential Secondary Function of One of the Four RNA Binding Domains in PTBP1 - Penallta, Miyamoto, Kappettipopa, Fullerton

274. Optimization of Recombinant a Beetle Antifreeze Protein Production in Escherichia coli - Lee, Lu, Enrique, Lomitaio, Ortiz, Salgado, Perez, Lopez, Wen, Los Angeles

275. Sexually Dimorphic Expression of RBM48 Protein in the Developing Mouse Cerebral Cortex and Hippocampus - Lertpanit, Tsai, Long Beach

276. Assessing the effect of heparin on acid-induced aggregation in apolipoprotein A-I variants - Nguyen, Roberts, Sacramento
277. Development of a platform that monitors cleavage during transport to and at the cell surface - Ventola, Salazar, Nader, Smurthwaite, Wolkowicz, San Diego


279. A New Hope For Antibiotic Drug Discovery: Nucleoside analogue inhibitors of GTP cyclohydrolase I (GCYH-I) as a potential new class of antibiotics - Samnan, Wyllie, Paranagama, Swairjo, Purse, San Diego

280. Structural Optimization of Atropisomeric Pyrrolopyrimidine Ret Kinase Inhibitors - Toenjes, Garcia, Maddox, Dawson, Cardenas, Saputra, Gustafson, San Diego

281. Chiral Bisphosphorylimides as Organocatalysts for Enantioselective Friedel–Crafts Reactions - Apolinar, Iafe, San Marcos

282. Microwave-Assisted Gold(I) Reaction of Benzylic Alcohols for the Preparation of Modified 1,2,3-Benzotriazoles - Nguyen, Perez, Iafe, San Marcos


284. Optimization of an Octavalent Dendrimer Core Synthesis - Zimmerman, Cerny, McReynolds, Sacramento

285. A simple total synthesis of (+)-Azaspirene, a formidable anti-angiogenesis instrument against cancer - Black, Bender, Walsworth, Bergdahl, Hecht, San Diego

286. Preparation of Bioactive 1,2,3-Benzotriazole Targets by a Microwave-Assisted Gold(I) Catalysis Procedure - Shabo, Franco-Bolanos, Iafe, San Marcos

287. Enzyme-Like Catalysis: Encasing Methane Monooxygenase Mimics in a Polymer Scaffold for Improved Catalysis - Ordona, Tafuri, Navarro, Radlauer, San Jose

288. A Rapid Determination of Enantiopurity of P-Chiral Compounds With Eu(hfc)3: the Terminal Methyl Group Signal is Most Diastereotopically Affected - Ly, Tran, Pace, Nakayama, Long Beach

289. Scope of the Gold(I)-IPr-OH-Catalyzed Synthesis of Benzo[b]thiophenes - Keophiphone, Sanchez, Muchalski, Fresno

ABOUT CSUPERB

The California State University Program for Education and Research in Biotechnology (CSUPERB) mission is to develop a professional biotechnology workforce by mobilizing and supporting collaborative CSU student and faculty research, innovating educational practices, and partnering with the life science industry.

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