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**Professional Preparation**

Arizona State University (Tempe, AZ)	Biochemistry	Postdoc 2014
Arizona State University (Tempe, AZ)	Biological Design	Ph.D. 2014
Sonoma State University (Rohnert Park, CA)	Physics	B.S. 2002

**Professional Appointments**

- 2021–present Associate Director of Research (ADR), Center for Negative Carbon Emissions (CNCE), Ira. Fulton School of Engineering, Arizona State University (ASU), Tempe, AZ
- **Responsibilities:** Building and maintaining Center faculty, capabilities and collaborations for current and prospective research programs; developing, integrating and managing interdisciplinary research teams, concepts and proposals with a focus on federally sponsored programs (details in *Research Development* on page 4); developing and executing strategic research development plans, and monitoring and evaluating research progress in coordinating with faculty, academic and administrative leadership and external sponsors.
  - **Project Management:** Three Department of Energy (DOE)-funded projects: 1) DAC to carbon-neutral methanol system design, 2) fundamental investigations of moisture-driven CO<sub>2</sub> capture, and 3) polymer-based CO<sub>2</sub> capture and direct delivery to algae ponds. One National Science Foundation (NSF)-funded project developing hybrid H<sub>2</sub>O/CO<sub>2</sub> sorbents with community engagement. Details and past projects are described in *Project Management* on page 8.
  - **Supervision:** *Managing workflow* for project teams, including building a positive team environment, setting goals, defining tasks and monitoring progress to ensure the team performs at a high level; *training team members* through project meetings, shared workspaces, and recruiting and hiring new team members; *creating and managing team schedules* to ensure rapid and efficient progress toward project

deliverables; *reporting progress* to the principal investigator and project sponsor (e.g. DOE, NSF); *evaluating performance* and providing feedback through project meetings and quarterly reports; *promoting career advancement* opportunities for students, postdocs and staff, including development plans, conferences and training; *resolving personnel issues*, including time commitments with other projects.

- 2019–2021 Associate Research Development Scientist, Center for Applied Structural Discovery (CASD), The Biodesign Institute, Arizona State University (ASU), Tempe, AZ
- **Responsibilities:** Similar responsibilities as Assistant Research Scientist, but with a larger leadership role. Additional responsibilities include highlight funding opportunities to director and group, co-manage funding group for graduate students and meet regularly with center faculty to develop and encourage new proposals.
  - **Project Management:** Three DOE-funded projects as described under ADR above.
  - **Supervision:** As described under ADR above.
- 2014–2019 Assistant Research Scientist, Center for Applied Structural Discovery (CASD), The Biodesign Institute, Arizona State University (ASU), Tempe, AZ
- **Responsibilities:** Research and business development; develop research teams and concepts; integrate content, critically review, and edit proposals; manage and supervise project teams, communicate with various team members, and report on project results to sponsors, including DOE-funded projects; develop and foster strategic collaborations; develop patents, develop presentations and websites; act as liaison between faculty and research administration; and provide scientific communication and outreach.
  - **Project Management:** DOE-funded project to capture CO<sub>2</sub> from air and deliver to microalgae ponds; two competitively awarded seed projects: 1) integrating photosynthetic organisms and electrochemical systems, 2) electrochemically controlling pH in algae photobioreactors (details in *Project Management* on page 8).
  - **Supervision:** As described under ADR above.
- 2014 Postdoctoral Research Associate, School of Molecular Sciences and ASU LightWorks, Arizona State University
- **Research:** Integrate photosynthetic organisms and electrochemical systems.
  - **Management:** Build interdisciplinary research teams, facilitate technical communication within diverse research teams and industry.
  - **Business:** Develop propositions that generate value for internal and external stakeholders.
- 2009–2014 Graduate Research Assistant, Biological Design Graduate Program, Arizona State University.
- **Research:** Synthesizing an Artificial Oxygen Evolving Complex inside a 3D DNA nanoscaffold for Dr. Petra Fromme, Center for Bio-Inspired Solar Fuel Production.
  - **Undergraduate Research Supervision:** Provide instruction and advising to two Biology and Biochemistry students on designing and executing research experiments.
  - **Molecular Biology Lab Manager:** Supervise equipment, users, lab duties, safety, hazardous waste to ensure smooth operation and safety compliance.
  - **Biological Design Student Representative:** Managed communications between program directors and executive committee and student body. Led student meetings to collect and prioritize program improvement ideas and worked to implement with executive committee.
  - **Collaboration Coordinator:** Organize subtask meetings for the center between four labs (Fromme, Ghirlanda, Yan, Liu).

- **Lab Rotations:** Investigate self-assembly of DNA into higher order structures for Drs. Hao Yan and Yan Liu, and topological structure and electrochemical activity of a hydrogenase protein for Dr. Thomas Moore.
- 2007–2009     Software Quality Assurance Engineer and Biosensor Chemistry Research Mentorship, Abbott Diabetes Care, Alameda, CA
- **Software:** Work in a diverse team of engineers and regulators to verify and validate software of consumer medical devices for FDA compliance.
  - **Research:** 3 hours per week researching *in vivo* continuous blood glucose monitoring sensors for Dr. Udo Hoss, Director of Sensor Chemistry.
- 2002–2007     Lead Test Engineer, Symmetricom (TrueTime, MicroSemi), Santa Rosa, CA
- **Test Engineer:** Design tests, build automation systems and lead strategy for product quality of precise time and frequency distribution systems.
  - **Development:** Worked closely with sales and marketing, research and development, quality assurance, finance, technical support and manufacturing.
- 2000–2001     Materials Characterization Scientist Internship, Optical Coating Labs (JDS Uniphase, Viavi Solutions), Santa Rosa, CA
- **Research:** Metrology, including scanning probe microscopy, and defect research of optical thin films for Dr. Said Mansour, Materials Characterization Lab Manager.

### Extracurricular Appointments

- 2021–Present     Soccer Coach, Scottsdale Youth Soccer League & Phoenix Rising Youth Soccer League
- Coached soccer teams (2<sup>nd</sup>-7<sup>th</sup> grade) in fall and spring each year; organizing teams and running practices; motivating players.
- 2017–2022     Pueblo Dads Club and Parent Teacher Organization (PTO), Pueblo Elementary School
- **President, Pueblo Dads Club (2019-2022; ongoing member):** Recruit new members and officers including VP of Communications, VP of Marketing, VP of Recruiting and Volunteers, VP of Finance and lead volunteers for 5-6 school-wide events per year and 2-3 team building events per year. Set annual budget, manage shared organization documents and oversee all Dads Club events.
  - **Executive Board Member, PTO (2019-2022):** Foster an environment in which students can do their best learning and teachers can do their best teaching. Review and approve annual budgets and meeting minutes, promote school-wide events.
  - **Dads Club VP of Communication, Recruiting, and Event Lead (2017-2019):** Developed and distributed email and Facebook communications to members and parents, coordinated development of event and organization graphics and flyers, personally recruited over 50 new members (over 100 total), managed and volunteered at over a dozen school wide events that typically drew 100–300 participants.
- 2002–2019     Violist, 13 years in Cotati Philharmonic, Chandler Symphony, Scottsdale Philharmonic
- **Scottsdale Philharmonic (2017-2019):** Violist for +90 member orchestra.
  - **Chandler Symphony Orchestra (2010-2011):** Violist for +100 member orchestra.
  - **Cotati Philharmonic (2002-2009):** Principal violist for ~75 member orchestra. Led sectional rehearsals, assigned practice material, managed other violists.

### Relevant Skills

- Leadership, collaborative, positive, strong work ethic, teamwork and interpersonal skills.
- Written, verbal and visual communication; able to integrate and articulate compelling and impactful science for a broad range of audiences as a part of proposals, reports, press releases and presentations.
- Provide substantive feedback to improve a proposal's research strategy and significance.

- Develop strategic, persuasive and compelling approaches to present proposed research to evaluators.
- Creatively develop research concepts with interdisciplinary teams and mold to fit sponsor needs.
- Integrate technical content from subject matter experts in diverse fields of science and engineering.
- Manage research projects with interdisciplinary scientific teams to produce high quality results.
- Highly organized, coordinate multiple projects, set schedules, and track items to completion.
- Self-motivated, able to meet multiple deadlines and remain calm and focused under pressure.
- Problem solver, good listener, flexible, confident, proactive and resourceful.
- Interpersonal skills and follow through to build strong relationships and trust with faculty.
- Balance, negotiate and incorporate ideas from all faculty members.

### **Research Development**

Assisted in preparing 101 grants from Oct. 2014 to Nov. 2023 with \$153M in budget requests and supporting 499 faculty, including 107 extramural faculty (15 proposals, \$21.6M and 70 faculty annually), submitted to a range of agencies (DOE, NIH, NSF, DOD, ASU, and foundations). This support resulted in 32 awards (30% funding rate) totaling \$26.5M for 161 faculty including 43 extramural, with an average of 4.5 awards totaling \$3.7M per year with an average budget of \$827k per award. The average proposal team had 5.0 faculty. Every faculty requesting support received some level of support, with effort scaled based on availability. Excluded are concept papers, pre-applications and 4 awards (from 8 proposals) from national facilities for usage time with no budget. Details of the awarded grants are shown in **Table 1** and with no award are shown in **Table 2**. Grants are sorted by level of effort then by budget. Effort is defined as: 1 – Review and Edit (1–5 days) proposal; 2 – Coordinate (3–8 days) is #1 plus coordinate team and prepare ancillary docs; 3 – Develop (6–20 days) is #2 plus develop concept, team and technical content. Date is when the proposal was submitted. Budget is total project funding. The career stage of the PI is noted as early, mid or senior.

**Table 1.** Grants supported with successful award.

#	Date	Topic	PI	Agency	Budget	Effort
1	5/18/22	CO <sub>2</sub> capture	Early	DOE BES	\$4,500,000	3 - Develop
2	6/27/18	CO <sub>2</sub> delivery to algae	Senior	DOE EERE	\$2,500,000	3 - Develop
3	5/14/20	CO <sub>2</sub> capture and conversion	Senior	DOE EERE	\$2,500,000	3 - Develop
4	2/7/22	CO <sub>2</sub> capture	Early	NSF CBET	\$1,700,000	3 - Develop
5	6/30/18	CO <sub>2</sub> capture materials	Early	DOE ARPA-E	\$1,667,000	3 - Develop
6	12/17/14	CO <sub>2</sub> capture and conversion	Senior	DOE EERE	\$1,250,000	3 - Develop
7	1/21/20	Pump-probe spectroscopy	Senior	NSF	\$1,010,000	3 - Develop
8	2/15/23	DAC to methanol	Early	DOE FECM	\$400,000	3 - Develop
9	3/20/14	Photosynthesis and electrochemistry	Senior	ASU LightWorks	\$50,000	3 - Develop
10	8/28/15	Photosynthesis and electrochemistry	Senior	ASU LightWorks	\$35,000	3 - Develop
11	8/13/16	Wastewater treatment; electrochemistry	Senior	ASU LightWorks	\$35,000	3 - Develop
12	10/3/18	Desert photosynthesis, bioenergy	Early	ASU LightWorks	\$35,000	3 - Develop
13	10/3/18	CO <sub>2</sub> capture mechanisms	Early	ASU LightWorks	\$35,000	3 - Develop
14	10/28/20	CO <sub>2</sub> capture to fuels	Early	ASU LightWorks	\$35,000	3 - Develop
15	6/5/17	Microfluidic separations	Mid	NIH R01	\$1,200,000	2 - Coordinate
16	7/6/23	Marine carbon dioxide removal	Early	DOE ARPA-E	\$1,100,000	2 - Coordinate
17	7/17/19	X-ray solution scattering	Early	NSF BIO	\$1,000,000	2 -

						Coordinate
18	7/17/19	Computational Biology	Early	NSF BIO	\$600,000	2 - Coordinate
19	5/15/20	Photosynthesis, structural biology	Early	NSF	\$300,000	2 - Coordinate
20	7/22/22	CO <sub>2</sub> mineralization	Early	DOE FECM	\$233,000	2 - Coordinate
21	5/30/18	Sample delivery technology for X-ray	Senior	NIH	\$135,000	2 - Coordinate
22	2/15/23	DAC to methanol	Early	DOE FECM	\$120,000	2 - Coordinate
23	10/30/22	CO <sub>2</sub> capture	Senior	ASU LightWorks	\$30,000	2 - Coordinate
24	1/21/15	Cryogenic Electron Microscope	Senior	NSF	\$2,800,000	1 - Review and Edit
25	3/16/20	Chemistry, catalysis	Early	DOE	\$765,000	1 - Review and Edit
26	12/15/17	Photosynthesis, structural biology	Senior	DOE BES	\$750,000	1 - Review and Edit
27	7/1/16	Solar fuel catalysts	Early	NSF CHE	\$660,000	1 - Review and Edit
28	5/29/15	3D Nanoprinter	Senior	NIH HEI	\$600,000	1 - Review and Edit
29	10/21/19	Computational biology	Early	NSF	\$138,000	1 - Review and Edit
30	6/27/19	Photosynthesis and agriculture	Early	USDA	\$120,000	1 - Review and Edit
31	2/6/20	Bioinspired materials/catalyst	Early	Dryfus	\$100,000	1 - Review and Edit
32	3/30/20	Microfluidic biomolecule separations	Mid	NIH	\$71,000	1 - Review and Edit

**Table 2.** Grants supported with no award. See Table 1 for header definitions.

#	Date	Title / Topic	PI	Agency	Budget	Effort
1	1/25/18	CO <sub>2</sub> capture and conversion	Senior	DOE BES	Preproposal	3 - Develop
2	7/17/18	X-ray beamline technology development	Senior	NIH X02	Preproposal	3 - Develop
3	4/26/19	Biological Materials	Senior	NSF	\$25,000,000	3 - Develop
4	5/21/19	Biomedical infrastructure	Senior	NIH P41	\$8,859,000	3 - Develop
5	5/21/23	Synthetic fuels and fertilizers	Mid	NSF	\$5,000,000	3 - Develop
6	4/30/18	Alzheimer's disease; cryo-EM	Senior	NIH U01	\$4,600,000	3 - Develop
7	10/14/22	CO <sub>2</sub> storage materials	Senior	DOE ARPA-E	\$4,200,000	3 - Develop
8	4/7/2021	Microalgae; direct air capture	Senior	DOE	\$4,000,000	3 - Develop
9	7/22/22	CO <sub>2</sub> capture	Early	DOE FECM	\$3,750,000	3 - Develop
10	3/30/21	CO <sub>2</sub> capture and conversion	Mid	DOE BES	\$3,600,000	3 - Develop
11	3/30/21	CO <sub>2</sub> capture	Mid	DOE BES	\$3,600,000	3 - Develop
12	8/16/19	Photosynthesis and electrochemistry	Senior	DOD ONR	\$3,000,000	3 - Develop
13	8/28/20	Structure determination; infectious diseases	Senior	DOD	\$3,000,000	3 - Develop
14	5/22/14	Photosynthesis and electrochemistry	Senior	DOE EERE	\$2,000,000	3 - Develop
15	12/2/19	CO <sub>2</sub> capture and conversion	Early	NSF	\$2,000,000	3 - Develop
16	2/7/23	Reactive CO <sub>2</sub> capture and conversion	Mid	NSF	\$1,800,000	3 - Develop

17	11/1/19	Material science, Ultrafast X-rays	Senior	NSF	\$600,000	3 - Develop
18	6/1/20	Computational cluster, cryo-EM	Early	NIH	\$600,000	3 - Develop
19	10/20/15	Photosynthesis and electrochemistry	Senior	NSF	\$300,000	3 - Develop
20	5/29/15	Photosynthesis and electrochemistry	Senior	ASU Biodesign	\$150,000	3 - Develop
21	3/13/15	Algae education	Senior	Foundation - ASU	\$100,000	3 - Develop
22	5/14/20	CO <sub>2</sub> delivery to algae	Early	Industry	\$100,000	3 - Develop
23	8/28/15	Algae biomass processing; mechanisms	Early	ASU LightWorks	\$50,000	3 - Develop
24	10/28/21	CO <sub>2</sub> capture and conversion	Mid	ASU LightWorks	\$35,000	3 - Develop
25	9/5/19	Membrane protein structure/function	Early	ASU LightWorks	\$35,000	3 - Develop
26	4/30/21	CO <sub>2</sub> capture	Mid	ASU Engineering	\$25,000	3 - Develop
27	8/31/21	CO <sub>2</sub> capture and conversion	Early	DOE ARPA-E	\$5,200,000	2 - Coordinate
28	5/21/18	Ultrafast chemistry	Early	DOE BES	\$4,400,000	2 - Coordinate
29	4/7/21	CO <sub>2</sub> capture and conversion	Senior	DOE EERE	\$4,000,000	2 - Coordinate
30	7/22/22	CO <sub>2</sub> capture	Senior	DOE FECM	\$3,749,999	2 - Coordinate
31	1/15/19	Membrane protein structure/function	Early	NSF	\$1,728,161	2 - Coordinate
32	1/15/19	Molecular Biophysics	Early	NSF	\$1,728,161	2 - Coordinate
33	11/1/16	Photosynthesis structure/function	Senior	NSF BIO	\$1,500,000	2 - Coordinate
34	11/20/17	Photosynthesis structure/function	Senior	NSF BIO	\$1,500,000	2 - Coordinate
35	7/24/20	Cryo-EM structure determination	Early	NSF	\$1,231,345	2 - Coordinate
36	10/14/22	CO <sub>2</sub> storage materials	Senior	Novo Nordisk	\$1,000,000	2 - Coordinate
37	12/19/18	Photosynthetic Systems	Early	DOE	\$830,085	2 - Coordinate
38	4/29/19	Biomolecular motor modeling	Early	DOE	\$750,000	2 - Coordinate
39	4/29/19	Chemistry, catalysis	Early	DOE	\$750,000	2 - Coordinate
40	7/17/21	Community engagement, carbon capture	Early	Climateworks	\$150,000	2 - Coordinate
41	10/20/20	Drug detection; microfluidics	Early	NSF	\$138,000	2 - Coordinate
42	10/20/20	Membrane biophysics; computation	Early	NSF	\$138,000	2 - Coordinate
43	10/20/20	Synthetic catalyst design and evaluation	Early	NSF	\$138,000	2 - Coordinate
44	12/1/01	Synthetic photocatalysts for O <sub>2</sub> reduction	Early	Foundation	\$60,000	2 - Coordinate
45	12/1/01	Synthetic catalysts for CO <sub>2</sub> reduction	Early	Foundation	\$60,000	2 - Coordinate
46	4/19/23	Nanomanufacturing	Mid	NSF	\$3,000,000	1 - Review and Edit

47	6/5/15	Protein engineering	Mid	NIH	\$2,200,000	1 - Review and Edit
48	5/31/17	Cryo-Electron microscope	Early	NIH HEI	\$1,800,000	1 - Review and Edit
49	6/4/18	Membrane protein structure/function	Early	NIH	\$1,500,000	1 - Review and Edit
50	6/4/18	Membrane protein structure/function	Early	NIH R01	\$1,400,000	1 - Review and Edit
51	7/17/19	Structural biology methods	Early	NSF BIO	\$1,000,000	1 - Review and Edit
52	12/19/18	Membrane protein structure/function	Early	DOE	\$830,085	1 - Review and Edit
53	4/29/19	Structural biology, photosynthesis	Early	DOE	\$750,000	1 - Review and Edit
54	4/29/19	Computational biology	Early	DOE	\$750,000	1 - Review and Edit
55	4/29/19	Structural biology, photosynthesis	Early	DOE	\$750,000	1 - Review and Edit
56	4/29/19	Solar fuel catalysts	Early	DOE	\$750,000	1 - Review and Edit
57	4/29/19	Membrane protein structure/function	Early	DOE	\$750,000	1 - Review and Edit
58	4/29/19	Membrane protein structure/function	Early	DOE	\$750,000	1 - Review and Edit
59	11/14/14	Ultrafast laser system	Early	DOD	\$740,000	1 - Review and Edit
60	12/15/17	Photosynthesis structure/function	Early	DOE BES	\$700,000	1 - Review and Edit
61	12/15/18	Photosynthesis structure/function	Early	DOE BES	\$700,000	1 - Review and Edit
62	9/30/17	Photosynthesis and electrochemistry	Senior	DOE BES	\$600,000	1 - Review and Edit
63	6/16/17	Alzheimer's disease; protein analysis	Mid	NIH R21	\$400,000	1 - Review and Edit
64	6/15/20	Cryo-EM method development	Early	NIH	\$379,821	1 - Review and Edit
65	10/30/18	Photosynthesis structure/function	Early	Foundation - Life Sciences Research Foundation	\$186,000	1 - Review and Edit
66	11/28/17	Alzheimer's biomarkers	Early	Foundation - Alzheimer's Association	\$175,000	1 - Review and Edit
67	11/28/17	Alzheimer's disease; protein analysis	Mid	Foundation - Alzheimer's Association	\$150,000	1 - Review and Edit
68	3/1/22	CO <sub>2</sub> capture and conversion	Mid	Zimin Institute	\$140,000	1 - Review and Edit
69	10/18/22	Community engagement, carbon capture	Early	NSF	\$140,000	1 - Review and Edit
70	4/8/20	Tularemia, drug discovery	Early	NIH	\$138,000	1 - Review and Edit
71	4/8/20	Lyme disease structural biology	Early	NIH	\$138,000	1 - Review and Edit
72	2/7/19	Teacher-scholar award	Early	Foundation	\$100,000	1 - Review and Edit
73	9/15/17	Lyme disease structure/function	Early	Foundation - Global Lyme Alliance	\$100,000	1 - Review and Edit

74	9/23/22	Carbon sequestration; certification	Early	ASU Foundation	\$50,000	1 - Review and Edit
75	10/8/19	Photosynthesis and electrochemistry	Early	Foundation	\$40,000	1 - Review and Edit

### **Philanthropy**

**\$10M Gift for Beus Compact X-ray Free Electron Laser (CXFEL) Lab.** Worked with the ASU foundation and Biodesign Institute from 2015–2019 in fundraising efforts for ASU’s compact X-ray program leading to a \$10M gift in 2019. **Contributions:** Drafted presentations, written content for a case statement, concept development for videos (<https://research.asu.edu/file/x-ray-visionaries>), instrument cost estimates, and contributed to agendas and donor visits. <https://asunow.asu.edu/20190418-solutions-beus-10-million-gift-build-worlds-first-its-kind-x-ray-laser-lab-asu>

### **Project Management** (reverse chronological order)

1. **Mobile Air to Methanol (Air2Fuel)** (DOE, Award # DE-FE00032405, \$0.4M, Dec. 2023–Nov. 2024)
  - **Team:** PI (J. Flory), 4 Co-PIs (ASU: M. Green, L. Keeler, J. Chandler, J. Babendure, D. Ravikumar; Air Company: S. Sheehan, M. Garedeew, P. Ward; NREL: A. Roy, G. Grim, A. Badgett, K. Harrison, D. Ruddy), 3 researchers
  - **Responsibilities:** Principal Investigator, scientific input on experimental results and design; advise technical project direction; organize team meetings/communications; integrate technical content for annual reports.
2. **Autothermal Direct Air Capture (aDAC) for a Circular Carbon Economy** (NSF, Award #2219247, \$1.7M, Oct. 2022–Sept. 2026)
  - **Team:** PI (J. Wade), 4 Co-PIs (M. Green, K. Lackner, C. Miller, S. Sheehan), 5 researchers
  - **Responsibilities:** Scientific input on experimental results and design; advise technical project direction; organize team meetings/communications; integrate technical content for annual reports.
3. **Molecular mechanisms of moisture-driven DAC within polymeric sorbents (MissionDAC)** (DOE Office of Science, DE-SC0023343, \$4.5M, Sept. 2022–Aug. 2025)
  - **Team:** PI (J. Wade), 9 Co-PIs (M. Green, K. Lackner, J. Flory, P. Fromme, H. Zuang, M. Yacaman, H. Feigenbaum, B. Freeman, J. Brennecke), 25 researchers
  - **Responsibilities:** Scientific input on experimental results and design; advise technical project direction; organize team meetings/communications; integrate technical content for annual reports.
4. **Fossil-free fuel synthesis strategies using CO<sub>2</sub> from air** (ASU LightWorks, \$35k, Jan.–June 2021)
  - **Team:** PI (G. Moore), 4 Co-PIs (M. Green, K. Lackner, J. Flory, R. Stirling), 5 researchers
  - **Responsibilities:** Scientific input on experimental results and design; advise technical project direction; organize team meetings/communications; prepare final report.
5. **ASU’s DAC polymer-enhanced cyanobacterial bioproductivity** (DOE EERE, DE-EE0009274, \$2.5M, Oct. 2020–Sept. 2023)
  - **Team:** PI (W. Vermaas), 5 Co-PIs (K. Lackner, M. Green, J. McGowen, J. Quinn, J. Flory), 5 researchers, 4 institutions (ASU, Sustainability Science LLC, Blu4U)
  - **Responsibilities:** Scientific input on experimental results and design; system design and integration; advise technical project direction; organize team meetings/communications; integrate technical and administrative content for quarterly, annual, and final reports; analyze data and prepare technical figures; organize site visits.
6. **Mining Air for Fuels and Fine Chemicals** (DOE ARPA-E, DE-AR0001103, \$1.7M, Aug. 2019–Aug. 2022)
  - **Team:** PI (M. Green), 3 Co-PIs (K. Lackner, B. Freeman, J. Wade), 5 researchers, 4 staff; 3 institutions (ASU, Northern Arizona Univ., Univ. of Texas at Austin)



- **Responsibilities:** Feedback on experimental design and results; organize team meetings/communications; integrate technical and administrative content for quarterly, annual, and final reports; analyze data and prepare technical figures; organize site visits; contribute to technology to market strategy and effort.
7. Membrane Carbonation for 100% Efficient Delivery of Industrial CO<sub>2</sub> Gases (DOE EERE, DE-EE0008517, \$2.5M, Jan. 2019–Dec. 2021)
    - **Team:** PI (B. Rittmann), 3 Co-PIs (R. Krajmalnik-Brown, Y. Lai, J. McGowen), 7 researchers, 2 staff; 2 external partners (City of Mesa, Salt River Project).
    - **Responsibilities:** Organize team meetings/communications; integrate technical and administrative content for quarterly, annual, and final reports; analyze data and prepare technical figures; organize site visits; manage relationships with partners; coordinated onsite cultivation at City of Mesa.
  8. Atmospheric CO<sub>2</sub> Enrichment and Delivery (DOE EERE, DE-EE0007093, \$1.25M, Oct. 2015–Dec. 2018)
    - **Team:** PI (B. Rittmann), Co-PI (K. Lackner), 6 researchers, 2 staff.
    - **Responsibilities:** Organize team meetings/communications; integrate technical and administrative content for quarterly, annual, and final reports; analyze data and prepare technical figures; organize site visits; integrate design/requirements document; proposal development leading subsequent awards from DOE EERE (\$2.5M; Rittmann) and ARPA-E (\$1.7M; Green/Lackner).
  9. Microbial Electrophotosynthesis (ASU LightWorks, \$85k, June 2014 – June 2016; ongoing project)
    - **Team:** PI (P. Fromme), Co-PI (C. Torres, B. Rittmann, W. Vermaas, A. Moore, T. Moore, S. Hecht, Y. Mazor), 2 postdocs, 2 graduate students. Continues with 1 grad student (ASU funded).
    - **Responsibilities:** Lead researcher (Summer 2014), postdoc mentor (Aug 2014 – June 2016), graduate student mentor (Jan 2016 to present), team coordination; led 4 grant submissions.
  10. Electrochemical pH Control for Biological Wastewater Treatment (ASU LightWorks, \$35k, Dec. 2015 – June 2016)
    - **Team:** PI (P. Lammers), Co-PI (C. Torres, B. Rittmann), 2 researchers, 2 staff.
    - **Responsibilities:** Organize team meetings/communications, scientific input.

### **Peer-Reviewed Publications**

1. Wade, J.L., Marques, H.L., Wang, W., Flory, J. and Freeman, B. (2023) Moisture-driven CO<sub>2</sub> pump for direct air capture. *Journal of Membrane Science*, p.121954. doi.org/10.1016/j.memsci.2023.121954
2. Lewis, C., Flory, J., Moore, T., Moore, A., Rittmann, B., Vermaas, W., Torres, C., and Fromme, P. (2022) Electrochemically driven photosynthetic electron transport in cyanobacteria lacking photosystem II, *J. Am. Chem. Soc.* 144, 7, 2 doi:10.1021/jacs.1c09291.
3. Flory, J. D., Shinde, S., Lin, S., Liu, Y., Yan, H., Ghirlanda, G., and Fromme, P. (2013) PNA-Peptide Assembly in a 3D DNA Nanocage at Room Temperature., *J. Am. Chem. Soc.* 135, 6985–6993P.
4. Flory, J. D., Simmons, C. R., Lin, S., Johnson, T., Andreoni, A., Zook, J., Ghirlanda, G., Liu, Y., Yan, H., and Fromme, P. (2014) Low Temperature Assembly of Functional 3D DNA-PNA-Protein Complexes., *J. Am. Chem. Soc.* 136, 8283–8295.
5. Flory, J. D., Johnson, T., Simmons, C. R., Lin, S., Ghirlanda, G., and Fromme, P. (2015) Purification and assembly of thermostable Cy5 labeled  $\gamma$ -PNAs into a 3D DNA nanocage. *Artif. DNA. PNA XNA* 5, 1–8.

### **Patents and Other Publications**

1. Samantha Taylor, Justin Flory, Klaus Lackner, System and method for the continuous capture of CO<sub>2</sub>

using sorbent particles contained within mesh tubes, US patent application 63/589,910 filed on 10/12/23.

2. Marlene Alejandra Velazco Medel, Matthew Green, Wim Vermaas, Shuqin Li, Justin Flory. Biocompatible, alkaline stable moisture-driven CO<sub>2</sub> sorbents for CO<sub>2</sub> delivery to CO<sub>2</sub>-consuming microbes and method for synthesizing the same. US patent application 63/589,916 filed on 10/12/23.
3. Systems and methods of atmospheric carbon dioxide enrichment and delivery to photobioreactors via membrane carbonation; Bruce Rittmann, Klaus Lackner, Justin Flory, Megha Patel, Allen Wright; Patent No. US 11,306,280 B2, Filled Apr. 7, 2016 (provisional Apr. 7, 2015); Issued Apr. 19, 2022
4. Microbial Electro-photosynthesis; Justin Flory, Petra Fromme, Willem Vermaas, Bruce Rittmann, Cesar Torres, Thomas Moore, Ana Moore; Patent No. US 10,385,304 B2, Filled Dec. 17, 2015 (provisional Dec. 18, 2014); Issued Aug. 20, 2019
5. Microbial Electro-photosynthesis; Justin Flory, Petra Fromme, Willem Vermaas, Bruce Rittmann, Cesar Torres, Thomas Moore, Ana Moore; Patent No. US 10,563,162 B2, Issued Feb. 18, 2020; Continuation of Pat. No. 10,385,304 that broadens to include algae (and cyanobacteria).
6. Green, Matthew, Lackner, Klaus, Shokrollahzadeh Behbahani, Hoda, Kaneko, Yuta, Niimoto, Kacie, Mithaiwala, Husain, Stirling, Robert, Flory, Justin, Freeman, Benny, Kumar, Manish, Lopez Marques, Horacio, Wang, Winston, Bridge, Alexander, Gleason, Kris, Wade, Jennifer, Smith, Edwin, and Stratton, Ryan. 2022. "Mining Air for Fuels and Fine Chemicals". United States. <https://doi.org/10.2172/1869810>. <https://www.osti.gov/servlets/purl/1869810>
7. Rittmann, Bruce, Lackner, Klaus, Flory, Justin, Stirling, Robert, Eustance, Everett, Lai, Yen-Jung, Shesh, Tarun, Wright, Allen, Kmon, Jason, L'Heureux, Zara, and Badvipour, Shahrzad. (2019) Atmospheric CO<sub>2</sub> Capture and Membrane Delivery. <https://www.osti.gov/servlets/purl/1509489>
8. Methods and Systems for Membrane Carbonation; Everett Eustance, Bruce Rittmann, Yen-Jung Lai, Justin Flory, Diana Calvo, Tarun Shesh; Filled Mar. 4, 2020 (provisional Mar. 5, 2019). Application No. 16/809,384

## **Products**

1. Websites: Developed written scientific content for several websites with feedback from faculty, worked with graphic design team to develop the images and a web developer to build the site, including the CNCE website <https://globalfutures.asu.edu/cnce/> and CASD website <http://biodesign.asu.edu/applied-structural-discovery>
2. FreeStyle Blood Glucose Meter: Developed test requirements and tested the software for the FreeStyle meter while working at Abbott: <https://www.myfreestyle.com/>
3. XLi Time and Frequency Distribution System: Developed test automation systems, engineering and testing requirements and tested the software and hardware for the XLi: [http://www.microsemi.com/document-portal/doc\\_view/133379-xli](http://www.microsemi.com/document-portal/doc_view/133379-xli)
4. Navigator Continuous Blood Glucose Monitoring: Developed test requirements and tested the software for the Navigator meter while working at Abbott: <https://abbottdiabetescare.co.uk/our-products/other-meters/freestyle-navigator-2>

## **Academic Service**

1. Peer reviewer (2020, 2019, 2023) DOE Energy Efficiency and Renewable Energy (EERE), Bioenergy Technology Office (BETO), Small Business Innovation Research (SBIR) program.
2. Peer reviewer (2023) for Energy & Fuels, American Chemical Society.

3. Red team review (2020) for ASU-led NSF Science and Technology Center proposal.
4. Peer reviewer (2019) for Applied Biosafety, SAGE Publishing.
5. Peer reviewer (2016) for Photochemical & Photobiological Sciences, Royal Society of Chemistry.
6. Poster judge (2017) for Biodesign Fusion retreat.
7. DOE Workshop (2014) Participant in a Department of Energy Algal Strategy Workshop.

### **Public Outreach**

1. High Impact Presentations (2014–2019) Develop presentations with Biodesign Communications team to engage potential donors, industry, new collaborators and ASU events (KED town hall, Biodesign board of directors).
2. Tour Guide (2014–2020) Regularly provide tours of Biodesign Institute and CASD to high profile visitors from academia, industry, research institutes, non-profit organizations, faculty candidates.
3. Press Releases (2015–2020) Draft and edit press releases including, [Photosynthesis in action](#) (Nov. 8, 2019) [Direct Air Capture of CO<sub>2</sub>](#) (Feb. 21, 2019) [CO<sub>2</sub> for Algae](#) (Nov. 6, 2018), [Molecular Movies](#) (Scientific American, May 8, 2017), [X-ray Visionaries Video](#) (Dec. 21, 2016), [Salud Digna MOU](#) (Aug. 16, 2016), [Solar Fuels](#) (ACS, May 2, 2016), [CO<sub>2</sub> Enrichment for Algae](#) (Nov. 12, 2015).
4. ASU Open Door (2011–2017). Coordinate and execute exhibits engaging the public about scientific research for ASU Open Door (open house) each year. Coordinate developing and executing activities engaging thousands of visitors about CASD research. Activities involved over 30 volunteers from 5 or more CASD research groups each year, and included: plastic 3D protein models, an electron race, coloring sheets, movies, technical posters, and virtual reality viewer.
5. Faculty Posters (2015–2019) Work with Biodesign Communications and CASD faculty to develop themed posters for 17 faculty with a common template emphasizing unifying connection with Biodesign as well as other department and center affiliations.
6. Animating Research (2017–2018) Help develop a student-led collaboration with Professor Liz Lerman in ASU's Institute of Design to create dance, theater and other interpretive performances to showcase Biodesign and CASD research.
7. Arizona Science Center (2011–2012) Engage the lay public of all ages about the science of the human body, electricity and magnetism, physics and solar energy conversion systems.

### **Oral Presentations**

1. Enabling global-scale carbon management, DOE National Energy Technology, Online webinar, October 4, 2022 (invited talk)
2. Scientists Can Offer Unique Lenses As RD Professionals, NORDP 2021 Virtual Conference, Online webinar, May 3, 2021 (selected talk); Co-presenters: Toyin Babarinde (MD Anderson / Univ. Texas), Sujatha P. Koduvayur (Worcester Polytechnic Institute), Andrea Stith (UC Santa Barbara), Christine M. Blaumueller (University of Iowa), Robert Lawrence (Binghamton Univ.)
3. Scientists in Research Development: Turning ideas into compelling proposals, NORDP 2020 Virtual Conference, Online webinar, Sept. 1, 2020 (selected talk); Co-presenters: Debbie Frank (Wash. Univ. St. Louis), Samarpita Sengupta (Univ. Texas Southwestern), Jessica Moon (Stanford Univ.)
4. Life, art and miniature accelerators, Sip of Science, Flemings DC Ranch, Scottsdale, AZ, Feb. 26, 2019 (invited talk)
5. Storing Sunlight, ASU Open Door, Biodesign Institute, Tempe, AZ, Feb. 24, 2018 (invited talk)
6. PNA-Polypeptide Assembly in a 3D DNA Nanocage for Building an Artificial Oxygen Evolving

- Complex, Western Photosynthesis, Pacific Grove, CA, January 5, 2014 (selected talk)
7. PNA-Polypeptide Assembly in a 3D DNA Nanocage for Building an Artificial Oxygen Evolving Complex, EFRC PARC Graduate Student Seminar, Online, October 23, 2013 (invited talk)
  8. Nucleic Acid-Driven Polypeptide Assembly, Foundations of Nanoscience, Snowbird UT, April 16<sup>th</sup>, 2013 (selected talk)
  9. Nucleic Acid-driven Peptide Assembly for Building an Artificial Oxygen Evolving Complex, Bioenergy/EFRC seminar, Biodesign Institute, Tempe, AZ, April 5th, 2012
  10. The Atomic Hard Disk, What Physicists Do, Sonoma State University, Rohnert, Park, CA; Feb. 2001

### **Poster Presentations**

1. Biodesign Center for Applied Structural Discovery, Nature Conference – Functional Dynamics, Arizona State University, Tempe, AZ, Nov 6 – 8, 2019
2. PNA-Polypeptide Assembly in a 3D DNA Nanocage for Building an Artificial Oxygen Evolving Complex, Western Photosynthesis, Pacific Grove, CA, Jan 2 – 5, 2014
3. Building a Bio-Inspired Water Oxidation Catalyst to Enhance Photosynthesis and Biomass Production, Algae Biomass Summit, Orlando, FL, Sept 30 – Oct 3, 2014
4. Nucleic Acid (PNA-DNA) Driven Polypeptide Assembly for Building an Artificial Oxygen Evolving Complex, Energy Frontier Research Center Principal Investigator Meeting, Washington DC, July 18–19, 2013
5. Nucleic Acid-Driven Polypeptide Assembly, Foundations of Nanoscience, Snowbird, UT, Apr 15–18, 2013
6. Carbon Free Fuels Inspired by Nature, ASU Open Door, Tempe, AZ, 2011–2014
7. Nucleic Acid (PNA-DNA) Driven Polypeptide Assembly for Building an Artificial Oxygen Evolving Complex, PEM6 Sixth Peptide Engineering Meeting, Emory University, Atlanta, GA, Oct. 2–5, 2012
8. Physics, Chemistry and Biology of Membrane Proteins, Arizona State University, May 15–16, 2012

### **Professional Development**

1. NETL Project Review (2023). 1200 attendees (record), good networking, good variety of DAC technologies. IRA generating significant private sector activity; insurance available for sequestration.
2. CNCE Retreat (2023) organized a day long retreat attended by ~60 CNCE researchers and faculty to showcase research progress and discuss future directions and priorities for the center.
3. ASU DEIA Conference (2023) learned about ways of increasing DEIA in CNCE including adding welcoming statements, promoting opportunities with underrepresented groups and strengthening relationships within the center.
4. Professional Success Institute (PSI) Basic Seminar (2023) for personal and professional growth.
5. Doing Research in Indigenous Communities Conference (2022) to learn insights on the cultural review process; the importance of listening to tribal needs and priorities rather than pushing our own agendas; taking time to build relationships and trust.
6. NETL Project Review and DAC Test Center Workshop (2022). 650 attendees (record), good networking, good variety of DAC technologies; DAC Test center ready in 2 years.
7. ASU Inclusive Communities Training and DEI conference (2022) to learn how to be more inclusive in work at ASU and creating a diverse, equitable and inclusive working environment.

8. I-Corp (2018) to learn about NSF i-Corps program at ASU for commercializing CASD technologies.
9. Integral Facilitation Workshop (2018) to improve meeting facilitation skills.
10. GROW Coaching (2018) to improve management and leadership skills (2018).
11. National Organization for Research Development Professionals (NORDP) membership and conference (2018) joined NORDP and attended conference to learn about research development best practices including a preconference workshop on preparing large proposals.
12. Science Alive (2018) attended workshop to improve presenting to lay audiences and philanthropists.
13. Individual Development Plan (2017) created a personalized plan to develop skills in research and business development for advancing my career. Led rollout of development plans within CASD (2017) and CNCE (2023) for postdocs and students to reinforce their own development and used as a mentoring tool.
14. Lens of the Market (2015) workshop for using market analysis to guide research proposals.

### **Honors and Awards**

- ASU Sun Award (2019) from Tobin Spratte
- ASU Sun Award (2016) from Tina Esquerra
- ASU Sun Award (2015) from Dianne Price

### **Professional Associations**

1. National Organization for Research Development Professionals (NORDP; 2018–2021)
2. Algal Biomass Organization (2014–2017)