

## *Curriculum Vitae* Floyd Eric Romesberg

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### Research Interests

The Romesberg group is pursuing four projects that are focused on using multidisciplinary approaches to understand evolution.

- 1) Developing unnatural base pairs with which to expand the genetic alphabet and thereby increase the chemical and functional potential of DNA and RNA and generate semi-synthetic organisms with increased potential for the storage and retrieval of genetic information.
- 2) The directed evolution of DNA polymerases with novel activities.
- 3) Using principles of evolution, as well as conventional synthetic and medicinal chemistry approaches, to identify and develop novel broad-spectrum antibiotics.
- 4) Developing tools that allow for the application of steady-state and time-resolved UV/vis and IR spectroscopy to understand how proteins are evolved for biological function.

### Education

| <i>Description</i>    | <i>Date</i> | <i>Location</i>                        | <i>Advisor</i>             |
|-----------------------|-------------|----------------------------------------|----------------------------|
| Postdoctoral Research | 1994–1998   | UC Berkeley, Berkeley, CA              | Professor Peter G. Schultz |
| Ph.D. in Chemistry    | 1994        | Cornell University, Ithaca, NY         | Professor David B. Collum  |
| M.S. in Chemistry     | 1990        | Cornell University, Ithaca, NY         | Professor David B. Collum  |
| B.S. in Chemistry     | 1988        | Ohio State University,<br>Columbus, OH | Professor Matthew S. Platz |

### Appointments

|                |                                                                              |
|----------------|------------------------------------------------------------------------------|
| 2014 – present | Professor, Department of Chemistry, The Scripps Research Institute           |
| 2006 – 2014    | Associate Professor, Department of Chemistry, The Scripps Research Institute |
| 1998 – 2006    | Assistant Professor, Department of Chemistry, The Scripps Research Institute |

### Professional Experience

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|----------------|------------------------------------------------------------------------------------------------------------------------|
| 2014 – present | Synthorx Inc., La Jolla, CA (Scientific Founder, Consultant, SAB member)                                               |
| 2010 – 2013    | RQx Pharmaceuticals, Inc., La Jolla, CA (Scientific Founder, Consultant, SAB member);<br>Acquired by Genentech in 2013 |
| 2005 – 2011    | Achaogen Inc., South San Francisco, CA (Scientific Founder, Consultant, SAB member);<br>NASDAQ: AKAO                   |

### Honors

|             |                                                                        |
|-------------|------------------------------------------------------------------------|
| 2015        | ACS Nobel Laureate Signature Award for Graduate Education in Chemistry |
| 2008 – 2009 | Member, Institute for Defense Analysis, Defense Science Study Group    |
| 2005        | World Technology Award Nominee in Biotechnology                        |

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|-----------|-------------------------------------------------------------|
| 2004      | Discover Magazine Technology Innovation Award               |
| 2004      | NSF CAREER Award                                            |
| 2003      | Camille Dreyfus Teacher Scholar Award                       |
| 2003      | Susan B. Komen Breast Cancer Foundation Award               |
| 2002      | The Baxter Foundation Award                                 |
| 1994–1996 | NIH National Research Service Award Postdoctoral Fellowship |
| 1987      | The Mac Nevin Award                                         |

### **Publications: Principal Investigator, Primary Research Articles**

1. AW Feldman, **FE Romesberg** (2017) In vivo structure-activity relationships and optimization of an unnatural base pair for replication in a semi-synthetic organism, *J Am Chem Soc* 139:11427-11433
2. T Chen, **FE Romesberg** (2017) Polymerase chain transcription: exponential synthesis of RNA and modified RNA, *J Am Chem Soc* 139:9949-9954
3. SE Morris, AW Feldman, **FE Romesberg** (2017) Synthetic biology parts for the storage of increased genetic information in cells, *ACS Synth Biol*, published online June 27
4. R Adhikary, YX Tan, J Liu, J Zimmermann, M Holcomb, C Yvellez, PE Dawson, **FE Romesberg** (2017) Conformational heterogeneity and DNA recognition by the morphogen bicoid, *Biochemistry* 56:2787-2793
5. D Thirunavukarasu, T Chen, Z Liu, N Hongdilokkul, **FE Romesberg** (2017) Selection of 2'-fluoro-modified aptamers with optimized properties, *J Am Chem Soc (Comm)* 139:2892-2895
6. AW Feldman, VT Dien, **FE Romesberg** (2017) Chemical stabilization of unnatural nucleotide triphosphates for the in vivo expansion of the genetic alphabet, *J Am Chem Soc* 139:2464-2467
7. Y Zhang, BM Lamb, AW Feldman, AX Zhou, T Lavergne, L Li, **FE Romesberg** (2017) A semisynthetic organism engineered for the stable expansion of the genetic alphabet, *Proc Natl Acad Sci USA* 114:1317-1322
8. R Adhikary, J Zimmermann, **FE Romesberg** (2017) Transparent window vibrational probes for the characterization of proteins with high structural and temporal resolution, *Chem Rev* 117:1927-1969
9. T Chen, N Hongdilokkul, Z Liu, D Thirunavukarasu, **FE Romesberg** (2016) The expanding world of DNA and RNA, *Curr Op Chem Biol* 34:80-87
10. T Chen, N Hongdilokkul, Z Liu, R Adhikary, SS Tsuen, **FE Romesberg** (2016) Evolution of thermophilic DNA polymerases for the recognition and amplification of C2'-modified DNA, *Nat Chem* 8:556-562
11. T Lavergne, R Lamichhane, DA Malyshev, Z Li, L Li, E Sperling, JR Williamson, DP Millar, **FE Romesberg** (2016) FRET characterization of complex conformational changes in a large 16S ribosomal RNA fragment site-specifically labeled using unnatural base pairs, *ACS Chem Biol* 11:1347-1353
12. R Adhikary, J Zimmermann, PE Dawson, **FE Romesberg** (2015) The temperature dependence of CN and SCN IR absorptions facilitates their interpretation and use as probes of proteins, *Anal. Chem.* 87:11561-11567 PMID: 26523838
13. A Craney, MM Dix, R Adhikary, BF Cravatt, **FE Romesberg** (2015) An alternative terminal step of the general secretory pathway in *Staphylococcus aureus*, *mBio*. 6:e01178-15. PMID: 26286693
14. DB Steed, J Liu, E Wasbrough, L Miller, S Halasohoris, J Miller, B Somerville, JR Hershfield, **FE Romesberg** (2015) Origins of *Y. pestis* sensitivity to the arylomycin antibiotics and the inhibition of type I signal peptidase, *Antimicrob. Agents Chemother.* 59:3887-3898. PMID: 25896690
15. A Craney, **FE Romesberg** (2015) A putative Cro-like repressor contributes to arylomycin resistance in *Staphylococcus aureus*, *Antimicrob. Agents Chemother.* 59:3066-3074. PMID: 25753642
16. RA Adhikary, W Yu, M Oda, T Chen, R Walker, R Stanfield, I Wilson, J Zimmermann, **FE Romesberg** (2015) Adaptive mutations alter antibody structure and dynamics during affinity maturation, *Biochemistry* 54:2085-2093. PMID: 25756188
17. RA Rodriguez, DB Steed, Y Kawamata, S Su, PA Smith, TC Steed, **FE Romesberg**, PS Baran (2014)

- Axinellamines as broad-spectrum antibacterial agents: scalable synthesis and biology, *J Am Chem Soc* 136:15403-15413. PMID: 25328977
18. R Adhikary, J Zimmermann, J Liu, RP Forrest, TD Janicki, PE Dawson, SA Corcelli, **FE Romesberg** (2014) Evidence of an unusual N–H···N hydrogen bond in proteins, *J Am Chem Soc* 136:13474-13477. PMID: 25226114.
  19. K Dhami, DA Malyshev, P Ordoukhanian, T Kubelka, M Hocek, **FE Romesberg** (2014) Systematic exploration of a class of hydrophobic unnatural base pairs yields multiple new candidates for the expansion of the genetic alphabet, *Nucleic Acids Res* 42:10235–10244. PMID: 25122747.
  20. DA Malyshev, K Dhami, T Lavergne, T Chen, N Dai, JM Foster, IR Corrêa, **FE Romesberg** (2014) A semi-synthetic organism with an expanded genetic alphabet, *Nature* 509:385-388. [featured on the cover] PMID: 24805238
  21. R Adhikary, J Zimmermann, PE Dawson, **FE Romesberg** (2014) IR probes of protein microenvironments: utility and potential for perturbation, *Chemphyschem* 15:849-853. PMID: 24519759.
  22. L Li, M Degardin, T Lavergne, DA Malyshev, K Dhami, P Ordoukhanian, **FE Romesberg** (2014) Natural-like replication of an unnatural base pair for the expansion of the genetic alphabet and biotechnology applications, *J Am Chem Soc* 136:826-829 [cover story]. PMID: 24152106
  23. K Betz, DA Malyshev, T Lavergne, W Welte, K Diederichs, **FE Romesberg**, A Marx (2013) Structural insights into DNA replication without hydrogen bonds, *J Am Chem Soc* 135:18637-18643. PMID: 24283923
  24. J Liu, PA Smith, DB Steed, **FE Romesberg** (2013) Efforts toward broadening the spectrum of arylomycin antibiotic activity, *Bioorg Med Chem Lett* 23:5654-5659. PMID: 24012184
  25. Z Li, T Lavergne, DA Malyshev, J Zimmermann, R Adhikary, K Dhami, P Ordoukhanian, Z Sun, J Xiang, **FE Romesberg** (2013) Site-specifically arraying small molecules or proteins on DNA using an expanded genetic alphabet, *Chem Eur J* 19:14205-14209. PMID: 24026962
  26. R Adhikary, J Zimmermann, J Liu, PE Dawson, **FE Romesberg** (2013) Experimental characterization of electrostatic and conformational heterogeneity in an SH3 domain, *J Phys Chem B* 117:13082-13089. PMID: 23834285
  27. T Lavergne, M Degardin, DA Malyshev, HT Quach, K Dhami, P Ordoukhanian, **FE Romesberg** (2013) Expanding the scope of replicable unnatural DNA: stepwise optimization of a predominantly hydrophobic base pair, *J Am Chem Soc* 135:5408-5419. PMID: 23547847
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  29. DA Malyshev, K Dhami, HT Quach, T Lavergne, P Ordoukhanian, A Torkamani, **FE Romesberg** (2012) Efficient and sequence-independent replication of DNA containing a third base pair establishes a functional six letter genetic alphabet, *Proc Natl Acad Sci USA*, 109:12005-12010. PMID: 22773812
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  31. R Adhikary, W Yu, M Oda, J Zimmermann, **FE Romesberg** (2012) Protein dynamics and the diversity of an antibody response, *J Biol Chem* 287:27139-27147. PMID: 22685303
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  33. W Yu, PE Dawson, J Zimmermann, **FE Romesberg** (2012) Carbon-deuterium bonds as probes of protein thermal unfolding, *J Phys Chem B*, 116:6397-6403. PMID: 22625650
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- DNA and RNA using an efficiently replicated and transcribed class of unnatural base pairs, *J Am Chem Soc* 133: 19878-19888. PMID: 21981600
37. J Liu, C Luo, PA Smith, JK Chin, MGP Page, M Paetzel, **FE Romesberg** (2011) Synthesis and characterization of the arylomycin lipoglycopeptide antibiotics and the crystallographic analysis of their complex with signal peptidase, *J Am Chem Soc* 133: 17869-17872. PMID: 21999324
  38. KC Nicolaou, SP Ellery, F Rivas, K Saye, E Rogers, TJ Workinger, M Schallenger, R Tawatao, A Montero, A Hessel, **F Romesberg**, D Carson, D Burton (2011) Synthesis and biological evaluation of 2',4'- and 3',4'- bridged nucleoside analogues, *Bioor Med Chem* 19: 5648-5669. PMID: 21840722
  39. J Zimmermann, MC Thielges, YJ Seo, PE Dawson, **FE Romesberg** (2011) Cyano groups as probes of protein microenvironments and dynamics, *Angew Chem Int Ed* 50: 8333-8337. PMID: 21780257
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  52. P Weinkam, J Zimmermann, **FE Romesberg**, PG Wolynes (2010) The folding energy landscape and free energy excitations of cytochrome *c*, *Acc Chem Res* 43:652-660. PMID: 20143816
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  56. J Zimmermann, K Gundogdu, ME Cremeens, JN Bandaria, GT Hwang, MC Thielges, CM Cheatum, **FE Romesberg** (2009) Efforts toward developing probes of protein dynamics: vibrational dephasing and relaxation of carbon-deuterium stretching modes in deuterated leucine *J Phys Chem B* 113:7991-

7994. PMID: 19441845
57. DA Harris, M E Powers, **FE Romesberg** (2009) Synthesis and biological evaluation of penem inhibitors of bacterial signal peptidase *Bioorg Med Chem Lett* 19:3787-3790. PMID: 19427205
  58. ME Cremeens, J Zimmermann, W Yu, PE Dawson, **FE Romesberg** (2009) Direct observation of structural heterogeneity in a  $\beta$ -sheet, *J Am Chem Soc* 131:5726-5727. PMID: 19351132
  59. MC Thielges, J Zimmermann, **FE Romesberg** (2009) Direct observation of ligand dynamics in cytochrome *c*, *J Am Chem Soc* 131:6054-6055. PMID: 19361220
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  62. D Groff, MC Thielges, S Celliti, PG Schultz, **FE Romesberg** (2009) Efforts toward the direct experimental characterization of enzyme microenvironments: tyrosine 100 in dihydrofolate reductase, *Angew Chem, Int, Ed* 48:3478-3481. PMID: 19347910
  63. P Weinkam, **FE Romesberg**, PG Wolynes (2009) Chemical frustration in the protein folding landscape: grand canonical ensemble simulations of cytochrome *c*, *Biochemistry*, 48:2394-2402. PMID: 19199810
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  65. YJ Seo, G T Hwang, P Ordoukhanian, **FE Romesberg** (2009) Optimization of an unnatural base pair towards natural-like replication, *J Am Chem Soc* 131:3246-3252. PMID: 19256568
  66. P Weinkam, J Zimmermann, LB Sagle, S Matsuda, PE Dawson, PG Wolynes, **FE Romesberg** (2008) Characterization of alkaline transitions in ferricytochrome *c* using carbon-deuterium infrared probes, *Biochemistry* 47:13470-13480. PMID: 19035653
  67. Y Hari, GT Hwang, AM Leconte, N Joubert, M Hock, **FE Romesberg** (2008) Optimization of the pyridyl nucleobase scaffold for polymerase recognition and unnatural base pair replication, *ChemBioChem* 9:2796-2799. PMID: 19012285
  68. GT Hwang, **FE Romesberg** (2008) The unnatural substrate repertoire of A, B, and X family DNA polymerases, *J Am Chem Soc* 130:14872-14882. PMID: 18847263
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  70. MC Thielges, DA Case, **FE Romesberg** (2008) Carbon-deuterium bonds as probes of dihydrofolate reductase, *J Am Chem Soc* 130:6597-6603. PMID: 18412341
  71. ET Lis, BM O'Neill, C Gil-Lemaigre, JK Chin, **FE Romesberg** (2008) Identification of pathways controlling DNA damage induced mutation in *Saccharomyces cerevisiae*, *DNA Repair* 7:801-810. PMID: 18400565
  72. AM Leconte, GT Hwang, S Matsuda, P Capek, Y Hari, **FE Romesberg** (2008) Discovery, characterization, and optimization of an unnatural base pair for expansion of the genetic alphabet, *J Am Chem Soc* 130:2336-2343. PMID: 18217762
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  74. GT Hwang, AM Leconte, **FE Romesberg** (2007) Polymerase recognition and stability of fluoro substituted pyridone nucleobase analogs, *ChemBioChem* 8:1606-1611. PMID: 17647205
  75. S Matsuda, JD Fillo, AA Henry, P Rai, SJ Wilkens, TJ Dwyer, BH Geierstanger, DE Wemmer, PG Schultz, G Spraggon, **FE Romesberg** (2007) Efforts toward expansion of the genetic alphabet: structure and replication of unnatural base pairs, *J Am Chem Soc* 129:10466-10473. PMID: 17685517
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  118. OK Abou-Zied, R Jimenez, **FE Romesberg** (2001) Tautomerization dynamics of a model base-pair in DNA, *J Am Chem Soc* 123:4613-4614. PMID: 11457253
  119. JK Chin, R Jimenez, **FE Romesberg** (2001) Direct observation of protein vibrations by selective incorporation of spectroscopically observable carbon-deuterium bonds in cytochrome *c*, *J Am Chem Soc* (Comm), 123:2426-2427. PMID: 11456893
  120. H Shulman, C Makarov, AK Ogawa, **FE Romesberg**, E Keinan (2000) Chemically reactive immunogens lead to functional convergence of the immune response, *J Am Chem Soc* 122:10743-10753. DOI: 10.1021/ja000616o

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123. M Berger, Y Wu, AK Ogawa, DL McMinn, PG Schultz, **FE Romesberg** (2000) Universal bases for hybridization, replication, or chain termination, *Nucleic Acids Res* 28:2911-2914. PMID: 10908353
124. Y Wu, AK Ogawa, M Berger, DL McMinn, PG Schultz, **FE Romesberg** (2000) Efforts toward the expansion of the genetic alphabet: optimization of interbase hydrophobic interactions, *J Am Chem Soc* 122:7621-7632. DOI: 10.1021/ja0009931
125. M Berger, AK Ogawa, DL McMinn, PG Schultz, **FE Romesberg** (2000) Stable and selective hybridization of oligonucleotides using unnatural hydrophobic bases, *Angew Chem Int Ed* 39:2940-2942. PMID: 11028017
126. AK Ogawa, Y Wu, DL McMinn, J Liu, J-Q, PG Schultz, **FE Romesberg** (2000) Efforts toward the expansion of the genetic alphabet: information storage and replication with unnatural hydrophobic base pairs, *J Am Chem Soc* 122:3274-3287. DOI: 10.1021/ja9940064
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#### **Publications: Principal Investigator, Invited Reviews.**

129. A Craney, **FE Romesberg** (2016) Discovery of novel antibacterials, *Bioorg Med Chem* 24:6225-6226
130. SI Walsh, A Craney, **FE Romesberg** (2016) Not just an antibiotic target: Exploring the role of type I signal peptidase in bacterial virulence, *Bioorg Med Chem* 24:6370-6378
131. T Chen, N Hongdilokkul, Z Liu, D Thirunavukarasu, **FE Romesberg** (2016) The Expanding World of DNA and RNA, *Curr Op Chem Biol* 34:80-87
132. A Craney, **FE Romesberg** (2015) The inhibition of type I bacterial signal peptidase: Biological consequences and therapeutic potential, *Bioorg. Med. Chem. Lett.* 25:4761-4766. PMID: 26276537
133. DA Malyshev, **FE Romesberg** (2015) An expanded genetic alphabet, *Chem Int. Ed.* 54:11930-11944. PMID: 26304162
134. T Chen and **FE Romesberg** (2014) Directed polymerase evolution, *FEBS Lett* 588:219-229. PMID: 24211837
135. J Zimmermann and **FE Romesberg** (2014) Carbon-deuterium bonds as non-perturbative infrared probes of protein dynamics, electrostatics, heterogeneity, and folding, *Methods Mol Biol* 1084:101-119. PMID: 24061918
136. DA Harris and **FE Romesberg** (2012) SpsB signal peptidase Handbook of Proteolytic Enzymes, vol 3, N Rawlings and G Salvesen, eds, Academic Press, 3502-3508.
137. Y X Tan and **FE Romesberg** (2012) Latent antibiotics and the potential of the arylomycins for broad-spectrum antibacterial activity, *Med Chem Comm* 3:916-925. DOI: 10.1039/C2MD20043K
138. J Zimmermann, MC Thielges, W Yu, **FE Romesberg** (2009) Protein dynamics and the evolution of novel protein functions Protein Engineering Handbook, vol 1, S Lutz and U T Bornscheuer, eds, Wiley-VCH: Weinheim, 147-186.
139. A M Leconte and **FE Romesberg** (2009) Engineering nucleobases and polymerases for an expanded genetic alphabet, Protein Engineering, C Köhrer and U L TajBhandary, eds, Springer-Berlag, 291-314.
140. A Mapp and **FE Romesberg** (2008) Editorial overview: Next generation therapeutics, *Curr Opin Chem Biol* 12:387-388. PMID: 18707019
141. J Heideker, ET Lis, **FE Romesberg** (2007) Phosphatases, DNA damage checkpoints and checkpoint deactivation, *Cell Cycle* 6:3058-3064. PMID: 18075314



142. PA Smith and **FE Romesberg** (2007) Combating bacteria and drug-resistance by inhibiting mechanisms of persistence and adaptation, *Nat Chem Biol* 3:549:556. PMID: 17710101
143. RT Cirz and **FE Romesberg** (2007) Opening the door for the intervention in evolution as a therapeutic strategy: controlling induced mutagenesis, *Crit Rev Biochem Mol Biol* 42:341-354. PMID: 17917871
144. H Bayley and **FE Romesberg** (2006) From therapeutic nucleic acids to redox hydrogels: the diverse world of biopolymers, *Curr Opin Chem Biol* 10:598-600. DOI: 10.1016/j.cbpa.2006.10.028
145. AM Leconte and **FE Romesberg** (2006) Chemical Biology: a broader take on DNA, *Nature* 444:553-555. PMID: 17136078
146. AM Leconte and **FE Romesberg** (2006) Amplify this! DNA and RNA get a third base pair, *Nat Methods* 3:667-668. PMID: 16929309
147. RT Cirz, N Gingles, **FE Romesberg** (2006) Side effects may include evolution, *Nat Med* 12:890-891. PMID: 16892033
148. AA Henry and **FE Romesberg** (2005) The evolution of DNA polymerases with novel activities, *Curr Opin Biotech* 16:370-377. PMID: 16006114
149. RC Holmberg, AA Henry, **FE Romesberg** (2005) Directed evolution of novel polymerases *Biomol Eng.* 22:39-49. PMID: 15857782
150. R L Schowen and **FE Romesberg** (2004) Isotope effects and quantum tunneling in enzyme-catalyzed hydrogen transfer Part I The experimental basis, *Adv Phy Org Chem* 39:27-77. DOI: 10.1016/S0065-3160(04)39002-7
151. AA Henry and **FE Romesberg** (2003) Beyond A, C, G & T: augmenting nature's alphabet, *Curr Opin Chem Biol* 7:727-733. PMID: 14644182
152. **FE Romesberg** (2003) Multidisciplinary Experimental approaches to characterizing biomolecular dynamics, *ChemBioChem* 4:563-571. PMID: 12851924
153. **FE Romesberg**, C Yu, S Matsuda, AA Henry (2002) UNIT 1.5 Development of a universal nucleobase and nucleobases for expanding the genetic code, *Curr Prot Nucleic Acid Chem* doi: 10.1002/0471142700.nc0105s10. PMID: 18428883

#### **Publications: Postdoctoral work**

154. **FE Romesberg** and PG Schultz (1999) A mutational study of a Diels-Alder catalytic antibody, *Bioorg Med Chem Lett* 9:1741-1744. PMID: 10406634
155. **FE Romesberg**, BD Santarsiero, B Spiller, PG Schultz, RC Stevens (1998) Structural and kinetic evidence for strain in biological catalysis, *Biochemistry* 37:14404-14409. PMID: 10406634
156. **FE Romesberg**, ME Flanagan, T Uno, PG Schultz (1998) Mechanistic studies of an antibody-catalyzed elimination reaction, *J Am Chem Soc* 120:5160-5167. DOI: 10.1021/ja9738992
157. **FE Romesberg**, BS Spiller, PG Schultz, RC Stevens (1998) Immunological origins of binding and catalysis in a Diels-Alderase antibody *Science*, 279:1929-1933. PMID: 9506942
158. ME Blackwood Jr, TS Rush III, **FE Romesberg**, PG Schultz and TG Spiro (1998) Alternative modes of substrate distortion in enzyme and antibody catalyzed ferrocyclization reactions, *Biochemistry* 37:779-782. PMID: 9457047
159. RC Stevens, LC Hsieh-Wilson, BD Santarsiero, GJ Wedemayer, B Spiller, LH Wang, D Barnes, HD Ulrich, PA Patten, **FE Romesberg**, PG Schultz (1996) Structural studies of catalytic antibodies, *Isr J Chem* 36:121-132. DOI: 10.1002/ijch.199600018
160. D Ulrich, PL Yang, PA Patten, **FE Romesberg**, PG Schultz (1995) Expression studies of catalytic antibodies, *Proc Natl Acad Sci USA* 92:11907-11911. PMID: 8524873

#### **Publications: Ph.D. work**

161. F Remenar, BL Lucht, D Kruglyak, **FE Romesberg**, JH Gilchrist, DB Collum (1997) Lithium 2,2,6,6-tetramethylpiperidide and lithium 2,2,4,6,6-pentamethylpiperidide: Influence of TMEDA and related chelating ligands on the solution structures. Characterization of higher cyclic oligomers, cyclic dimers, open dimers, and monomers, *J Org Chem* 62:5748-5754. DOI: 10.1021/jo9705201

162. **FE Romesberg** and DB Collum (1995) Mechanism of lithium dialkylamide mediated deprotonations: An MNDO study of monomer and open dimer pathways, *J Am Chem Soc* 117:2166-2178. DOI: 10.1021/ja00113a006
163. **FE Romesberg** and DB Collum (1994) Lithium dialkylamide mixed aggregate formation: An NMR spectroscopic study of the influence of hexamethylphosphoramide (HMPA), *J Am Chem Soc* 116:9198-9202. DOI: 10.1021/ja00099a039
164. **FE Romesberg** and DB Collum (1994) Lithium dialkylamide mixed aggregate formation: An MNDO computational study of salt and solvent dependencies. *J Am Chem Soc* 116:9187-9197. DOI: 10.1021/ja00099a038
165. Sakuma, JH Gilchrist, **FE Romesberg**, CE Cajthaml, DB Collum (1993) Lithium bis(2-adamantyl)amide: Structure and reactivity of an extremely hindered lithium dialkylamide, *Tetrahedron Lett* 34:5213-5216. DOI: 10.1016/S0040-4039(00)73955-4
166. **FE Romesberg**, MP Bernstein, JH Gilchrist, DJ Fuller, AT Harrison, DB Collum (1993) Structure and reactivity of lithium hexamethyldisilazide in the presence of hexamethylphosphoramide. Spectroscopic and computational studies of monomers, dimers, and triple ions, *J Am Chem Soc* 115:3475-3483. DOI: 10.1021/ja00062a010
167. M P Berstein, **FE Romesberg**, D J Fuller, A T Harrison, DB Collum, Q-Y Liu, P G Willard (1992) Structure and reactivity of lithium diisopropylamide in the presence of *N,N,N',N'*-tetramethylethylenediamine, *J Am Chem Soc* 114:5100-5110. DOI: 10.1021/ja00039a022
168. **FE Romesberg** and DB Collum (1992) Determination of the structures of solvated lithium dialkylamides by semiempirical (MNDO) methods comparison of theory and experiment, *J Am Chem Soc* 114:2112-2121. DOI: 10.1021/ja00032a027
169. **FE Romesberg**, JH Gilchrist, AT Harrison, DJ Fuller, DB Collum (1991) The structure of lithium tetramethylpiperdide and lithium diisopropylamide in the presence of hexamethylphosphoramide: Structure-dependent distribution of cyclic dimers, open dimers, ion triplets, and monomers, *J Am Chem Soc* 113:5751-575. DOI: 10.1021/ja00015a032
170. Y J Kim, M P Bernstein, A S Galiano-Roth, **FE Romesberg**, PG Willard, D J Fuller, A T Harrison, DB Collum (1991) On the structure and reactivity of lithium diisopropylamide in hydrocarbon solutions formation of unsolvated ketone, ester, and carboxamide enolates, *J Org Chem* 56:4435-4439. DOI: 10.1021/jo00014a019

## Patents

1. **F. E. Romesberg**, Y. Zhang, E.C. Fischer, A.W. Feldman, V.T. Dien. Incorporation of Unnatural Nucleotides and Methods Thereof. Provisional Patent Application 62/531,325, 11 July 2017.
2. T. Chen, **F.E. Romesberg**. Polymerase Chain Transcription (PCT): Exponential Synthesis of RNA and Modified RNA. Provisional Patent Application 62/531,603, 12 July 2017.
3. **F.E. Romesberg**, Y. Zhang. Novel Nucleoside Triphosphate Transporter and Uses Thereof. PCT Patent Application US2017039133, 23 June 2017.
4. **F.E. Romesberg**, P. Baran, D. Peters. Synthesis of the Arylomycin Macrocyclic Core. PCT Patent Application US2017036797, 9 June 2017.
5. **F.E. Romesberg**, B. Lamb, Y. Zhang. Production of Unnatural Nucleotides Using a Crispr/CAS9 System. PCT Patent Application US2016067353, 16 December 2016.
6. **F.E. Romesberg**, A. Craney. Compositions and Methods for Identifying Type I Signal Peptidase Inhibitors. PCT Patent Application US2016045796, 5 August 2016.
7. **F.E. Romesberg**, D.A. Malyshev. Import of Unnatural or Modified Nucleoside Triphosphates into Cells via Nucleic Acid Triphosphate Transporters. Patent Application US2017029829 (A1), 2 February 2017.
8. **F.E. Romesberg**, D.A. Malyshev, L. Li, T. Lavergne, Z. Li. A Method for the Site-Specific Enzymatic Labelling of Nucleic Acids In Vitro by Incorporation of Unnatural Nucleotides. Patent Application

- US20160168187 (A1), 16 June 2016.
9. **F.E. Romesberg**, P.A. Smith, T.C. Roberts. Broad Spectrum Antibiotic Arylomycin Analogs. U.S. Patent 9,187,524 (B2), 17 November 2015.
  10. **F. E. Romesberg**, D.A. Bachovchin. Genomic Mutation Inhibitors that Inhibit Y Family DNA Polymerases. Patent Application US20100130439 (A1), 27 May 2010.
  11. **F. E. Romesberg**, R.T. Cirz, P.A. Patten. Compositions and Methods for Enhancing Drug Sensitivity and Treating Drug Resistant Infections and Diseases. Patent Application US2006286574 (A1), 21 December 2006.
  12. **F. E. Romesberg**, N. David, R.T. Cirz. Compositions and Methods to Reduce Mutagenesis. US Patent 7,455,840 (B2), 25 November 2008.

## Invited Seminars

2017

- ChemBio Seminar Series, University of Southern California, Los Angeles, CA
- International Symposium of Bioorganic Chemistry, Konstanz, Germany
- CBI Annual Research Symposium, University of California, San Diego
- Chemical Biology Program Retreat, University of California, Davis
- San Diego State University, San Diego, CA
- BIO International Convention, San Diego, CA
- 15<sup>th</sup> Annual Genomics Forum, Vancouver, British Columbia
- World Molecular Engineering Meeting, Los Cabos, Mexico
- Frontiers in Chemical Biology, Henan Normal University, Xinxiang, China
- FNANO 17 Self-Assembled Architectures and Devices, Snowbird, UT
- Purdue University, West Lafayette, IN
- China Society of Biotechnology Young Scientist Forum II, South China University of Technology, Guangdong, China
- University of Miami, Miller School of Medicine, Miami, FL
- Department of Chemistry Colloquium, University of California, Riverside
- Scripps Florida External Seminar Series, Jupiter, FL
- Pathogenesis Affinity Group, Rancho Santa Fe, CA
- PepTalk The Protein Science Week, San Diego, CA

2016

- Nucleic Acid Workshop, Telluride Science Research Center, Telluride, CO
- XXII International Roundtable on Nucleosides, Nucleotides and Nucleic Acids, Paris, France
- Medical University of Vienna, 12<sup>th</sup> PhD Symposium, Vienna, Austria
- XB2 The Second Conference on Xenobiology, Berlin, Germany
- Princeton University, Chemistry Department Lecture Series, Princeton, NJ
- FNANO16 Foundations of Nanoscience, Snowbird, UT
- Antibody Biology & Engineering Gordon Research Conference, Galveston, TX
- UT Southwestern Medical Center, Dallas, TX
- Genome Engineering and Synthetic Biology Conference, Gent, Belgium
- Salk Institute IPSEN Science Symposium on Biological Complexity, La Jolla, CA

2015

- Pacifichem 2015, Honolulu, HI
- Cellular and Molecular Biotechnology Conference, Institut des Hautes Études Scientifiques, Paris, France
- BMB 2015 Biochemistry and Molecular Biology, Kobe, Japan
- TEDMED 2015, Palm Springs, CA
- Molecular Biology Program Retreat, University of Colorado, School of Medicine, Denver, CO
- Denison University, Chemistry Department Lecture Series, Granville, OH
- Chemical and Structural Biology and Biophysics RFG Seminar, The Ohio State University, Columbus, OH
- The Past, Present, and Future of DNA, Radcliffe Institute for Advanced Study, Harvard University, Cambridge, MA
- The Scripps Research Institute Graduate Student Symposium, Lake Arrowhead, CA
- Protein Dynamics 2015, Telluride Science Research Center, Telluride, CO
- Synthetic Biology Gordon Research Conference, Newry, ME

- CAS Conference Synthetic Biology, Munich, Germany
- Bioorganic Chemistry Gordon Research Conference, Andover, New Hampshire
- University of California, Chemical Biology and Biophysics Seminar, San Diego, CA
- Berkeley City College, Science Seminar Program, Berkeley, CA
- PEGS: The Protein and Antibody Engineering Summit, Boston, MA
- World Molecular Engineering Meeting, Los Cabos, Mexico
- University of Wisconsin, Microbiology Doctoral Training Program, Madison, WI
- 12<sup>th</sup> Annual Foundations of Nanoscience Conference, Snowbird, UT
- Boston College, Chemistry Seminar Series, Boston, MA
- Indiana University, Chemical Biology Seminar Series, Bloomington, IN
- 249<sup>th</sup> ACS National Meeting, Chemistry & Biology of Non-Natural Nucleic Acids Session, Denver, CO
- Carnegie Mellon University, Chemistry Department Lecture Series, Pittsburgh, PA
- Frontiers in Biomedical Research Symposium, Indian Wells, CA
- RNA Consortium Workshop, The Scripps Research Institute, La Jolla, CA
- 7<sup>th</sup> Annual Engineering Genes, Vectors, Constructs and Clones PepTalk 2015, San Diego, CA

2014

- Techonomy TE14, Half Moon Bay, CA
- New England Biolabs, Ipswich, MA
- Yale University, Organic Chemistry Seminar Series, New Haven, CT
- Colloquium Series, Origins Institute, McMaster University, Ontario, Canada
- University of Pennsylvania, Department of Biochemistry and Biophysics Seminar Series, Philadelphia, PA
- National Academies CSTL Forum on Synthetic Biology, Washington, D.C.
- Texas A&M University, College Station, TX
- 17<sup>th</sup> Annual San Diego Medchem Symposium, San Diego, CA
- GTCbio Nucleic Acids Summit, San Diego, CA
- Techonomy Bio, Mountain View, CA
- Plenary Speaker, XVI<sup>th</sup> Symposium on Chemistry of Nucleic Acid Components, Czech Republic
- North Dakota State Frontiers in Biomedical Research Symposium, Fargo, ND
- World Molecular Engineering Meeting, Los Cabos, Mexico
- SUNY Buffalo Department of Chemistry Foster Colloquium, Buffalo, NY
- 247<sup>th</sup> ACS National Meeting, Frontiers of Nucleic Acid Chemistry Session, Dallas, TX

2013

- Molecular Basis of Disease Area of Focus, George State University, Atlanta, GA
- University of Montréal, Québec
- 246<sup>th</sup> ACS National Meeting, Optical Spectroscopy of Proteins Session, Indianapolis, IN
- Georgia Tech College of Sciences, Atlanta, GA
- Biomolecular Interaction Technologies Center Symposium on Antibody Flexibility, Durham, NH
- Chemistry Biology Interface Training Grant Symposium, Univ. of Minnesota Dept. of Chemistry
- Claremont Colleges Keck Science Department, Chemistry Seminar Series, Claremont, CA
- Department of Chemistry Seminar, The Scripps Research Institute, Jupiter, FL
- 65<sup>th</sup> Fujihara Seminar and Symposium, Hokkaido, Japan
- Tsing Hua University, Hsinchu, Taiwan
- Institute of Chemistry Symposium, Academia Sinica, Taipei, Taiwan
- Department of Chemistry Colloquium, University of Chicago
- World Molecular Engineering Meeting, Los Cabos, Mexico
- PEGS: The Protein and Antibody Engineering Summit, Boston, MA
- California State University - Long Beach, Chemistry and Biochemistry Seminar Series

2012

- 244<sup>th</sup> American Chemical Society National Meeting and Exposition, Philadelphia, PA
- World Molecular Engineering Meeting, Los Cabos, Mexico
- Georgia Institute of Technology, Atlanta, GA
- 243<sup>rd</sup> American Chemical Society National Meeting and Exposition, San Diego, CA

2011

- McMaster University Biochemistry and Biomedical Sciences Seminar Series, Ontario, Canada
- University of Maryland, Baltimore County Chemistry-Biology Interface Program, Baltimore, MD
- Society for Industrial Microbiology Annual Meeting, New Orleans, LA
- Gordon Research Conference on Tuberculosis Drug Development, Lucca, Italy
- 22<sup>nd</sup> American Peptide Society Symposium, San Diego, CA
- Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences, Shanghai, China
- Shanghai Institute of Materia Medica, Chinese Academy of Sciences, Shanghai, China

- Chemical and Structural Biology of Nucleic Acids and Proteins for Novel Drug Discovery, Beijing, China
- CLIO Proposers Day Workshop, DARPA

2010

- University of Victoria Lecture Series, Victoria, BC
- Lectures in Modern Chemistry Series, University of British Columbia, Vancouver, BC
- Simon Fraser University Lecture Series, Vancouver, BC
- Nucleic Acid Chemistry Workshop, Telluride, CO
- Center for Workshops in the Chemical Sciences: Nucleic Acids Workshop, Atlanta, GA
- Evolving DNA Polymerases: Chemistry Meets Biology, Ascona, Switzerland
- World Molecular Engineering Meeting, Los Cabos, Mexico
- Johns Hopkins Chemistry-Biology Interface Program, Baltimore, MD
- Highs in Chemistry and Biology Conference, Dead Sea, Israel

2009

- Wayne State University Lecture Series, Detroit, MI
- Michigan State University Lecture Series, East Lansing, MI
- 3<sup>ème</sup> Cycle Lecture Tour in Chemistry, Switzerland
- Functional Nucleic Acids Conference, Regensburg, Germany
- Gordon Research Conference on Proteins, Holderness, NH
- New York University, New York, New York
- Society for General Microbiology, Hastings, England
- Case Western Reserve University, Cleveland, OH

2008

- Mesilla Chemistry Workshop, Mesilla, New Mexico
- 43<sup>rd</sup> Congress of the Mexican Chemical Society, Tijuana, Mexico
- Workshop on Evolution in Health and Disease, Oeiras, Portugal
- 236<sup>th</sup> American Chemistry Society National Meeting, Philadelphia, PA
- Mutagenesis Gordon Conference, Oxford, UK
- Broad Institute, Cambridge, MA
- Reuben H. Fleet Science Center, San Diego, CA

2007

- Nucleic Acids Gordon Conference, Salve Regina University
- UCSD Medical Center, San Diego, CA
- San Diego State University, San Diego, CA
- 223<sup>rd</sup> American Chemical Society National Meeting, Chicago, IL
- American Society of Biochemistry and Molecular Biology 2007 Annual Meeting, Washington DC

2006

- Frontiers in Biological Chemistry Session, 20<sup>th</sup> Annual Symposium of the Protein Society, San Diego, CA
- Second International Symposium on Biomolecular Chemistry, Kobe, Japan
- Osaka Prefecture University, Osaka, Japan
- Beckman Symposium on Evolution, Palo Alto, CA
- Sixth Osaka University Forum, San Diego, CA
- Department of Biological Sciences, University of Southern California
- Department of Chemistry, University of Utah
- Department of Pharmacology and Molecular Sciences, Johns Hopkins University
- Gordon Research Conference on Chemistry and Biology of Peptides, Ventura, CA

2005

- Symposium on Chemically Modified DNA: Synthesis, Photochemistry, and Applications, Pacificchem, Honolulu, HI
- 17<sup>th</sup> Annual Frontiers of Science Symposium of the National Academy of Sciences, Frontiers in Synthetic Chemistry and Biology Session, Irvine, CA
- Ambassador Speaker, Gordon Research Conference on Epigenetics, Plymouth, NH
- Plenary Speaker, 32<sup>nd</sup> Symposium on Nucleic Acids Chemistry, Fukuoka, Japan
- Plenary/Novartis Speaker, XIII<sup>th</sup> Symposium on the Chemistry of Nucleic Acid Components, Prague, Czech Republic
- Institute of Organic Chemistry and Biochemistry, Academy of Science of the Czech Republic, Prague, Czech Republic
- Department of Chemistry, Uppsala University, Uppsala, Sweden
- Biomimetic Polymers symposium, 229<sup>th</sup> American Chemical Society National Meeting, San Diego, CA
- Gordon Research Conference on Nucleosides, Nucleotides and Oligonucleotides, Newport, RI
- Telluride Science Research Center Workshop on Vibrational Dynamics of Biological Molecules, Telluride, CO
- Department of Defense Era of Hope Conference, Philadelphia, PA
- Instituto Tecnológico de Tijuana, Tijuana, Mexico
- BioAgenda2005, Palm Springs, CA

2004

- Department of Pharmaceutical Chemistry, University of California, San Francisco, CA
- Department of Chemistry, University of Iowa, Iowa City, IA
- Department of Chemistry, University of Texas, Dallas, TX
- Department of Chemistry & Biology, University of Maryland, College Park, MD
- Department of Chemistry, Emory University, Atlanta, GA
- Department of Chemistry & Chemical Engineering, California Institute of Technology, Pasadena, CA
- Department of Biochemistry, Tufts University, Boston, MA
- Department of Chemistry, Ohio State University, Columbus, OH
- Department of Chemistry & Biochemistry, Denison University, Granville, OH
- Department of Chemistry & Biochemistry, University of Colorado, Boulder, CO
- Department of Chemistry, Michigan State University, Ann Arbor, MI
- Department of Chemistry, Wayne State University, Detroit, MI
- Department of Chemistry, Massachusetts Institute of Technology, Cambridge, MA

2003

- International Symposium on Bio-Inspired Engineering, Tel Aviv, Israel
- Department of Chemistry, Stanford University, Stanford, CA
- Department of Chemistry & Biochemistry Physical Chemistry Lecture, University of California, San Diego, CA
- Department of Chemistry, University of Rochester, Rochester, NY
- Conference on Lasers and Electro Optics/Quantum Electronics & Laser Science Conference, Baltimore, MD
- Department of Chemistry, Cornell University, Ithaca, NY

2002

- Department of Biochemistry & Biophysics, Albert Einstein College of Medicine of Yeshiva University, Bronx, NY
- Department of Chemistry, Yale University, New Haven, CT
- Department of Chemistry, Bowdoin College, Brunswick, ME
- Archemix Corp., Cambridge, MA
- Reaction Mechanisms Conference, Bartlett Session, Columbus, OH

2001

- Gordon Research Conference on Bioorganic Chemistry, Andover, NH
- New Frontiers in Chemical Biology, Seoul National University, Seoul, Korea
- Biomolecular Engineering Research Institute, Osaka, Japan
- Department of Chemistry, Pohang University of Science and Technology, Pohang, Korea

2000

- Department of Chemistry, University of Southern California, Los Angeles, CA
- Department of Chemistry, University of California, Irvine, C

1999

- International Conference on Phosphorus Chemistry, Cincinnati, OH

1995

- Gordon Research Conference on Isotopes in the Biological and Chemical Sciences, Oxnard, CA

1994

- Department of Chemistry, Yale University, New Haven, CT
- Department of Chemistry, Columbia University, Columbia, NY
- Department of Chemistry, University of Rochester, Rochester, NY
- Department of Chemistry, University of Wisconsin, Madison, WI
- Department of Chemistry, Ohio State University, Columbus, OH
- Department of Chemistry, University of Colorado, Boulder, CO

## Professional Service

### Academic Activities at The Scripps Research Institute

#### *Teaching:*

- 2000–2010, Physical Organic Chemistry, Chemistry Program (1/2 quarter each year)
- 2001–present, Spectroscopy, Chemistry Program (full quarter each year)
- 2001–present, Enzymology, Macromolecular and Cellular Structure and Chemistry Program; Section on Enzyme kinetics, Biology Program (8 one hr lectures each year)
- 2003–present, Enzymology, Macromolecular and Cellular Structure and Chemistry Program; Section on DNA Replication, Biology Program (2 one hr lectures each year)
- 2011–present, Bacteria and Antibiotics, Chemistry Program (full quarter each year)

*Committees:*

- 2002–2010, Graduate Admissions
- 2003–present, Postdoctoral Issues
- 2009–present, WASC Scientific Communications
- 2000–present, Graduate thesis committees (>90 doctoral candidates)

**Trainees, Graduate Students**

| <i>Name</i>                             | <i>Training Period</i> | <i>Previous Training</i>       | <i>Current Position</i>            |
|-----------------------------------------|------------------------|--------------------------------|------------------------------------|
| Rebekah Karadeema, M.S.                 | 2016 -                 | Univ. of Central Florida       | Romesberg Lab                      |
| Emil Fischer, M.S.                      | 2016 -                 | Univ. of Copenhagen            | Romesberg Lab                      |
| Matthew Holcomb, B.S.                   | 2016-                  | Luther College                 | Romesberg Lab                      |
| Vivian Dien, B.S.                       | 2015-                  | UC Berkeley                    | Romesberg Lab                      |
| Sydney Morris, B.S.                     | 2015-                  | George Washington Univ.        | Romesberg Lab                      |
| Shawn Walsh, B.S.                       | 2015-                  | Emory University               | Romesberg Lab                      |
| David Peters, B.S.                      | 2015-                  | Univ. of San Diego             | Romesberg Lab                      |
| Michael Ledbetter, B.S.                 | 2014-                  | Univ. of Texas, Austin         | Romesberg Lab                      |
| Yorke Zhang, B.S.                       | 2014 -                 | Johns Hopkins Univ.            | Romesberg Lab                      |
| Aaron Feldman, B.S.                     | 2014 -                 | Connecticut College            | Romesberg Lab                      |
| Danielle Barrios Steed, M.D, Ph.D.      | 2011 – 2015            | Emory University               | Medical Residency                  |
| Yun Xuan Tan, B.S.                      | 2011 –                 | Univ. of Cambridge             | Romesberg Lab                      |
| Denis Malyshev, Ph.D. Chemistry         | 2008 – 2013            | Higher Chemical College RAS    | Scientist, Synthorx Inc.           |
| Mark Schallenberger, M.S. Chemistry     | 2008 – 2011            | Univ. Montana                  | Proj. Manager, Bacterin            |
| David Harris, Ph.D. Chemistry           | 2005 – 2012            | Cornell Univ.                  | Technical Advisor, Oblon, Inc.     |
| Wayne Yu, Ph.D. Chemistry               | 2005 – 2012            | N. Lehman/Portland State Univ. | Scientist, Abzena                  |
| Peter Smith, Ph.D. Biology              | 2005 – 2011            | A. Friedman/Purdue Univ.       | Scientist, Genentech               |
| Tucker Roberts, Ph.D. Chemistry         | 2005 – 2011            | C. Nuckolls/Columbia Univ.     | Scientist, Aduro Biotech           |
| Aaron Leconte, Ph.D. Chemistry          | 2004 – 2009            | D. Alberg/Carleton College     | Asst. Prof., Claremont Colleges    |
| Patrick Weinkam, Ph.D. UCSD Chemistry   | 2004 – 2009            | UC Santa Barbara               | A. Sali/UCSF                       |
| Megan Thielges, Ph.D. Biophysics        | 2004 – 2009            | Arizona State Univ.            | Asst. Prof., Indiana Univ.         |
| Ewa Lis, Ph.D. Chemistry                | 2002 – 2007            | T. Begley/Cornell Univ.        | Scientist, Genomica                |
| Ryan Cirz, Ph.D. Biology                | 2002 – 2007            | Penn State Univ.               | Scientist, Achaogen                |
| Erin Oakman (transfer)                  | 2002 – 2005            | A. Ellington/UT Austin         | Ph.D. studies, NYU Neurosciences   |
| Bryan O'Neill, Ph.D. Biology            | 2001 – 2007            | T. Dwyer/Univ. San Diego       | Scientist-Founder, Sapphire Energy |
| Laura Sagle, Ph.D. UCSD Chemistry       | 2001 – 2006            | UC Santa Cruz                  | Asst. Prof., Univ. Cincinnati      |
| Allison (Henry) Berger, Ph.D. Chemistry | 1999 – 2005            | Reed College                   | B. Koksche/Free Univ. Berlin       |

**Trainees, Postdoctoral Students**

| <i>Name</i>                   | <i>Training Period</i> | <i>Previous Training</i>    | <i>Current Position</i>              |
|-------------------------------|------------------------|-----------------------------|--------------------------------------|
| Deepak Thirunavukarasu, Ph.D. | 2015- 2017             | H. Shi/SUNY Albany          | Scientist, Base Pair Biotechnologies |
| Chien-Hung Yeh, Ph.D.         | 2015-                  | Baran/TSRI                  | Romesberg Lab                        |
| Zhixia Liu, Ph.D.             | 2015-                  | X. Huang/UCSD               | Romesberg Lab                        |
| Martin Tabor, Ph.D.           | 2015 - 2017            | Shenvi / TSRI               | Investigator, GlaxoSmithKline        |
| Narupat Hongdilokkul, Ph.D.   | 2014 - 2016            | Hilvert/ETH Zurich          | Asst. Prof., Mahidol University      |
| Takashi Ando, Ph.D.           | 2014 - 2015            | Rebek, TSRI                 | Scientist, Kaneka Corp.              |
| Brian Lamb, Ph.D.             | 2014 - 2016            | C. Barbas/TSRI              | Scientist, Vertex Pharma             |
| Elie Diner, Ph.D.             | 2014 – 2016            | R. Vance/UC Berkeley        | Medical Writer, Arbor Scientia       |
| Shujian Cun, Ph.D.            | 2013 - 2014            | S. Hecht/Arizona State      | ???                                  |
| Arryn Craney, Ph.D.           | 2012 – 2017            | J Nodwell/McMaster Univ.    | CM Fellow, Univ of Nebraska MC       |
| Ana-Florina Voica, Ph.D.      | 2012 – 2013            | P. Baran/TSRI               | Scientist, Gilead                    |
| Melissa Degardin, Ph.D.       | 2012 – 2013            | J. Rebek/TSRI               | Postdoc, J.Fourier Univ.             |
| Ramkrishna Adhikary, Ph.D.    | 2011 –                 | J. Petrich/Iowa State Univ. | Romesberg Lab                        |
| Tingjian Chen, Ph.D.          | 2011 –                 | Z. Lin/Tsinghua Univ.       | Romesberg Lab                        |
| Lingjun Li, Ph.D.             | 2011 – 2012            | Henan Normal Univ.          | Assoc Prof, Henan Normal Univ.       |
| Haoxing Wu, Ph.D.             | 2011 – 2012            | Sichuan Univ.               | Prof, Sichuan University             |
| Changxia Shao, Ph.D.          | 2010 – 2012            | W. Gao/Texas Tech           | Project Manager, Merck               |
| Zhengtao Li, Ph.D.            | 2010 – 2012            | K.C. Nicolaou/TSRI          | Scientist, Astrazeneca               |
| Xin Sheng, Ph.D.              | 2010 – 2013            | M. Newcomb/Univ. Illinois   | Scientist, Thermo Fisher             |

|                               |             |                                |                                   |
|-------------------------------|-------------|--------------------------------|-----------------------------------|
| Thomas Lavernege, Ph.D.       | 2010 – 2012 | J.J. Vasseur/Univ. Montpellier | CR2/CNRS, JFourier Univ.          |
| Jian Liu, Ph.D.               | 2009 – 2014 | X. She/Lanzhou Univ.           | Assoc. Prof., Xiamen Univ.        |
| Young Jun Seo, Ph.D.          | 2007 – 2010 | B. Kim/Pohang Univ.            | Prof., Chonbuk National Univ.     |
| Allen Horhota, Ph.D.          | 2007 – 2009 | L. McLaughlin/Boston Univ.     | SrScientist, BIND Biosciences     |
| Petr Capek, Ph.D.             | 2006 – 2009 | M. Hocek/Charles Univ.         | Prognosys Biosciences             |
| Cristina Gil-Lemaigere, Ph.D. | 2006 – 2007 | B. Beutler/TSRI                | Univ. Hosp. Ntra. Sra. Candelaria |
| Gil Tae Hwang, Ph.D.          | 2005 – 2009 | B. Kim/Pohang Univ.            | Asst.Prof., Kyungpook Natl. Univ. |
| Matthew Cremeens, Ph.D.       | 2003 – 2008 | B. Carpenter/Cornell Univ.     | Asst. Prof., Gonzaga Univ.        |
| Jörg Zimmermann, Ph.D.        | 2003 – 2010 | G. Fleming/UC Berkeley         | Scientist, Romesberg lab          |
| Rebecca Holmberg, Ph.D.       | 2003 – 2005 | H. Thorpe/Univ. North Carolina | Scientist, Akonni Biosystems      |
| Chengzhi Yu, Ph.D.            | 2001 – 2003 | L. Hu/Rutgers Univ.            | Group Leader, Celgene             |
| Ming Fa, Ph.D.                | 2000 – 2003 | T. Ny/Umeå Univ.               | Director, Genetivision            |
| Shigeo Matsuda, Ph.D.         | 1999 – 2007 | H. Saito/Kyoto Univ.           | Scientist, Alnylam                |
| Osama Abou-Zied, Ph.D.        | 1999 – 2002 | A. Zewail/Caltech              | Assoc. Prof., Sultan Qaboos Univ. |
| Gang Xia, Ph.D.               | 1999 – 2002 | M. Pickart/Johns Hopkins Univ. | Prof., East China Normal Univ.    |
| Markus Berger, Ph.D.          | 1999 – 2002 | J. Mulzer/Free Univ. Berlin    | Scientist, Schering AG            |
| Yiqin Wu, Ph.D.               | 1999 – 2001 | M. Roberts/Boston College      | Scientist, Quanticel              |
| Eunju Lee Tae, Ph.D.          | 1999 – 2001 | M. Platz/Ohio State Univ.      |                                   |
| Liangjing Chen, Ph.D.         | 1999 – 2001 | M. Roberts/Boston College      | Scientist, Ambion                 |
| Jodie Chin, Ph.D.             | 1999 – 2005 | J. Klinman/UC Berkeley         | Scientist, Romesberg lab          |
| Mimi Roy, Ph.D.               | 1999 – 2000 | M. Hecht/Princeton Univ.       | Scientist, Surromed               |
| Ralph Jimenez, Ph.D.          | 1998 – 2003 | G. Fleming/Univ. Chicago       | Asst. Prof., JILA/UC Boulder      |
| Dustin McMinn, Ph.D.          | 1998 – 1999 | M. Greenberg/Colorado State    | Assoc. Dir., Onyx                 |
| Jianquan Liu, Ph.D.           | 1998 – 1999 | J. Taylor/WUSTL                |                                   |
| Takashi Sera, Ph.D.           | 1998 – 1999 | A. Wolffe/NIH                  | Assoc. Prof., Kyoto Univ.         |
| Anthony Ogawa, Ph.D.          | 1998 – 2000 | R. Armstrong/UCLA              | Scientist, Merck                  |

## Trainees, Interns

| <i>Name</i>              | <i>Training Period</i> | <i>Program</i>               | <i>Current Position</i>        |
|--------------------------|------------------------|------------------------------|--------------------------------|
| Reta Behnam              | Summer 2017            | TSRI Educational Outreach    |                                |
| Emily Zhang              | Summer 2017            | TSRI Educational Outreach    |                                |
| Anne Xiaozhou Zhou, B.S. | Summer 2015            | TSRI Educational Outreach    | The Scripps Research Institute |
| Jose Santiago            | Summer 2015            | TSRI Educational Outreach    | UC Santa Cruz                  |
| Amy Pai                  | Summer 2014            | TSRI Educational Outreach    |                                |
| Triet Pham               | Summer 2013            | TSRI Educational Outreach    |                                |
| Carolyn Yvellez          | Summer 2013            | TSRI Educational Outreach    | Univ. of Notre Dame            |
| Henry Quach, B.S.        | Summer 2012            | Academic Intern Program      | Vanderbilt Univ Med School     |
| Jesus Ramos              | Summer 2012            | TSRI Educational Outreach    |                                |
| Daniel Waizman           | Summer 2011            | TSRI Educational Outreach    |                                |
| Kirandeep Dhami          | 2010 – 2012            | UCSD Student Work Study      | Res.Assoc., Synthorx           |
| Henry Quach              | Summer 2010            | TSRI Educational Outreach    | (see above)                    |
| Amber Berry              | Summer 2009            | TSRI Educational Outreach    |                                |
| Nazc-Aru Gonzalez        | Summer 2009            | TSRI Educational Outreach    | Harvard Univ.                  |
| Wendy Feng, M.D.         | Summer 2009            | MSTAR Program                | Medical Residency              |
| Megan Meza               | Summer 2007            |                              |                                |
| Michael Comstock         | Summer 2004            |                              | Sr.Algorithms Arch., Synaptics |
| Daniel Bachovchin        | Summer 2004            | Harvard College              | Research Fellow, Broad Inst.   |
| Anne Goldbech Olsen      | Summer 2003            | P.Nielsen/Univ. Copenhagen   | Scientist, Nuevolution         |
| Annalisa Radeghieri      | Summer 2003            | H.Hochkoeppler/Univ. Bologna |                                |
| Scott Luzzi              | Summer 2000            | Rochester Inst. Technology   | Project Manager, Gilead        |
| David Keene              | Summer 1999            | Reed College                 |                                |

## Trainees, Research Associates

| <i>Name</i>           | <i>Training Period</i> | <i>Current Position</i>                               |
|-----------------------|------------------------|-------------------------------------------------------|
| Kirandeep Dhami, B.S. | 2012 – 2014            | (see above)                                           |
| Michael Powers, B.S.  | 2006 – 2008            | Doctoral candidate, J.Bubeck Wardenburg/Univ. Chicago |
| Meha Patel, M.S.      | 2007 – 2009            | Researcher, GeneDX                                    |



|                         |             |                                           |
|-------------------------|-------------|-------------------------------------------|
| Georgina Salazar, Ph.D. | 2001 – 2003 | Intern, UN Ambassador for Palau           |
| Denise Hanway, B.S.     | 1998 – 2002 | Scientific Writer, Ferring Research Inst. |

## Sponsored Sabbatical Research

Prof. Lingjun Li, Henan Normal University, College of Chemistry and Chemical Engineering, 2016  
 Prof. Yoshiyuki Hari, Osaka University, Graduate School of Pharmaceutical Sciences, 2006 - 2007  
 Prof. Poul Nielsen, University of Southern Denmark, Department of Chemistry, 2006  
 Prof. Masayuki Oda, Kyoto Prefectural University, Graduate School of Agriculture, 2005  
 Prof. Taiha Joo, Pohang University of Science and Technology, Department of Chemistry, 2002  
 Prof. Dr. Christian Leumann, University of Berne, Department of Chemistry and Biochemistry, 2001

## Other Intramural Activities

Invited speaker at the Trends in the Research and the Scientific Marketplace professional development seminar for San Diego school teachers, as a part of The Scripps Research Institute's Science Outreach Program, 2001  
 Participation in The Scripps Research Institute's High School Student Research Education Program, involving lectures to students and laboratory demonstrations, 2000 – present

## Extracurricular Professional Service

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Grant Review              | Synthetic and Biological Chemistry A Study Section, Center for Scientific Review, NIH, Ad Hoc review for NIGMS Bioorganic and Natural Products, American Chemical Society Petroleum Research Fund, Defense Threat Reduction Agency, Chemical and Biological Technologies, National Human Genome Research Institute, National Institutes of Health, National Science Foundation                                                                                                                                                              |
| Manuscript Review         | <i>Accounts of Chemical Research, Angewandte Chemie, Biochemistry, Bioorganic and Medicinal Chemistry Letters, Cellular and Molecular Life Sciences, Chemistry &amp; Biology, ChemPhysChem, Chemical Reviews, Journal of the American Chemical Society, Journal of Molecular Biology, Journal of Organic Chemistry, Journal of Physical Chemistry, Nucleic Acids Research, Nature, Nature Biotechnology, Nucleosides, Nucleotides, and Nucleic Acids, Proceedings of the National Academy of Sciences, Tetrahedron, Tetrahedron Letters</i> |
| Editorial Boards          | Current Protocols in Chemical Biology, 2010 – present<br>PLoS ONE, 2006 – present                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Consulting                | Archemix, Cambridge, MA (Consultant; 2010)<br>Helicos BioSciences Corp, Cambridge, MA (Consultant, SAB member; 2005 – 2009)<br>NuAce Technologies, Ltd., Rehovot, Israel (Consultant, SAB member; 2001 – 2006)                                                                                                                                                                                                                                                                                                                              |
| Professional Affiliations | American Chemical Society (1998 – present)<br>American Society for Microbiology (2005 – present)<br>Biophysical Society (2014 – present)                                                                                                                                                                                                                                                                                                                                                                                                    |

## Scientific Collaborators

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Current at TSRI               | Phil Baran (Chemistry), Ben Cravatt (Chemical Physiology), Philip Dawson (Cell Biology), Gerald Joyce (Molecular Biology), Phil Ordoukhanian (Nucleic Acid Facility), Peter Schultz (Chemistry), Ali Torkamani (Molecular and Experimental Medicine), Ian Wilson (Molecular Biology)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Current at other institutions | Charles Brooks III (Univ. Michigan), David Case (Rutgers Univ.), Chris Cheatum (Univ. of Iowa/Chemistry), Steve Corcelli (Notre Dame), Tammy Dywer (Univ. San Diego), Andreas Marx (Konstanz Univ.), Shaul Mukamel (UCI), Peter Wolynes (UCSD/Chemistry), Martin Zanni (UWisc/Chemistry)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Past                          | Carlos Barbas III (Scripps/Molecular Biology), David Andes (UWisc/Medicine), Oscar Aparicio (USC/Biological Science), Steven Boxer (Stanford Univ/ Chemistry), Andrei Chabes (Umeå University), William Craig (UWisc/Medicine), Valérie de Crécy Lagard (Scripps/Molecular Biology), Jane Dyson (Scripps/Molecular Biology), Brunie Felding-Habermann (Scripps/Molecular & Experimental Medicine), Steve Head (DNA Array Core), Bernhard Geierstanger (Genomics Institute of the Novartis Research Foundation/Protein Sciences), M. Glasbeek (Universiteit van Amsterdam), Myron Goodman (USC), Wolf-Dietrich Heyer (UC Davis/Microbiology), Ehud Keinan (Scripps, Molecular Biology), Hadar Kless (NuAce), K. C. Nicolaou (Scripps/Chemistry), Art Olsen (Scripps/Molecular Biology), Scott Peterson (TIGR/Pathogen Functional Genomics Resource Center/JCVI), Stephen Quake (Stanford/Chemistry), |

Igor Rubtsov (Tulane University), Glen Spraggon (Genomics Institute of the Novartis Research Foundation/Protein Sciences), Ray Stevens (Scripps/Chemistry), John Straub (Boston Univ./Chemistry), David Wemmer (UC Berkeley/Chemistry), Elizabeth Winzeler (Scripps/Cell Biology), John Yates III (Scripps/Cell Biology), Huilin Zhou (UCSD/Ludwig Institute for Cancer Research)