Appendix VI

Alumni Survey Results

Appendix VI: CMU Alumni Survey Results
Comparison of Chemistry Alumni (CHEM) to All University Alumni (CMU) 2013 - 2018

Overall, how satisfied are you with your undergraduate education?

	CMU		CHEM	
	#	%	#	%
Very Satisfied	296	45.9%	11	73.3%
Generally Satisfied	301	46.7%	4	26.7%
Ambivalent	27	4.2%	0	0.0%
Generally Dissatisfied	17	2.6%	0	0.0%
Very Dissatisfied	4	0.6%	0	0.0%

While an undergraduate, about how often did you have conversations with faculty outside of class?

	CMU		CHEM	
	#	%	#	%
Never	19	2.9%	0	0.0%
Rarely (1-2 times per semester)	78	12.0%	0	0.0%
Occasionally (3-5 times per semester)	155	23.9%	1	6.7%
Often (once every two weeks)	153	23.6%	1	6.7%
Very Often (at least once a week)	243	37.5%	13	86.7%

Would you encourage a current high school senior to attend CMU?

	CMU		CHEM	
	#	%	#	%
Definitely Would	397	61.3%	11	73.3%
Probably Would	177	27.3%	3	20.0%
Maybe	59	9.1%	1	6.7%
Probably Would Not	8	1.2%	0	0.0%
Definitely Would Not	7	1.1%	0	0.0%

How would you rate the overall quality of your education within that degree/certificate program?

	CMU		CHEM	
	#	%	#	%
Very High	244	37.5%	8	53.3%
High	280	43.0%	7	46.7%
Average	106	16.3%	0	0.0%
Low	16	2.5%	0	0.0%
Very Low	5	0.8%	0	0.0%

Baccalaureate Student Learning Outcomes

Based on what you know now, how well do you think your undergraduate experience prepared you to

	CMU									
	Very Well		More than Adequately		Adequately		Less Than Adequately		Very Poorly	
	#	%	#	%	#	%	#	%	#	%
Construct a summative project, paper or practiced--based performance that draws on current research, scholarship and/or techniques, and specialized knowledge in the discipline (Applied Learning/ Specialized Knowledge)	104	31.0 %	124	36.9 %	88	26.2 %	16	4.8 %	4	1.2 %
Analyze data critically, reason logically, and apply quantitative analysis methods correctly to develop appropriate conclusions (Intellectual Skills: Quantitative Fluency)	124	37.0 %	124	37.0 %	72	21.5 %	13	3.9%	2	0.6 %
Make and defend assertions about a specialized topic in an extended well-organized document and an oral presentation that is appropriate to the discipline (Intellectual Skills: Communication Fluency)	115	34.7 %	128	38.7 %	69	20.8 %	15	4.5%	4	1.2 %
Identify assumptions, evaluate hypotheses or alternative views, articulate implications and formulate conclusions (Intellectual Skills: Critical Thinking)	129	38.5 %	116	34.6 %	77	23.0 %	10	3.0%	129	38.5 %

Based on what you know now, how well do you think your undergraduate experience prepared you to

CHEM

	Very Well		More than Adequately		Adequately		Less Than Adequately		Very Poorly	
	#	%	#	%	#	%	#	%	#	%
Construct a summative project, paper or practice-based performance that draws on current research, scholarship and/or techniques, and specialized knowledge in the discipline (Applied Learning/Specialized Knowledge)	5	33.3 %	7	46.7 %	2	13.3 %	1	6.7 %	0	0.0 %
Analyze data critically, reason logically, and apply quantitative analysis methods correctly to develop appropriate conclusions (Intellectual Skills: Quantitative Fluency)	13	86.7 %	2	13.3 %	0	0.0 %	0	0.0 %	0	0.0 %
Make and defend assertions about a specialized topic in an extended well-organized document and an oral presentation that is appropriate to the discipline (Intellectual Skills: Communication Fluency)	7	46.7 %	4	26.7 %	3	20.0 %	1	6.7 %	0	0.0 %
Identify assumptions, evaluate hypotheses or alternative views, articulate implications and formulate conclusions (Intellectual Skills: Critical Thinking)	8	53.3 %	6	40.0 %	1	6.7 %	0	0.0 %	0	0.0 %

Job and Career Questions

Are you working for pay right now?

	CMU		CHEM	
	#	%	#	%
Yes, work full-time	51 5	79.1%	15	100.0%
Yes, workpart-time	75	11.5%	0	0.0%
No	61	9.4%	0	0.0%

Only respondents who answered "Yes," they are working for pay right now, answered the following questions.

In what type of organization is your principal employment? Mark the one best answer.

	CMU	CHEM
Self-employed in own business or professional non-group practice	31	0
Private for profit corporation/company/group/group-practice	203	4
Higher education (public or private)	47	4
Elementary or secondary education (public or private)	77	1
International organization in the US	14	0
International organization outside of the US	6	2
US Military	7	0
Federal Government (except military)	17	2
State and local government, institution, or agency (except education)	71	0
Private non-profit org. (except education and international organizations)	72	0
Other -	29	2

Other-501c6&501c3organization,Archerycompany,Banking,CorporateMortgageCompany,Internet Marketing,Oil&GasIndustry,Restaurant,Workforhighereducation,physicallabor,ResearchAssistant,special district,Trucking

Which of the following best describes your current position?

	CMU		CHEM	
	#	%	#	%
Entry Level	206	35.3%	8	53.3%
Mid-Level	279	47.9%	6	40.0%
Senior Level	71	12.2%	1	6.7%
Executive Level (except for chief executive)	11	1.9%	0	0.0%
Chief Executive (CEO, COO, CFO, GM or principal in business of other organization)	12	2.1%	0	0.0%
Graduate Assistantship	4	0.7%		

How many years have you been in your current job type?

	CMU		CHEM	
	#	%	#	%
Less than 3 years	38 6	65.6%	9	60.0%
3-5 years	14 5	24.7%	6	40.0%
6-9 years	32	5.4%	0	0.0%
10 or more years	25	4.3%	0	0.0%

Is your current position related to your undergraduate field(s) of study?

	CMU		CHEM	
	#	%	#	%
Yes, related to major(s)	44 6	76.0%	14	93.3%
No, not related	14 1	24.0%	1	6.7%

How well did CMU prepare you for your current career?

	CMU		CHEM	
	#	%	#	%
Very Well	155	26.6%	4	26.7%
More than Adequately	170	29.2%	8	53.3%
Adequately	202	34.6%	3	20.0%
Less Than Adequately	21	3.6%	0	0.0%
Very Poorly	10	1.7%	0	0.0%
NA	25	4.3%	0	0.0%

What is your approximate annual gross income (before taxes)?

	CMU		CHEM	
	#	%	#	%
Under $20,000	40	7.7%	0	0.0%
$20,000 - $29,999	73	14.0%	2	13.3%
$30,000 - $39,999	120	23.1%	6	40.0%
$40,000 - $49,999	96	18.5%	4	26.7%
$50,000 - $59,999	75	14.4%	1	6.7%
$60,000 - $74,999	56	10.8%	1	6.7%
$75,000 - $99,999	38	7.3%	1	6.7%
$100,000 - $149,999	16	3.1%	0	0.0%
$150,000 - $249,999	3	0.6%	0	0.0%
$250,000 - $499,999	2	0.4%	0	0.0%
Over $500,000	1	0.2%	0	0.0%

Only respondents who answered "No," they are not working for pay right now, answered the following question.

Why are you not currently working for pay? (Please mark all that apply)

	# of times checked	
	CMU	**CHEM**
I chose not to enter the workforce at this time.	8	0
It has been difficult to find a position in my field.	20	0
It has been difficult to find a position paying an appropriate salary.	13	0
I am raising a family.	46	0
I am currently a student.	33	0
I am doing volunteer work.	5	0
I am retired.	3	0
Other	27	0

Education since College

Have you enrolled in a graduate, professional, or other degree/certificate program since graduating from CMU?

	CMU		CHEM	
	#	%	#	%
Yes	196	30.1%	10	66.7%
No	312	47.9%	4	26.7%
No, but I plan to enroll in the next two years.	143	22.0%	1	6.7%

Only respondents who answered "Yes" I have enrolled in another degree/certificate program since graduating from CMU answered the following questions.

Are you enrolled in this program now?

	CMU		CHEM	
	#	%	#	%
Yes, I am a full-time student	79	40.5%	6	60.0%
Yes, I am a part-time student	27	13.8%	0	0.0%
No	89	45.6%	4	40.0%

How long after you graduated from the degree/certificate program this survey pertains to did you start this program?

	CMU		CHEM	
	#	%	#	%
Immediate	98	50.0%	5	50.0%
1 year later	37	18.9%	4	40.0%
2-3 years later	44	22.4%	1	10.0%
4-6 years later	14	7.1%	0	0.0%
NA	3	1.5%	0	0.0%

Altogether, how many years have/did you attend(ed) further schooling? Mark the best answer.

	CMU		CHEM	
	#	%	#	%
None	14	7.2%	1	10.0%
1 to 2 years	11 9	61.3%	5	50.0%
3 to 4 years	46	23.7%	4	40.0%
5 to 6 years	12	6.2%	0	0.0%
NA	3	1.5%	0	0.0%

How long after you graduated from the degree/certificate program this survey pertains to did you start this program?

	CMU		CHEM	
	#	%	#	%
Immediately (following fall or spring)	98	50.0%	5	50.0%
1 year later	37	18.9%	4	40.0%
2-3 years later	44	22.4%	1	10.0%
4-6 years later	14	7.1%	0	0.0%
NA	3	1.5%	0	0.0%

Altogether, how many years have/did you attend(ed) further schooling? Mark the best answer.

	CMU		CHEM	
	#	%	#	%
None	14	7.2%	1	10.0%
1 to 2 years	11 9	61.3%	5	50.0%
3 to 4 years	46	23.7%	4	40.0%
5 to 6 years	12	6.2%	0	0.0%
NA	3	1.5%	0	0.0%

How well did CMU prepare you for this educational program?

	CMU		CHEM	
	#	%	#	%
Very Well	75	38.5%	5	50.0%
More than Adequately	53	27.2%	3	30.0%
Adequately	49	25.1%	1	10.0%
Less Than Adequately	7	3.6%	0	0.0%
Very Poorly	3	1.5%	0	0.0%
NA	8	4.1%	1	10.0%

What level of education are/were you pursuing?

	CMU		CHEM	
	#	%	#	%
Certificate	14	7.3%	0	0.0%
Associate	10	5.2%	0	0.0%
Baccalaureate	22	11.5%	0	0.0%
Post-Bacc Certificate	5	2.6%	1	10.0%
Master's	10 2	53.1%	3	30.0%
J.D.	12	6.3%	0	0.0%
Doctoral	27	14.1%	6	60.0%
Other	0	0.0%	0	0.0%

Did you complete this program?

	CMU		CHEM	
	#	%	#	%
Yes	71	36.8%	3	30.0%
No	16	8.3%	0	0.0%
In the process of finishing	10 6	54.9%	7	70.0%

Demographic Questions

What is your gender?

	CMU		CHEM	
	#	%	#	%
Male	252	39.1%	8	53.3%
Female	376	58.4%	7	46.7%
Prefer not to respond	16	2.5%	0	0.0%

What is your ethnicity?

	CMU		CHEM	
	#	%	#	%
American Indian or Alaskan Native	8	1.2%	0	0.0%
Asian	13	2.0%	0	0.0%
Black or African American	6	0.9%	0	0.0%
Hispanic of any race	41	6.4%	1	6.7%
Native Hawaiian or Pacific Islander	2	0.3%	0	0.0%
White	514	80.2%	13	86.7%
Two or more races	24	3.7%	0	0.0%
Race and ethnicity unknown	1	0.2%	0	0.0%
Non-Resident Alien (of any race or ethnicity)	1	0.2%	0	0.0%
Prefer not to respond	25	3.9%	1	6.7%
Other	6	0.9%	0	0.0%

What is your current age?

	CMU		CHEM	
	#	%	#	%
Under 21	7	1.1%	0	0.0%
21-24	160	24.8%	3	20.0%
25-34	341	52.8%	10	66.7%
35-44	75	11.6%	2	13.3%
45-54	36	5.6%	0	0.0%
55 or older	17	2.6%	0	0.0%
Prefer not to respond	10	1.5%	0	0.0%

Do you live in the state of Colorado?

	CMU		CHEM	
	#	%	#	%
Yes	489	75.7%	8	53.3%
No	157	24.3%	7	46.7%

If yes, do you live in Western Colorado?

	CMU		CHEM	
	#	%	#	%
Yes	356	59.3%	6	40.0%
No	244	40.7%	9	60.0%

Comments from CHEM Alumni

Job and Career Questions (continued)

Comments about your work experience that will help improve CMU:

- Would like to see more options for industry placements that students could use to gain work experience
- Graduate Research Assistant: My field of study is not chemistry, but a field using chemistry regularly. I feel that the education provided at CMU was excellent for the size. The research culture, however, is much different than at my current place of work. I felt that I was lacking experience with talks and presentations. The knowledge base and problem solving skills I developed at CMU is excellent and applicable. I do feel that more work with communications and seminars/colloquium would be a great addition to the chemistry program at CMU.
- CMU prepared me to interview well, but more discussion involving what to look for in a company, what a career in industry vs.academia is like, and how to develop people skills to succeed in the `real world` would have been extremely helpful. I've learned these things on the fly in my career, and truly experience is the best teacher, but it would have been awesome to have some of these conversations before leaving college.
- The Communications in Chemistry course was extremely helpful and very applicable towards the work I have been exposed to since graduating. However, I believe this type of exposure should be expanded to more than one semester of undergraduate coursework, i.e., I believe it would be very helpful to increase exposure to peer-reviewed literature more heavily in other chemistry undergraduate courses.

Education since College (continued)

In which field and program are/were you studying and what is the name of the College/University you attend(ed)?

Graduate Program	College/University Attend(ed)
• Physical Chemistry	University of Illinois at Urbana Champaign
• Organic Chemistry	Yale University
• MSc(Eng) Aerospace Materials Engineering	University of Sheffield
• Materials Science	The Pennsylvania State University
• MA Leadership	Denver Seminary
• Geochemistry	Colorado State University
• Education	CMU
• Chemistry	University of Texas at Dallas
• Applied Chemistry	Colorado School of Mines
•	University of Houston

Other comments about furthering your education:

- Would like to see an addition of strength of materials or materials science to the chemistry department
- Staff members at CMU always encouraged me to further my education and were extremely supportive in helping me figure out where and how. I always felt there was plenty of information available about graduate school.

General Comments by CHEM Alumni

Suggestions for improving the degree/certificate program:

- More focus on industry partnerships and placements for students to gain work experience BEFORE they graduate. Need more testing equipment. Especially Tensile and Charpy Tests.
- Colloquium/Seminars Senior Thesis
- Laboratory research experience was crucial in developing my ability to function as a chemist in the professional environment. I was encouraged to take advantage of these opportunities at CMU, so I would recommend that continues to happen. I do wish I had had a few internships prior to graduation in order to get a feel for what various careers are like, and this is by far my biggest recommendation for any current undergraduate student. I would recommend that professors push their students to seek those opportunities while they have the opportunity to do so.
- Overall, I believe the undergraduate chemistry program at CMU prepared me very well for both working in the field of chemistry as well as graduate school. One aspect that may have been lacking is emphasis on getting students involved in undergraduate research. While the laboratory skills that I developed in lab courses helped me greatly when entering into research projects, it was challenging to be comfortable being independent in the lab without the guidance of an instructor. Furthered undergraduate research would help in this aspect.
- The upper division electives for chemistry prepared me the most for graduate school (advanced lab, advanced organic, inorganic, physical chemistry, etc.). Providing more specialized upper division electives would be very helpful for preparing students for graduate school (advanced organic II or solid state chemistry).

Additional Comments:

- Really fun faculty and staff. The facilities for the Chem/Physical Sciences could use a face lift. The buildings are generally nice but the equipment was older and lacking.
- The involvement of the professors and their concern for the success of their students was very appreciated during my undergraduate career. I have found that other peers who have completed graduate programs in chemistry often have not had a similar experience and wish that their undergraduate advisors/professors had been similarly involved.

Appendix VII

Curricula Vitae for Tenured and Tenure-Track Faculty

Name:

James D Ayers

Start Year: 2007

Program:
Physical Sciences

Department:
Physical and Environmental Sciences

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

◉ Associate Professor ○ Instructor

Highest Degree

PhD	Stanford University	Chemistry	2003

Education: (List all degrees beginning with most recent-include post docs and external certificates)

Postdoctoral Scholar, Department of Chemistry and Biochemistry and Geophysical Institute, University of Alaska Fairbanks, 2003-2005

Ph.D., Chemistry, Stanford University, 2003

B.S., Physics, University of Texas at Austin, 1998

Teaching 2003-Present:

Courses Taught

CHEM 100, Chemistry and Society
CHEM 121/121L, Principles of Chemistry with lab
CHEM 131/131L, General Chemistry I with lab
CHEM 132/132L, General Chemistry II with lab
CHEM 151/151L, Engineering Chemistry with lab
CHEM 300, Environmental Chemistry
CHEM 321, Physical Chemistry I
CHEM 322, Physical Chemistry II
CHEM 341, Advanced Lab
CHEM 397, Structured Research
CHEM 442, Communicating in the World of Chemistry
UNIV 101, Introduction to Higher Education

Evidence of Continuous Improvement

UNIV 101 training meeting, May 2017
Assessment workshop with Dr. Paul Gaston, 2013
SUPP 101 training course, May 2010
SUPP 101 training course, May 2009

Innovative Materials/Activities

Developed Lab materials for CHEM 131L/132L

Supervision of Student Research/Project(s)

Fall 2018 - Two students working on ozone/low-cost sensor project
Spring 2017 - Three students working on ozone/air quality egg project (Student Showcase Poster)
Fall 2017 - One student working on ozone/air quality egg project
Summer 2017- One student working on ozone/air quality egg project
Spring 2017 - One student working on ClO4 detection via IC
2013-2016: Supervised 10 students working on perchlorate/IC/ozone projects (advanced undergraduate research projects).
Fall 2011- One student working on calibration curve for ClO4
Fall 2010 - One student working on ClO4

Spring 2010 - One student working on snow major ions baseline project
Fall 2007-Spring 2008 - One student working on snow major ions baseline project

Scholarship and Creative Work, 2003-Present:
Scholarship Related to Discipline
Journal Articles
J. D. Ayers and W. R. Simpson. "Measurements of N_2O_5 near Fairbanks, Alaska." *Journal of Geophysical Research Atmospheres* 111, D14309, doi:10.1029/2006JD007070, (2006).

J.D. Ayers, R. L. Apodaca, W. R. Simpson, and D. S. Baer. "Off-axis cavity ringdown spectroscopy: application to atmospheric nitrate radical detection." *Applied Optics* 44, 7239-7242 (33), (2005).

J. D. Ayers, A. E. Pomerantz, F. Fernández-Alonso, F. Ausfelder, B. D. Bean, and R. N. Zare. "Measurement of the cross section for $H+D_2 \rightarrow HD(v'=3,j'=0)+D$ as a function of angle and energy," *Journal of Chemical Physics* 119 (9), 4662-4670 (2003).

Conference Presentation
J. D. Ayers and W. R. Simpson. Measurements of NO_3 and N_2O_5 in the Polluted Subarctic Atmosphere: A Seasonal Perspective From Multi-year Observations in Fairbanks, AK. Poster presented at the Fall American Geophysical Union meeting, San Francisco, CA, December 2004.

J. D. Ayers, A. E. Pomerantz, F. Ausfelder, F. Fernández-Alonso, B. D. Bean, and R. N. Zare. Experimental Cross Section for $H + D_2 \rightarrow HD(v'=3,j'=0) + D$ as a Function of Angle and Energy. Poster presented at the 50th Western Spectroscopy Association Conference, Asilomar, CA, January 2003.

Grant Submissions

2016: EPA SmartCities Proposal (not funded, honorable mention)

2009,2010: NSF MRI Proposal (not funded)

Other
Reviewer for 5 grant proposals, Department of Energy Small Business Innovation Research

Professional Memberships

American Geophysical Union (2003-present)
Service 2003-Present:
University
2018
Faculty Senate, Colorado Faculty Advisory Council Member (spring)
Vice President, Faculty Senate (spring)
Member, Academic Policies Committee
2017
Tenure and Promotion committee member
Faculty Senate, Colorado Faculty Advisory Council Member
Vice President, Faculty Senate
Senate ad-hoc committee on tenure and promotion
2016
Faculty Senate, Colorado Faculty Advisory Council Member
Vice President, Faculty Senate
2015
Tenure and Promotion Committee member
Faculty Senate, Colorado Faculty Advisory Council Member
Member, Assistant Vice President for Academic Affairs Search

Member, Library Head of Public Services Search
2014
Tenure and Promotion Committee Member
Faculty Senate, Colorado Faculty Advisory Council Member
2013
Curriculum Committee Vice Chair
2012
Curriculum Committee Vice Chair
HLC Criterion 1 Committee Member
2011
Curriculum Committee Representative, PES
Faculty-to-Faculty Representative, Chemistry
HLC Criterion 1 Committee Member
2010
Curriculum Committee Representative, PES
Faculty-to-Faculty Representative, Chemistry
Assessment Committee Representative, PES (spring only)
2009
NSSEE Evaluation Committee Representative, PES
2008

Department
2018
Member, Biochemistry Assistant Professor Search (Fall)
2017
Chair, Biochemistry Assistant Professor Search Committee (Fall)
Chair, Biochemistry Visiting Assistant Professor Search Committee (Spring)
2016
Program Coordinator, Chemistry
Chair, Engineering Chemistry Development Committee
Member, Environmental Science Search Committee
2015
Program Coordinator, Chemistry
Lead role in creation of Biochemistry Program
2014
Member, Chemistry Tenure-Track Search Committee
2013
Member, Chemistry Tenure-Track and Biochemistry Search Committees
2012
Member, Biochemistry Search Committee

2011
Program Coordinator, Chemistry
Chair, Inorganic Chemistry Search Committee
Member, Chemistry Laboratory Coordinator Search Committee
Member, Biochemistry Search Committee
2010
Program Coordinator, Chemistry
Chair, Inorganic Chemistry Search Committee
2009
Program Coordinator, Chemistry (summer and fall)
Chair, Analytical Chemistry Search Committee
PES Faculty Evaluation Review Committee
2008
Chair, Analytical Chemistry Search Committee

Community

National
2018
Exam Author, US National Chemistry Olympiad
Exam Grader, US National Chemistry Olympiad
2017
Exam Author, US National Chemistry Olympiad
Exam Grader, US National Chemistry Olympiad
2016
Exam Author, US National Chemistry Olympiad
2015
Exam Author, US National Chemistry Olympiad
2014
Exam Author, US National Chemistry Olympiad
2013
Exam Author, US National Chemistry Olympiad
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Exam Author, US National Chemistry Olympiad
2011
Exam Author, US National Chemistry Olympiad
2010
Exam Author, US National Chemistry Olympiad
2009
Exam Author, US National Chemistry Olympiad
2008
Exam Author, US National Chemistry Olympiad

Local
2016
Presenter, CMU science camp for middle school students
2014
Presenter, CMU science camp for middle school students
2008
Judge, Western Slope Science Fair.
Chemistry demonstration, Western Slope Science Fair Awards Ceremony
Chemistry demonstration, Plateau Valley High School

Advising 2003-Present:
University level
2018
SOAR sessions (1)
2017
SOAR sessions (1)
2016
SOAR sessions (1)
2015
SOAR sessions (1)
2014
SOAR sessions (1)
2013
SOAR sessions (1)
2012
SOAR sessions (1)
2011
SOAR sessions (1)
2010
SOAR sessions (1)
2009

SOAR sessions (3)
2008
SOAR sessions (2)

Department level
2008-2018 Served as faculty advisor for 10-30 students
Honors and Awards 2003-Present:

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

	Books	0	**Book Reviews**		**Creative Publications**
3	**Journal Articles**		**Performances**		**Patents**
2	**Conference Presentations**		**Exhibitions**	3	**Grants-funded and non-funded**
	Sabbaticals		**Fullbright**		**Book Chapter**
5	**Other (related to discipline)**	Reviewer for grant proposals			

Name:

Timothy Michael D'Andrea

Start Year: 2009

Program:
Physical Sciences

Department:
Physical and Environmental Sciences

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank
○ Professor ○ Assistant Professor
◉ Associate Professor ○ Instructor

Highest Degree

PhD	University of Colorado, Boulder	Chemistry	2008

Education: (List all degrees beginning with most recent-include post docs and external certificates)
Ph. D. Chemistry and Biochemistry~Summer 2008
B.S. Chemistry, *summa cum laude*~Spring 2003, Ursinus College, PA

Teaching 2003-Present:
Courses Taught
CHEM 121, Principles of Chemistry
CHEM 131, General Chemistry 1
CHEM 131L, General Chemistry 1 Lab
CHEM 132, General Chemistry 2
CHEM 132L, General Chemistry 2 Lab
CHEM 211, Quantitative Analysis
CHEM 211L, Quantitative Analysis Lab
CHEM 301, Analytical Chemistry
CHEM 301L, Analytical Chemistry Lab
CHEM 322, Physical Chemistry 2
CHEM 341, Advanced Lab
CHEM 396, Topics: Analytical Chemistry of Brewing
CHEM 397, Structured Research
CHEM 411, Main Group Elements
CHEM 431, Instrumental Analysis
CHEM 431L, Instrumental Analysis Lab

Evidence of Continuous Improvement

2017: Made significant changes/improvements to CHEM 301L. Specifically, I added a new lab exercise aimed at improving basic analytical techniques that students should have developed in General Chemistry. I find, however, these techniques are severely lacking. In addition, I restructured the requirements in lab to enhance the students' writing and communication skills.
2015: Created a new and very successful topics course on the Analytical Chemistry of Brewing.
2013: Introduced a new three-week lab into CHEM 431L. I created this lab based on the techniques developed by my previous research students to measure IBUs of beer samples for local breweries.
2010: Rewrote all of the CHEM 132 labs. Most of the labs were similar to ones previously performed at CMU; however, several new experiments were added.
2009:
Rewrote all of the CHEM 131 labs. Most of the labs were similar to ones previously performed at CMU; however, several new experiments were added.

Completely developed curriculum for CHEM 431/431L

2008: Completely developed curriculum for CHEM 211/211L.

Innovative Materials/Activities

2018: Developed a hands-on circuits lab in CHEM 431. This allows students to create circuits and measure components of circuits in the classroom and solidify concepts discussed in lecture.

2016: Developed a hands-on circuits exercise in CHEM 431. This allows students to create circuits and measure components of circuits in the classroom and solidify concepts discussed in lecture. Next year I will create a lab exercise based on the same concept.

2015: Created a new topics course on the Analytical Chemistry of Brewing. This course was nontraditional in the sense that it contained a wide variety of educational approaches. It included lectures, group work, homework, in-class and take-home exams, a great deal of lab work, the writing of a comprehensive lab report, oral presentations, and discussions with/tours from local experts in the field.

2013-present: Worked with a local brewery (The Rockslide Brewery) to measure IBUs of their beer samples as part of a two-week CHEM 431L experiment.

2011: Created a two week inquiry based lab experiment for CHEM 431L.

2010: Implemented an atoms first approach to General Chemistry. This required a complete overhaul of the curriculum. Added an exciting synthetic lab (synthesis of nylon and oil of wintergreen) to CHEM 131L.

2009: Introduced i-clickers into General Chemistry curriculum.

Supervision of Student Research/Project(s)

2018:Supervised 5 research students in the lab
2017:Supervised 8 research students in the lab
2016:Supervised 5 research students in the lab
2015:Supervised 7 research students in the lab
2014:Supervised 13 research students in the lab
2013:Supervised 6 research students in the lab
2012:Supervised 4 research students in the lab
2011: Supervised 2 research students in the lab
2010: Supervised 5 research students in the lab
2009:Supervised 2 research students in the lab

A description of the research can be seen below under "Unpublished Research"

Scholarship and Creative Work, 2003-Present:
Scholarship Related to Discipline

Journal Articles:

Timothy M. D'Andrea, Xu Zhang, Evan B. Jochnowitz, T.G. Lindeman, C.J.S.M. Simpson, Don David, Tom Curtiss, John R. Morris, G. Barney Ellison. Oxidation of Organic Films by Beams of Hydroxyl Radicals. *J. Phys. Chem. B*; 2008; 112(2) pp 535 - 544.

Conference Presentations:

Summer 2014
"Thermal Decomposition Kinetics of Iso-alpha Acids" presented at the American Society of Brewing Chemists Annual Conference. Chicago, IL, June 2014.

Summer 2007
"Oxidation of Organic Films by Beams of Hydroxyl Radicals" presented at the 62nd International Symposium on Molecular Spectroscopy. Ohio State University, Columbus, OH

Other
Seminar talks:

Fall 2015
"Molecular Beams of Highly Reactive Species Part 2" presented at the Physics Seminar Series. Colorado Mesa University, Grand Junction, CO.

Spring 2014
"Molecular Beams of Highly Reactive Species" presented at the Physics Seminar Series. Colorado Mesa University, Grand Junction, CO.

Spring 2009
"The Physics of Heterogeneous Chemistry and the Applications to Our Atmosphere" to be presented at the Physics Colloquium. Mesa State College, Grand Junction, CO.

Spring 2008
"Oxidation of Organic Films by Beams of Hydroxyl Radicals" presented at the Gas Phase Ion Chemistry Seminar. University of Colorado, Boulder, CO.

Fall 2007
Presented the methods used to create clean and intense molecular beams of hydroxyl radicals and reactively scatter them off the surface of thin films at Methods in Chemistry Seminar. University of Colorado, Boulder, CO.

Fall 2005
Presented the methods used to study the matrix isolation Fourier-Transform Infrared Spectroscopy of reactive intermediates at Methods in Chemistry Seminar. University of Colorado, Boulder, CO.

Scholarship Related to Pedagogy in Discipline

Publications:
Timothy M. D'Andrea, James Ayers. General Chemistry Lab Manual. *Fountainhead Press*, 2013.

Presentations:
Spring 2015
"Hop Chemistry in the Real World" presented as part of CMU's May Talks Series. Colorado Mesa University, Grand Junction, CO.

Spring 2007
"Interactive Student Learning is Just a Click Away" presented at the First-Year International Chemistry Conference. Boulder, CO.

Other:
External Grants:
NSF MRI grant submitted as supporting researcher. MRI: Acquisition of an LCMS-ELSD System for Undergraduate Research and Instruction at Colorado Mesa University. January 23, 2014.
The grant was declined

NSF MRI grant submitted as supporting researcher. MRI: Acquisition of an LCMS-ELSD System for Undergraduate Research and Instruction at Colorado Mesa University. January 23, 2014.
The grant was declined.

NSF MRI grant submitted as P.I., $139,572, MRI: Acquisition of a pyrolysis gas chromatograph/mass spectrometer at Mesa State College. April 21, 2010.
This grant was declined.

NSF MRI^2 grant submitted as P.I., $144,983, MRI-R^2: Acquisition of a pyrolysis gas chromatograph/mass spectrometer at Mesa State College. August 10, 2009.

This grant was declined.

Funding Obtained:

In 2014 I was awarded a CMU Faculty Professional Development Grant for $1257.

In 2012 I was able to purchase a Gas Chromatograph/Mass Spectrometer with money donated to the department by Dr. Ken Kosanke.

Student Research Presentations:
"Thermal Degradation of Iso-Alpha Acids" presented by Erin Bair at the Colorado Mesa University Student Showcase. Grand Junction, CO. Spring 2018.

"Beer Brewing Kinetics: Rates of Thermal Decomposition of Iso-Alpha Acids" presented by Kelly Bryant at the Colorado Mesa University Student Showcase. Grand Junction, CO. Spring 2016.

"Thermal Decomposition of Iso-Alpha Acids" presented by Alexandra Milard and Alex Brahmstead at the Colorado Mesa University Student Showcase. Grand Junction, CO. Spring 2015.

"Thermal Decomposition of Iso-Alpha Acids" presented by James Goff and Kara O'Brien at the 249th American Chemical Society National Conference. Denver, CO. March 2015.

"Thermal Decomposition of Iso-Alpha Acids" presented by Alexandra Milard and Alex Brahmstead at the Colorado Mesa University Student Showcase. Grand Junction, CO. Spring 2015.

"Thermal Decomposition Kinetics of Iso-alpa Acids" presented by Jenna Short at the Colorado Mesa University Student Showcase. Grand Junction, CO. Spring 2014.

"Analysis of Iso-Alpha Acids in order to Quantify Beer Bitterness" presented by Zach Vincent at the Colorado Mesa University Student Showcase. Grand Junction, CO. Spring 2013.

"Quantifying the Bitterness of Beer: The Analysis of Iso-Alpha Acids" presented by Alan Felix at the Colorado Mesa University Student Showcase. Grand Junction, CO. Spring 2012.

Unpublished research
2009-2018: CHEM397, Structured Research

In 2009 I became interested in analyzing beer. Beer is an intriguing system to study as an analytical chemist. It is a complicated mixture and the composition is something brewers need to reproduce on a regular basis. The large majority of breweries do not perform sophisticated analytical analysis of their samples; instead they rely on simple measurements and qualitative descriptions of their beers. The popularity of craft breweries has grown at an alarming rate and currently national brewing competitions have been the measure of quality. Craft breweries that win medals at large competitions gain national attention and, as a result, their businesses flourish. In order to win a medal at a major competition, the beer submitted must conform to particular style. Measurable quantities such as alcohol content, color, and bitterness must fall within a small range of values for each beer style. Additionally, off flavors and low levels of contamination cannot be present. Beers that precisely conform to a certain style of beer are the beers that perform well in competitions. Brewers have simple ways of monitoring color, carbonation, and alcohol content. Bitterness of beers, on the other hand, is an extremely difficult thing to quantify. Brewers simply rely on very rough calculations to estimate the bitterness of beers and rely simply on taste to analyze this. In addition, bitterness is a very difficult parameter to reproduce, which presents a major issue to breweries that strive for perfection. As a result, I have worked with two local breweries, Kannah Creek Brewing Company, The Rockslide Brewery, and The Copper Club in order to quantify the bitterness of their beers. In turn, the brewers gained valuable information about their brew process, which enabled them to estimate the bitterness of future batches of beer much more accurately.

The bitterness of beer is measured using an international bittering unit (IBU). An IBU represents the ppm concentration of three compounds called iso-alpha acids. Iso-alpha acids come from alpha acids in hops that have been isomerized through boiling. The conversion of alpha acids into iso-alpha acids is a relatively complicated process, which depends on many factors including temperature, time, sugar content of the boiling wort, and vigor of the boil. Once the iso-alpha acids have been formed, they must be extracted from the hops and into the finished beer. In addition, iso-alpha acids

are known to degrade due to temperature and light. Consequently, it is extremely difficult to know the ppm concentration of iso-alpha acids in a finished beer without measuring it.

Measuring IBUs of a beer is a challenging problem. Iso-alpha acid concentrations are very low in beers. Typically IBU's range from 10-50. Ppm is a low concentration, analogous to a blade of grass on a football field. In addition, these compounds must be separated from all other components of a beer sample before they are analyzed. To accomplish this separation we use high performance liquid chromatography, HPLC. My early research students focused on preparing standard solutions and developing HPLC methods in order to completely isolate the iso-alpha acids. Once separated, standard solutions of iso-alpha acids were used to quantify the compounds. We have employed two different methods for this.

We initially used iso-alpha acid standards to create calibration curves, the results of which were presented by a research student of mine, Alan Felix, at the CMU Student Showcase in 2011. This method worked but was time consuming and tedious. A semesters worth of work would result in the IBU determination for a couple beer samples. As a result, we began investigating new methods of IBU determination. Specifically, we employed a method of internal standard. This method allowed us to quantify IBUs in a small fraction of the time required by calibration curves. In addition, the precision of the measurements were far superior. We were able to measure the IBUs of beer samples to +/- 2 IBUs at the 95% confidence interval. Once the details of these experiments were worked out, we were able to successfully measure the bitterness of 5 different beer samples in spring 2013. These results were presented by my research student, Zach Vincent, at the CMU Student Showcase in 2013.

Quantifying IBUs in beer samples was a great research project for undergraduates. This research gave my students valuable experience preparing standards and doing quantitative analysis using sophisticated instrumentation that is commonly used in analytical labs across the country. In addition, this work enabled us to develop a highly precise and efficient method to quantify iso-alpha acids in mixtures. We have built upon this early work to further understand the chemistry of iso-alpha acids.

As previously mentioned, iso-alpha acids degrade due to exposure to light and temperature. This decomposition adds off flavors to beer and adversely affects the shelf-life of beer. This is of great concern to brewers; however, the exact chemical mechanism of decomposition is currently unknown. There is a lot of work to be done until these mechanisms are well understand and our research, up to this point, has given us an ideal opportunity to contribute in this field.

We are currently investigating the thermal decomposition of iso-alpha acids. By monitoring how the concentration of iso-alpha acids degrades as a function of time, we have been able to measure rate constants for the thermal decomposition. In the fall of 2013, I had 5 research students working in the lab a minimum of 3 hours/week and we were very successful with these experiments. We continued these experiments and a great deal of data was collected in the summer of 2014 when two of my students, James Goff and Gabe Merluzzi, worked 40 hours/week for 4 weeks in the lab. This project has allowed my research group to grow, which has resulted in a great deal of data acquisition. We have successfully measured rate constants at numerous different temperatures. Currently, we are measuring rate constants at several more temperatures in order to more accurately determine an activation energy for thermal decomposition. The majority of the data we have collected since 2013 was presented by two of my research students at the 249th American Chemical Society National Conference. This information is extremely important to the brewing industry because it gives valuable insight into the ever-changing chemical composition of an aging beer. When these experiments are finished, we will publish the results in a peer-reviewed journal. Furthermore, we are currently analyzing the effect of pH and solvent on this degradation. We have found, while this reaction does not seem to be dramatically influenced by pH, it is certainly influenced by solvent. Specifically, the presence of water dramatically increases the rate of decomposition. These results have not be studied before and these new experiments will foster many years of exciting and productive research experiences for undergraduates.

A few research groups have investigated thermal decomposition of iso-alpha acids already; however, the data is extremely limited. Furthermore, no one has currently determined all of the decomposition products. In 2012 I received funding to purchase a gas chromatograph/mass spectrometer. This piece of instrumentation will allow us to successfully determine decomposition products of iso-alpha acids. By knowing the starting material and decomposition products as a function of temperature and time, this will allow us to start elucidating chemical mechanisms of decomposition. This information is not well understood, but will be very valuable. For instance, the understanding the chemical mechanisms by which iso-alpha acids thermally degrade may allow measures to be taken to help prevent or slow down these processes and ultimately enhance the shelf-life of beer. There is enough experimentation to be done to provide years of valuable research opportunities to our chemistry majors. Additionally, this field of chemistry is a relatively new and exciting field of chemistry and is an area in which we can continue to make significant contributions.

Service 2003-Present:
University:
2018:

- Active member of Essential Learning Committee
- Participated in Mesa Experience event (10/27/18)

2017:

- Active member of Essential Learning Committee
- Active member of Distinguished Faculty Committee
- An active participant in a quantitative literacy group whose task has been to evaluate our quantitative literacy requirements for essential learning courses and develop rubrics for assessment
- Continued participation in Fac2Fac
- Participated in two Mesa Experience events, 4/1/17 and 10/21/2017

2016:

- Higher Learning Commission Criterion Committee (Spring 2016)
- Member of the Teaching and Learning: Evaluation and Improvement Committee
- Essential Learning Committee member
- Distinguished Faculty Committee member
- An active participant in a quantitative literacy group whose task has been to evaluate our quantitative literacy requirements for essential learning courses and develop rubrics for assessment.
- Student Showcase facilitator
- Continued participation in Fac2Fac
- Participated in a MavScholars event, 9/30/16
- Participated in Mesa Experience event, 3/5/16

2015:

- Higher Learning Commission Criterion Committee
- Member of the Teaching and Learning: Evaluation and Improvement Committee
- Essential Learning Committee member
- Quantitative Literacy Committee member
- Represented CMU at Fac2Fac meeting in Denver, 10/22-10/23
- Participated in a Fac2Fac webinar, 10/16/2015
- Distinguished Faculty committee member (Fall 2015)
- Assistant Director of Outdoor Program search committee member
- Participated in a session to evaluate results of critical thinking and written communication value rubrics, 11/10/2015
- Chemistry Club advisor (Spring 2015)
- Chemistry Department Coordinator (Spring 2015)
- Student Showcase facilitator
- Presented "Hop Chemistry in the Real World" at the Mav Talks event on 5/14/15
- Presented "Molecular Beams of Highly Reactive Molecules Part 2" at Colorado Mesa University, Physics Seminar Series
- Participated in a MavScholars event, 10/2/15
- Helped prepare demonstrations that were performed by the Chemistry Club for CMU's Homecoming Carnival

2014:

- Essential Learning Committee member
- Library committee secretary
- Student Showcase facilitator
- High School Scholars chemistry coordinator
- Presented "Molecular Beams of Highly Reactive Molecules" at Colorado Mesa University, Physics Seminar Series
- Participated in Mesa Experience event on 2/22/14

- Participated in MavScholars event on 9/26/14
- Participated in Exploring a Major Fair on 10/8/14
- Participated in evaluating the quantitative literacy value rubric
- Acted as judge for the "Sustain a Beard" event sponsored by the Sustainability Council and Sexual Assault Prevention Club
- Helped prepare demonstrations that were performed by the Chemistry Club for CMU's Homecoming Carnival
- Helped organize a panel of professors to answer student questions regarding graduate school
- Helped organize a panel of professors and students to answer questions regarding summer research opportunities

2013:

- Library committee secretary
- Student Showcase facilitator
- High School Scholars chemistry coordinator
- Participated in Mesa Experience event on 3/14/13
- Participated in MavScholars event on 9/27/13
- Invited Dr. Ken Kosanke to give a seminar on pyrotechnics
- Was a member of a panel of professors to answer student questions regarding graduate school
- Helped organize a panel of professors and students to answer questions regarding summer research opportunities
- Helped raise money through the Chemistry Club to send students to national American Chemical Society meeting

2012:

- Library committee secretary
- High School Scholars chemistry coordinator
- Participated in three Mesa Experience events
- Invited Dr. Barney Ellison to give a seminar on renewable energy and global climate change

2011:

- Library committee member
- High School Scholars chemistry coordinator
- Participated in Exploring a Major Fair on 10/11/11
- Performed demonstrations for new marketing commercials

2010:

- Library committee member
- High School Scholars chemistry coordinator
- Participated in MavScholar event on 9/9/10
- Participated in Mesa State Experience program on 10/9/10
- Invited Dr. Barney Ellison to give a seminar on renewable energy and global climate change

2009:

- Library committee member
- High School Scholars chemistry coordinator
- Participated in Mesa State Experience program on 10/3/09

<u>Department:</u>

2018:

- Chair of Assistant Professor of Biochemistry search committee
- Active participant in our department program review
    - Wrote Analysis of Student Demands and Success section of our program review
- Helped edit CHEM 132L experiments and prepare them for publication (fall 2018)

2017:

- Active member of Visiting Professor of Biochemistry search committee
- Chemistry Club active participant

2016:
- Chair of Chemistry Lab Coordinator search committee
- Chemistry Club active participant

2015:
- Chemistry Club advisor (Spring 2015)

2014:
- Chemistry Coordinator
- Chemistry Club advisor
- Member of chemistry tenure-track search committee (Spring)
- Member of chemistry instructor search committee
- Helped develop and implement assessment strategies for chemistry courses
- Helped raise money through the Chemistry Club to send students to national American Chemical Society meeting

2013:
- Chemistry Coordinator
- Chemistry Club advisor
- Member of chemistry tenure-track search committee (Fall)
- Helped develop and implement assessment strategies for chemistry courses

2012:
- Chemistry Coordinator
- Member of tenure-track chemistry search (Spring)
- Chemistry Club advisor

2011:
- Chair of Chemistry Lab Coordinator search committee
- Member of two tenure-track chemistry searches

2010:
- Member of chemistry tenure-track search committee (Fall)
- Member of physical science committee for disabled students in the lab/field

2009:
- Member of physical science committee for disabled students in the lab/field

Community:

2017: Spent an afternoon with approximately 20 middle school students from Silverton performing lab experiments/ teaching basic chemistry and giving tours of labs

2014:
- Presented a talk at the Mesa County Library for the Junior Scientist Series entitled "Chemistry in Action"
- Gave an interview for local news station, KKCO, on 2/3/14
- Participated in Physics Club pumpkin drop

2013:
- Presented a talk at the Mesa County Library for the Junior Scientist Series entitled "Energy and the Magical World of Chemistry"
- Performed demonstrations for a chemistry camp at the John McConnell Math and Science Center on 7/19/13
- Completed NSF/NIH survey of doctorate recipients
- Performed demonstrations and gave lab tours to approximately 60 middle school students on 4/22/13

2012:
- Organized and assisted in a Chemistry Family Night at the John McConnell Math and Science Center
- Participated in an ACT curriculum survey
- Regional science fair junior finals judge

2011:
- Regional science fair junior finals judge

2010:
- Helped middle school student perform lab tests for her science fair project
- Regional science fair junior finals judge

2009:
- Regional science fair junior finals judge

Advising 2003-Present:

University:

2017:
- Participated in one SOAR session

2016:
- Participated in one SOAR session

2015:
- Participated in one SOAR session

2014:
- Participated in one SOAR session

2013:
- Participated in two SOAR sessions

2012:
- Participated in two SOAR sessions

2011:
- Participated in SOAR session

2010:
- Participated in SOAR session

2009:
- Participated in SOAR session

Department:

2018:
- Active participant in Chemistry Club
- Advised approximately 35 students each semester

2017:
- Active participant in Chemistry Club
- Advised approximately 30 students each semester
- Submitted approximately 25 letters of recommendation

2016:
- Active participant in Chemistry Club
- Advised 20-30 students each semester
- Submitted approximately 40 letters of recommendation

2015:
- Advisor of the Chemistry Club (Spring 2015)

- Advised 20-30 students each semester
- Submitted approximately 25 letters of recommendation

2014:
- Advisor of the Chemistry Club
- Advised approximately 30 students each semester
- Submitted approximately 30 letters of recommendation

2013:
- Advisor of the Chemistry Club
- Advised about 20 students each semester
- Submitted approximately 30 letters of recommendation

2012:
- Advisor of the Chemistry Club
- Advised approximately 25 students each semester
- Submitted over 20 letters of recommendation

2011:
- Advised approximately 25 students each semester
- Submitted approximately 20 letters of recommendation
- Participated in a Chemistry Game Night to advise incoming chemistry majors on 9/7/11

2010:
- Advised approximately 30 students each semester
- Submitted approximately 12 letters of recommendation

2009:
- Advised approximately 15 students each semester
- Submitted a few letters of recommendation

Honors and Awards 2003-Present:

Graduate Student Incentive Award~Spring 2005
Graduate Teaching Excellence Award~Fall 2003, Spring 2004
Member of Phi Beta Kappa~Spring 2003
American Chemical Society Annual Award~Spring 2003

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

0	**Books**	0	**Book Reviews**	0	**Creative Publications**
1	**Journal Articles**	0	**Performances**	0	**Patents**
3	**Conference Presentations**	0	**Exhibitions**	5	**Grants-funded and non-funded**
0	**Sabbaticals**	0	**Fullbright**	0	**Book Chapter**
8	**Other (related to discipline)**	Seminar talks, MavTalk, 2 publications of Lab Manuals			

Name:

Samuel E Lohse

Start Year: 2014

Program:
Physical Sciences

Department:
Physical and Environmental Sciences

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ◉ Assistant Professor

○ Associate Professor ○ Instructor

Highest Degree

PhD	University of Oregon	Chemistry	2011

Education: (List all degrees beginning with most recent-include post docs and external certificates)

2011-2014 Postdoctoral Researcher University of Illinois

2011 PhD Chemistry, University of Oregon

Dissertation Title: "Direct synthesis of thiolate-protected gold nanoparticles using Bunte salts as ligand precursors: Investigations of ligand shell formation and core growth"

2005 M.S. Chemistry, Idaho State University

2005 B.S. Chemistry, Idaho State University

2003 B.S. Biochemistry, Idaho State University

Teaching 2003-Present:

Courses Taught

CHEM 131 (General Chemistry)
CHEM 131L (General Chemistry Lab)
CHEM 132 (General Chemistry II)
CHEM 132L (General Chemistry Lab)
CHEM 151 (Engineering Chemistry)
CHEM 151L (Engineering Chemistry Lab)
CHEM 301 (Analytical Chemistry)
CHEM 301L (Analytical Chemistry Lab)
CHEM 311 L(Organic Chemistry Lab I)
CHEM 312L (Organic Chemistry Lab II)
CHEM 341 Advanced Laboratory
CHEM 351 (Inorganic Chemistry)
CHEM 397 (Structured Research)
CHEM 431 (Instrumental Analysis)
CHEM 431L (Instrumental Analysis)
UNIV 101 (First Year College Success)

Evidence of Continuous Improvement

Education Workshops/Seminars

Summer 2018. ACS Green Chemistry Conference. Social Justice as Sustainability in Education. Lecture Series and Workshop.

Spring 2017. CMU Faculty Development Seminar. Breaking the Iron Cage of Poverty: Tools for Increasing Educational Success.

Fall 2017. C&EN Webinar: Artificial Intelligence-Based Learning Tools: How Adaptive Learning at Emory University Transformed Student Engagement and Pre-Course Preparation.

Innovative Materials/Activities

1. Online review sessions for General Chemistry: allows students a virtual small group environment to review course materials prior to exams. Online review sessions are hosted through Google Chat.
2. Demonstration-based group learning activities in CHEM 131/132 and CHEM 351.

Supervision of Student Research/Project(s)

1. Spring 2015 (Nicholas Curry): Stability of Gold nanoparticles with different surface coatings in biological media
2. Summer 2015 (Jack Bryant): Gold nanoparticle transport in mesocosms as a function of size and shape
3. Summer 2015 (Jake Williams): An optoelectronic nose to detect engineered nanoparticles based on differences in surface chemistry
4. Summer 2015 (Joe Delaney): Gold nanoparticle aggregation in biological media as a function of surface chemistry
5. Fall 2015/Spring 2016 (Jake Williams): An optoelectronic nose to detect engineered nanoparticles based on differences in surface chemistry
6. Spring 2016 (Jared Bourget): Gold nanoparticle aggregation in biological media as a function of surface chemistry
7. Summer 2016-Fall 2017 (Jared Bourget/Kayla Murphy/Kerry Kaminski): Gold nanoparticle aggregation in biological media as a function of surface chemistry
8. Summer 2016 (Alan Thornburg): Long-term storage stability of gold nanoparticles
9. Fall 2016 (Erin Bair, Sophie Fortner): Gold nanoparticle aggregation in biological media as a function of surface chemistry
10. Fall 2016-Spring 2017: Long-term storage stability of gold nanoparticles
11. Spring 2017-current (Chris Vandermeer): Gold nanoparticle aggregation in biological media as a function of surface chemistry
12. Fall 2017-current (Jenna Dandurand): Protein interactions with functionalized gold nanoparticles
13. Summer 2018-current (Tori Catlett): Gold nanoparticle aggregation in biological media as a function of surface chemistry
14. Summer 2018-current (Kimbri Herring): Platinum nanoparticles as hydrosilylation catalysts.

Scholarship and Creative Work, 2003-Present:

Scholarship Related to Discipline

Book Chapters

1. Lohse, S.E. "Millifluidic Synthesis of Metal Nanoparticles with Controlled Sizes and Shapes." Nanomaterials Synthesis: A Practical Guide. C.S.S.R. Kumar, editor. De Gruyter Publishing. Accepted.

Journal Articles

1. Kharazian, B.; **Lohse, S.E.;** Ghasemi, F.; **Raoufi, M.**; Saei, A.A.; Hashemi, F... Mahmoudi, M. "Bare surfaces of gold nanoparticle induces inflammation through unfolding of plasma fibrinogen." *Scientific Reports.* **2018**, 8, 12557.

2. Olenick, L.L.; Troiano, J.M.; Vartanian, A.; Melby, E.S.; Mensch, A.C.... **Lohse, S.E.**; Zhang, Xi; Kuech, T.R.... Geiger, F.M. "Lipid Corona Formation from Nanoparticle Interactions with Bilayers." *Chem* **2018**, *4*, 2709-2723.

3. **Lohse, S.E.**; Abadeer, N.; Zoloty, M.; Newman, L.A.; White, J.C., Murphy, C.J. Nanomaterial probes in the environment: Gold nanoparticle soil retention and environmental stability as a function of surface chemistry. *ACS Sustainable Chem Eng* **2017**. Accepted.

4. Saei, A.A.; Yazdani, M.; **Lohse, S.E.**; Bakhtiary, Z.; **Ghavami, M.** et al. Nanoparticle surface functionality dictates cellular and systemic toxicity. *Chem Mater* **2017**, *29*, 6578.

5. **Lohse, S.E.;*** Melby, E.S.;* **Park**, J.-Y.; Murphy, C.J.; Pedersen, J.A. "Cascading bioeffects of nanoparticle functionalizations: Surface chemistry dictates protein corona composition and subsequent interaction with model cell membranes." *ACS Nano* **2017**, *11*, 5489.

6. Mahmoudi, M.; **Lohse, S.E.**; Murphy, C.J.; Suslick, K.S. Identification of nanoparticles with a colorimetric sensor array. *ACS Sensors* **2016**, *1*, 17.

5. Qui, T.A.; Bozich, J.S.; **Lohse, S.E.**; Vartanian, A.M.; Jacob, L.M.; Meyer, B.M. Gunsolus, I.L.; Niemuth, N.J.; Murphy, C.J., Haynes, C.L.; Klaper, R.D. Gene expression as an indicator of the molecular response and toxicity in the bacterium *Shewanella oneidensis* and the water flea *Daphnia magna* exposed to functionalized gold nanoparticles. *Environ Sci: Nano* **2015**, 2, 615-629.

6. Melby, E.S.; Mensch, A.C.; **Lohse, S.E.**; Hu, D.; Orr, G.; Murphy, C.J.; Hamers, R.J.; Pedersen, J.A. Formation of supported lipid bilayers containing phase-segregated domains and their interaction with gold nanoparticles. *Environ Sci: Nano* **2016**, *Advance article online.*

7. Jacobson, K.H.; Gunsolus, I.L.; Kuech, T.R.; Troiano, J.M.; Melby, E.S.; **Lohse, S.E.**; Hu, D.; Chrisler, W.B.; Murphy, C.J.; Orr, G. Geiger, F.M.; Haynes, C.L.; Pedersen, J.A. Lipopolysaccharide density and structure governs the extent and distance of nanoparticle interaction with actual and model bacterial outer membranes. *Environ. Sci. Tech.*, **2015**, *Environ Sci Technol* **2015**, *49*, 10642.

8. Feng, Z.V.; Gunsolus, I.L.; Qiu, T.A.; Hurley, K.R.; Nyberg, L.H.; Frew, H.; Johnson, K.P.; Vartanian, A.M.; Jacob, L.M.; **Lohse, S.E.**; Torelli, M.D.; Hamers, R.; Murphy, C.; Haynes, C. Impacts of gold nanoparticle charge and ligand type on surface binding and toxicity to gram-negative and gram-positive bacteria. *Chem. Sci.* **2015**, Advance article online.

9. Dominguez, G.A.; Lohse, S.E.; Torelli, M.D.; Murphy, C.J.; Hamers, R.J.; Orr, G.A.; Klaper, R.D. Differences in molecular interaction of nanomaterials with the gut of Daphnia magna: Changes in charge and ligand surface chemistry impacts cellular, oxidative stress and gene expression. *Aquatic Toxicology*. **2014**. *Advance article online.*.

10. Torelli, M.D.; Putans, B.A.; Tan, Y.; Lohse, S.E.; Murphy, C.J.; Hamers, R.J. Quantitative determination of ligand densities on nanomaterials by X-ray photoelectron spectroscopy. *ACS Applied Materials and Interfaces*. **2014**. *Advance article online.*

11. Troiano, J.M.; Olenick, L.L.; Kuech, T.R.; Melby, E.S.; Hu, D.; Lohse, S.E.; Mensch, A.C.; Domangue, M.; Vartanian, A.M. et al. Direct probes of 4 nm-diameter gold nanoparticles interacting with supported lipid bilayers. *Journal of Physical Chemistry C*. **2014**. *Advance article online.*

12. Gunsolus, I.L.; Hu, D.; Mihai, C.; Lohse, S.E.; Lee, C.S.; Hamers, R.J.; Murphy, C.J.; Orr, G.; Haynes, C.L. Facile method to stain the bacterial cell surface for super-resolution fluorescence microscopy. *Analyst*. **2014**, *139*, 3174-3178.

13. Bozich, J.; Lohse, S.E.; Torelli, M.; Hamers, R.J.; Murphy, C.J.; Klaper. R.D. Acute and chronic toxicity of functionalized gold nanoparticles in *D. Magna*. *Environmental Science Nano* **2014**, *1*, 260-270.

14. Alkilany, A.M.; Boulos, S.P.; Lohse, S.E.; Thompson, L.B.; Murphy, C.J. Homing-peptide-conjugated gold nanorods: The effect of amino acid sequence display on nanorod uptake and cellular proliferation. *Bioconjugate Chemistry* **2014**, *25*, 1162-1171.

15. Yang, J.-A.; Lohse, S.E.; Murphy, C.J. Tuning cellular response to nanoparticles *via* surface chemistry and aggregation. *Small*. **2014**, *10*, 1642-1651.

16. Lohse, S.E.; Burrows, N.D.; Scarabelli, L.; Liz-Marzan, L.M.; Murphy, C.J. Anisotropic noble metal nanocrystal growth: The role of halides. *Chemistry of Materials* **2013**, *26*. 34-43.

17. Mahmoudi, M.; Lohse, S.E.; Murphy, C.J.; Suslick, K.S. Variation of protein corona composition following plasmonic heating of gold nanoparticles. *Nano Letters* **2014**, *14*, 6-12.

18. Lohse, S.E.; Eller, J.R.; Sivapalan, S.T.; Plews, M.R.; Murphy, C.J. A simple millifluidic benchtop reactor for the high-throughput synthesis and functionalization of gold nanoparticles with different sizes and shapes. *ACS Nano* **2013**, *7*, 4135-4150.

19. Lohse, S.E.; Murphy, C.J. The quest for shape control: A history of gold nanorod synthesis. *Chemistry of Materials*. **2013**, *25*, 1251-1260.

20. Lohse, S.E.; Murphy, C.J. Colloidal nanoparticle applications: from biomedicine to energy. *Journal of the American Chemical Society*. 2012, *134*, 15607.

21. Yang, J.-A.; Lohse, S.E.; Boulos, S.P.; Murphy, C.J. The early life of gold nanorods: Temporal separation of anisotropic and isotropic growth. *Journal of Cluster Science*. 2012, *23*, 779.

22. Alkilany, A.M.; Lohse, S.E.; Murphy, C.J. The gold standard: Gold nanoparticle libraries to understand the nano-bio interface. *Accounts of Chemical Research*. 2012, *46*, 650-661.

23. Stankus, D.P.; Lohse, S.E.; Hutchison, J.E.; Nason, J.A. Interactions between natural organic matter and gold nanoparticles stabilized with different organic capping agents. *Environmental Science and Technology* 2011, *45*, 3238.

24.Lohse, S.E.; Dahl, J.A.; Hutchison, J.E. Direct synthesis of large water-soluble functionalized gold nanoparticles using Bunte salts as ligand precursors. *Langmuir* 2010, *26*, 7504.

25. Lohse, S.E.; Rosentreter, J.J. Photooxidation of aqueous trichloroethylene using a buoyant photocatalyst with reaction progress monitored via micro-headspace GC/MS. *Microchemical Journal* 2006, *82*, 66.

Conference Presentation

1. *Links Between Functionalized Gold Nanoparticle Surface Chemistry and Biocompatibility Compared in Two Model Organisms: D. magna and S. oneidensis*. ACS Fall National Meeting. Indianapolis, IN. Sept. 2013.

2. *A millifluidic environment for high-throughput AuNP synthesis, functionalization, and monitoring*. Sustainable Nanotechnology Organization Conference. Arlington, VA. Nov. 2012.

3. *The role of fluidic synthesis in nanoparticle production*. Greener Nano Conference. Portland, OR. June 2010.

4. *Functionalized gold nanoparticle synthesis in a microfluidic reactor*. With Corey Koch. Oregon Material Science Institute Symposium. Gleneden Beach, OR. December 2008.

5. *Gold Nanoparticle synthesis in a microfluidic device*. With Corey Koch. Greener Nano Conference. Vancouver, WA. June 2008.

6. *Identification of a shape-selective RNA aptamer for the synthesis of gold nanorods*. ACS Spring National Meeting. Salt Lake City, UT. March 2008.

7. *Direct synthesis of functionalized gold nanoparticles from Bunte salts*. ACS Fall National Meeting. Philadelphia, PA. August 2008.

Book reviews

Technical Reports

Book Chapters

Other

Scholarship Related to Pedagogy in Discipline

Books

Journal Articles

1. Hallaq, T.G.; Holman, R. W.; Lohse, S.E. Podcasts for pre-laboratory student preparation for organic chemistry: a recipe for collaboration with university media specialists. *The Chemical Educator* 2011, *16*, 152.

Conference Presentation

Book reviews

Technical Reports

Book Chapters

Other

Creative Work Related to Discipline

Performances

Exhibits

Publications

Other:
Grants

1.COLORADO MESA UNIVESITY FPDF PROPOSAL. AY 2017 - 18. Transformations of functionalized gold nanoparticles in environmental and biological media. $900 awarded.

2. COLORADO MESA UNIVESITY FPDF PROPOSAL. AY 2016 - 17. Transformations of functionalized gold nanoparticles in environmental and biological media. $2000 awarded.

3. COLORADO MESA UNIVESITY FPDF PROPOSAL. AY 2015 - 16. Transformations of functionalized gold nanoparticles in environmental and biological media. $2200 awarded.

4. COLORADO MESA UNIVESITY FPDF PROPOSAL. AY 2014 - 15. Transformations of functionalized gold nanoparticles in environmental and biological media. $3000 awarded.

5. Lohse, S.E.; Murphy, C.J. *Understanding Basic Aspects of Functionalized Gold Nanorod Uptake in vitro Using Nanoprobe X-ray Fluorescence*. Argonne User Proposal: Center for Nanomaterials. **January 2012.** *Not Approved.*
6. Murphy, C.J. *Understanding the Influence of Gold Nanorod Surface Chemistry and Aspect Ratio on Environmental and Biological Interactions and Applications.* Camille and Henry Dreyfus Foundation. Postdoctoral Fellowship in Environmental Chemistry. **August 2011.** *Not Funded.*
7. Lohse, S.E.; Murphy, C.J. *Investigations of Functionalized Gold Nanorod Formation.* America Competes in Chemistry. NSF. **April 2011.** *Not Funded.*
8. Haben, P.M.; Lohse, S.E.; Hutchison, J.E.; Kevan, S. *Investigating the growth of thiol-stabilized gold nanoparticles by SAXS.* Advanced Light Source, Berkeley National Laboratories. **December 2009-April 2011.**
9. Lohse, S.E. *Green Synthesis of Functionalized Gold Nanoparticles.* NSF-IGERT Fellowship Application. **2008-2010.**

Patents

1. TF12093-US. Catherine J. Murphy; Samuel E. Lohse; Jonathan R. Eller. Continuous Flow Reactor and Method for Nanoparticle Synthesis. July 25th, 2013. 2016.

Unpublished research

Sabbaticals

Fullbright

Professional Memberships

American Chemical Society (2008-2015)
Sustainable Nanotechnology Organization (2012-2015)

Service 2003-Present:
University
University Committees:
1. Undergraduate Curriculum Committee. PES Representative. F2017-current
2. Graduate Studies Advisory Council. S2017-current

Department
F 2015: Assisted with collection and presentation of Chemistry program assessment data
2016-2018: Participated in Department Hiring Committees

Community

National

Regional

Local

Advising 2003-Present:
University level

January 2015. Assisted in student advising as part of Mesa Orientation.
2015-Current. CMU Chemistry Club Advisor
2017-Current. UNIV 101 FYI Instructor

Department level

Honors and Awards 2003-Present:
National

Regional

Local

- Best Talk Finalist. 3rd Annual Postdoctoral Research Symposium. Beckman Institute, University of Illinois Urbana-Champaign. January 25, 2013.
- NSF-IGERT Fellow. University of Oregon. 2008-2010
- Idaho State University Graduate Research Symposium 2005- Outstanding oral presentation
- Kasisks Distinguished Scholar Idaho State University 2002-2003

Professional Experience:

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

	Books		Book Reviews		Creative Publications
25	Journal Articles		Performances	1	Patents
7	Conference Presentations		Exhibitions	9	Grants-funded and non-funded
	Sabbaticals		Fullbright	1	Book Chapter
	Other (related to discipline)				

JOSEPH LAWRENCE RICHARDS

Department of Physical and Environmental Sciences Colorado Mesa University
1100 North Avenue Grand Junction, CO 81501
970.248.1574
richards@coloradomesa.edu

Personal

Born August 25, 1964, Kwajalein, Marshall Islands
Married August 31, 1990, Susan B. Richards, two daughters (Kathryn JoAnn and Fiona Grace)

Education

Postdoctoral Fellow, University of California, San Diego (1991-1993)
Ph.D. (Organic Chemistry), University of North Carolina, Chapel Hill (1991)
B.A. (Chemistry and Biology), University of San Diego (1986)

Teaching Experience

Professor (Tenured), Chemistry (PES)
Colorado Mesa University (1995-present)
Assistant Professor, Chemistry
Grand Valley State University (1993-1995)
Visiting Professor, Chemistry
University of San Diego (1993)
Supervisor of Graduate and Undergraduate research projects
University of California, San Diego (1991-1993)
Development of Honors Microscale Laboratory
University of North Carolina, Chapel Hill (1990-1991)
Head Teaching Assistant, Chemistry
University of North Carolina, Chapel Hill (1990-1991)
Teaching Assistant, Chemistry
University of North Carolina, Chapel Hill (1986-1991)

Research Experience

Green Oxidation Reaction Method Development
Colorado Mesa University (2014-present)
Synthesis of multidentate ligands as models for protein active sites
Colorado Mesa University / Mesa State College (2003-present)
Synthesis of natural products isolated from *Piper* plants
Colorado Mesa University / Mesa State College (1998-present)
Synthesis of imidazole-based macrocycles
Colorado Mesa University / Mesa State College (1995-present)
Synthesis of dimeric porphyrin systems as models for biological electron transport
Grand Valley State University (1993-1995)
Synthesis of multidentate imidazole-based ligands as models for metalloprotein active sites
University of California, San Diego (1991-1993)
Synthesis and characterization of metalloporphyrins as models for hemeproteins
University of California, San Diego (1991-1993)
Synthesis and characterization of copper complexes as models for dinuclear copper proteins

University of North Carolina, Chapel Hill (1986-1991)
Synthesis of selectively functionalized cavitands
University of North Carolina, Chapel Hill (1986-1991)
Synthesis of non-symmetric macrocycles as molecular receptors
University of San Diego (1985-1986)

Awards and Honors

Colorado Mesa University Distinguished Faculty Award – Nominated
Colorado Mesa University (2012)
Mesa County Educator of the Year
Mesa State College (2006)
Mesa State College Distinguished Faculty Award – Teaching
Mesa State College (2004)
N.I.H. Postdoctoral Trainee
University of California, San Diego (1991-1993)
U.S. Department of Education Fellowship
University of North Carolina, Chapel Hill (1990-1991)
Graduate Teaching Fellowship
University of North Carolina, Chapel Hill (1987)
Reilly Fellowship
University of North Carolina, Chapel Hill (1986-1987)
American Institute of Chemists Outstanding Senior
University of San Diego (1986)
Departmental Honors in Chemistry
University of San Diego (1986)
Departmental Honors in Biology
University of San Diego (1986)

Grants Awarded

CMU Faculty Professional Development Fund, $1,000 (awarded2017)

CMU Faculty Professional Development Fund, $1,879 (awarded2014)

CMU Faculty Professional Development Fund, $2,011 (awarded2012)

National Science Foundation, $126,000 (awarded 2007)
Collaborative Research: Mixture Synergy in Piper Imides, Iridoid Glycosides, and Furanocoumarins
Craig D. Dodson and Joseph L. Richards

National Science Foundation, $69,685 (awarded 2004)
Collaborative Research: Plant Secondary Metabolites as Mediators of Trophic Interactions in a Tropical Forest Community, Craig Dodson and Joseph L. Richards

OSC Special Incentive Funds: Board Goals and Objectives, $1,250 (awarded 2000)
The Synthesis of Imidazole-Containing Porphyrin Analogs
Joseph L. Richards

OSC Special Incentive Professional Development Funds, $1,300 (awarded 2000)
The Synthesis of Imidazole-Containing Porphyrin Analogs
Joseph L. Richards

National Science Foundation – Ecological Studies Unit, $172,288 (awarded 2000)
Plant secondary metabolites as mediators of top-down and bottom-up forces in a tropical forest community, Lee A. Dyer, Craig Dodson, Deborah Letourneau and Joseph L. Richards

Office of State Colleges Faculty Development Grant, $5,000 (awarded 1998)
Study of the Phytochemistry of an Ant/Plant Mutualism
Craig D. Dodson and Joseph L. Richards

Office of State Colleges Joint Activity Grant, $9755 (awarded 1998)
Collaborative Study of the Phytochemistry of an Ant/Plant Mutualism
Craig D. Dodson and Joseph L. Richards

MSC Council of Chairs Research Grant, $670 (awarded 1996)
Porphyr*ims*: The Synthesis of Imidazole-Containing Porphyrin Analogs
Joseph L. Richards

Michigan Space Grant Consortium Grant, $5000 (awarded 1995)
Joseph L. Richards

Grand Valley State University Science and Mathematics Division Summer Undergraduate Research Award, $5000 (awarded 1995)
Joseph L. Richards

Grand Valley State University Science and Mathematics Division Summer Undergraduate Research Award, $2500 (awarded 1994)
Joseph L. Richards

Grand Valley State University Project Initiation Award, $1000 (awarded 1993)
Joseph L. Richards

Presentations and Publications

Inter- and Intraspecific Comparisons of Antiherbavore Defenses in Three Species of Rainforest Understory Shrubs, R. M. Fincher, L. A. Dyer, C. D. Dodson, J. L. Richards, M. A. Tobler, J. Searcy, J. E. Mather, A. J. Reid, J. S. Rolig, and W. Pidcock, J. Chem. Ecol., 34, 558-574, (2008).

Isolation, Synthesis, and Evolutionary Ecology of *Piper* amides, Lee Dyer, Joe Richards, and Craig Dodson, in *Piper* A Model Genus for Studies of Phytochemistry, Ecology, and Evolution, Dyer and Palmer, Eds., Kluwer Academic/Plenum Publishers (2004).

Improved synthesis of piplartine, 4'-desmethylpiplartine, and cenocladamide: Three compounds isolated from *Piper cenocladum*, Joseph L. Richards, Julie I. Jay, Wesley C. Pidcock, and Silja Ran Agustsdottir, presented at the 57th Northwest Regional Meeting of the American Chemical Society, June, 2002.

Total synthesis of piplartine, 13-desmethylpiplartine, and cenocladamide: Three compounds isolated from *Piper cenocladum*, Joseph L. Richards, Sylvia M. Myhre, and Julie I. Jay, presented at session on Methodology, Asymmetric Reactions, Synthesis, Process R&D, Division of Organic Chemistry, 221st National Meeting of the American Chemical Society, April 2001.

The Role of "Piper" Amides in the Ecology of a Neotropical Ant-Plant-Mutualism Formed between *Piper cenocladum* and *Pheidole bicornus*, C.D. Dodson, L.A. Dyer and J.L. Richards, presented at the Joint Meeting of American Society of Pharmacognosy, Association Francaise pour l'Enseignement et la

Recharche en Pharmacognoise, Gesellschaft fur Arzneipflanzenfor-schung, and Phytochemical Society of Europe, Amsterdam, The Netherlands (1999).

Distance Dependence of Photoinduced Electron Transfer in Metalloporphyrin Dimers, Carmita F. Portela, Jarmilla Brunckova, Joseph L. Richards, Bernd Schöllhorn, Yassuko Iamamoto, Douglas Magde, Teddy G. Traylor, and Charles L. Perrin, *J. Phys. Chem A*, **103**, 10540-10552 (1999).

Formation of Both 1° and 2° *N*-Alkylhemins during Hemin-Catalyzed Epoxidation of Terminal Alkenes, Z-Q Tian,
J.L. Richards, and T.G. Traylor, *J. Amer. Chem. Soc.*, 117, 21 (1995).

Reactions of Iron(III) Porphyrins with Oxidants: Structure-Activity Studies, T.G. Traylor, C. Kim, J.L. Richards, F. Xu, and C.L. Perrin, *J. Amer. Chem. Soc.*, 117, 3468 (1995).

Synthesis, structural characterization and dioxygen reactivity of imidazole-ligated Cu(I) complexes, T.N. Sorrell, M.L. Garrity, and J.L. Richards, *Inorganica Chimica Acta*, 218 (1/2), 103 (1994).

Model Compounds for the Study of Electron transfer in Photosynthesis, J.L. Richards, B. Schöllhorn, Y. Iamamoto, C.F. Portela, and T.G. Traylor, presented at the 6th International Conference on Bioinorganic Chemistry, San Diego, CA (1995).

Imidazole-Ligated Copper complexes: Synthesis, Structure, and Reactivity, T.N. Sorrell, M.L. Garrity, J.L. Richards, F.C. Pigge, and W.E. Allen, in *Bioinorganic Chemistry of Copper*, K.D. Karlin and Z. Tyeklar, eds., Chapman & Hall, New York (1993).

The Curriculum and Experiments in an Organic Honors Laboratory, N.J. Pienta, C. Regitz, J.L. Richards, and T.N. Sorrell, *J. Chem. Ed*, 70(10), 841 (1993).

Selectively Difunctionalized Cavitands, T.N. Sorrell and J.L. Richards, *SYNLETT*, 155 (1992).

Synthetic Models for the Active Site of Type III Copper Proteins, J.L. Richards, Dissertation, The University of North Carolina (1991).

Addendum

Courses Taught 2012 - 2018

CHEM 311	Organic Chemistry I
CHEM 311L	Organic Chemistry Laboratory I
CHEM 312	Organic Chemistry II
CHEM 312L	Organic Chemistry Laboratory II
CHEM 421	Advanced Organic Chemistry I
CHEM 397	Structured Research

Committee Service 2012-2017

2012
CMU Self Study Steering Committee – Co-Chair
General Education Review Working Group – Active Member
Unconventional Enery Center Workforce Development & Curriculum Enhancement Committee at CMU
CMU ISEP Advisory Committee

CMU Educational Access Services Advisory Committee PES Tenure and Promotion Advisory Committee
PES Chemistry Search Committee (Biochemistry) – Chair

2013
CMU Self Study Steering Committee – Co-Chair General Education Review Working Group
Unconventional Energy Center Workforce Development & Curriculum Enhancement Committee at CMU
CMU International Education Committee
CMU ISEP Advisory Committee
CMU Educational Access Services Advisory Committee PES Tenure and Promotion Advisory Committee
PES Chemistry Search Committee

2014
CMU Self Study Steering Committee – Co-Chair General Education Review Working Group
AAC&U Institute on Integrative Learning and the Departments
Unconventional Energy Center Workforce Development & Curriculum Enhancement Committee at CMU
CMU International Education Committee
CMU Educational Access Services Advisory Committee PES Chemistry Search Committee – Active Member
Reviewed and evaluated the use of the Value Rubric for assessment of Essential Learning outcomes

2015
CMU HLC Steering Committee
CMU HLC Criterion 5 Subcommittee – Chair CMU VPAA Search Committee – Member
Unconventional Energy Center Workforce Development & Curriculum Enhancement Committee at CMU
CMU Strategic Planning Committee Focus Group
CMU International Education Committee
CMU Educational Access Services Advisory Committee

2016
CMU HLC Steering Committee
CMU HLC Criterion 5 Subcommittee – Chair CMU VPAA Search Committee
Unconventional Energy Center Workforce Development & Curriculum Enhancement Committee at CMU
CMU Educational Access Services Advisory Committee
Chemistry Search Committee

2017
CMU HLC Steering Committee
CMU HLC Criterion 5 Subcommittee – Chair Distinguished Faculty Committee
Chemistry Search Committee (Visiting Biochemistry) Chemistry Search Committee (Biochemistry) – Member
Unconventional Energy Center Workforce Development & Curriculum Enhancement Committee at CMU
CMU Educational Access Services Advisory Committee

Name:

David R Weinberg

Start Year: 2011

Program:
Physical Sciences

Department:
Physical and Environmental Sciences

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank
○ Professor ○ Assistant Professor
◉ Associate Professor ○ Instructor

Highest Degree

PhD	California Institute of Technology	Chemistry	2009

Education: (List all degrees beginning with most recent-include post docs and external certificates)

Postdoctoral Scholar, The University of North Carolina at Chapel Hill, 2008 - 2011

Ph.D., Chemistry, California Institute of Technology, 2009

B. A., Biochemistry Pathway of Chemistry, University of San Diego, 2001

Teaching 2003-Present:
Courses Taught
CHEM 121, Principles of Chemistry
CHEM 121L, Principles of Chemistry Lab
CHEM 131, General Chemistry I
CHEM 131L, General Chemistry I Lab
CHEM 132, General Chemistry II
CHEM 132L, General Chemistry II Lab
CHEM 311L, Organic Chemistry I Lab
CHEM 341, Advanced Laboratory I
CHEM 351, Inorganic Chemistry I
CHEM 352, Inorganic Chemistry II
CHEM 397, Structured Research
CHEM 442, Communicating in the World of Chemistry
CHEM 497, Structured Research

Evidence of Continuous Improvement
Workshops and Seminars Attended:
Teacher to Teacher event: "Elevate Writing at CMU", February 21, 2018

Teacher to Teacher event: "Ask Me, Tell Me...What Do *You* Want to Know About Life at CMU?", October 3, 2017.

Faculty professional development workshops entitled "How Do We Know We Know, and, Once We Know, What Do We Do With It?" and "What does it mean to live the teacher-scholar model and how do I prepare my Tenure & Promotion Portfolio?", August 18, 2017

Faculty professional development workshop entitled "Breaking the Iron Cage of Poverty: Tools for Increasing Educational Success" by Dr. Donna Beegle, January 12, 2017

Training session on "Diversity and Inclusion," November 11, 2016

Training session on "Title IX," November 8, 2016

Training session on "Mental Health and Suicide Prevention," October 26, 2016

Faculty professional development workshop entitled "Critical Thinking Unmasked" by Dr. Linda Nilson, August 19, 2016

Faculty professional development workshop covering "Professionalism & Classroom Management Strategies," "Effective Constructive Criticism," and "Dealing with Volatile Students," January 15, 2016

HLC Seminar on Accreditation by Jeff Rosen, January 14, 2016

Coleman Faculty Entrepreneurship Fellows summit in Bloomingdale, IL, August 13th – 15th, 2015 with monthly follow-up web conferences until May, 2016.

Attended training sessions on "Campus Safety and Active Threat Response," "Suicide Prevention Efforts and Related Resources," and "Sexual Assault Prevention Efforts, Sexual Harassment, Mandatory Reporting and Related Resources," March 3 - 4, 2015.

Teacher 2 Teacher event focusing on Maverick Milestone Courses, February 17, 2015.

Terry Rhodes Workshop on General Education, January 16 - 17, 2014.

"What Do You Do?" Teacher 2 Teacher Program, November 20, 2013.

Mark Taylor Workshop on the NeXt Generation, October 13, 2013.

Safe Zone Training, July 16, 2013.

Grand Junction Town Hall Meeting Regarding Admissions Standards and Remedial Education Policy Review, June 26, 2013.

Paul Gaston Workshop on General Education, January 10 - 11, 2013.

Teacher 2 Teacher event focusing on "deep learning", December 5, 2012.

Ken Bain workshop on syllabi and "deep learning", August 9 - 10, 2012.

"VIPEr (Virtual Inorganic Pedagogical Electronic Resource) Workshop: Inorganic Chemistry at the Frontiers of Catalysis", July 15 - 20, 2012.

Presentation of results from the Learning and Study Skills Inventory (LASSI) pilot, April 27th, 2012.

"Teaching and learning: What works for you? What doesn't?" Student/faculty free-for-all discussion organized by Dr. Clare Boulanger, September 19, 2011.

Classes Observed:
Attended a CHEM 312 lecture by highly respected CMU chemistry professor, Dr. Joseph L. Richards, Spring, 2012.

Innovative Materials/Activities

Composed the first and final drafts of all program student learning outcomes, assessment plans, and assessment reports for the chemistry program at CMU, fall of 2012 - present.

Helped compose a chemistry program overview for a brochure aimed at prospective students, November 18, 2014.

Helped conceive of and develop a course titled "Communicating in the World of Chemistry," fall of 2013 - spring of 2014.

Helped convert "Advanced Laboratory I" into a team taught course involving a synthetic chemistry instructor and a physical chemistry instructor, fall of 2013 - spring of 2014.

Negotiated a deal with Sapling Learning involving the transition of General Chemistry I and II courses from Mastering Chemistry for the online homework over to Sapling Learning. This saved each General Chemistry student about $100, and the students generally seem happier with Sapling Learning relative to Mastering Chemistry, Spring, 2013.

Reorganized the inorganic chemistry curriculum and developed new "Inorganic I" and "Inorganic II" courses, Spring, 2012 - Fall, 2013.

Conceived of, organized, advertised, and participated in an informational game night for students interested in pursuing a major or minor in chemistry, September 7, 2011.

Supervision of Student Research/Project(s)

Development of Novel Gold(III) Complexes for the Functionalization of Highly Unreactive C-H Bonds

2012 - present, 34 undergraduate researchers

My research group synthesizes gold(III) complexes that have never been reported previously. We develop these complexes due to their potential for breaking carbon-hydrogen bonds, a type of reaction that has applications in the utilization of oil and natural gas as well as in the synthesis of pharmaceuticals and other chemicals. Thus far, my undergraduate researchers have synthesized and fully characterized 3 novel gold(III) complexes. We have gained a great deal of insight regarding the various conditions that can be used to generate these complexes. We have also studied some of the unique differences between these complexes including what gives rise to a rare green color for one of these gold(III) complexes.

Development of Electrocatalysts for CO_2 Reduction

2011 - 2013, 4 undergraduate researchers

My research group tested small organic molecules for carbon dioxide reduction electrocatalysis using cyclic voltammetry.

Scholarship and Creative Work, 2003-Present:

Scholarship Related to Discipline

Journal Articles:

Weinberg, D. R.; Gagliardi, C. J.; Hull, J. F.; Murphy, C. F.; Kent, C. A.; Westlake, B.; Paul, A.; Ess, D. H.; McCafferty, D. G.; Meyer, T. J. "Proton-Coupled Electron Transfer" Chemical Reviews 2012, 112, 4016 – 4093.

Zuofeng Chen, Chuncheng Chen, David R. Weinberg, Peng Kang, Javier Concepcion, Daniel P. Harrison, Maurice S. Brookhart, and Thomas J. Meyer. "Electrochemical reduction of CO_2 to CO by polypyridyl ruthenium complexes" Chemical Communications 2011, 47, 12607 – 12609.

Weinberg, D. R.; Hazari, N.; Labinger, J. A.; Bercaw, J. E. "Iridium(I) and Iridium(III) Complexes Supported by a Diphenolate Imidazolyl-Carbene Ligand" Organometallics 2010, 29, 89-100.

Weinberg, D. R.; Labinger, J. A.; Bercaw, J. E. "The Competitive Oxidation and Protonation of Aqueous Monomethylplatinum(II) Complexes: A Comparison of Oxidants" Organometallics 2007, 26, 167-172.

Soper, J. D.; Saganic, E.; Weinberg, D.; Hrovat, D. A.; Benedict, J. B.; Kaminsky, W.; Mayer, J. M. "Nucleophilic Aromatic Substitution on Aryl-Amido Ligands Promoted by Oxidizing Osmium(IV) Centers" Inorganic Chemistry 2004, 43, 5804-5815.

Conference Presentations:

Hernandez, M.; Rutter, K.; Sleck, M.; Thompson, T.; Murphy, H. R.; Saucedo Chavez, K.; Donalson, G.; Rheingold, A. L.; Weinberg, D. R. Gold(III) complexes with 2-*tert*-butyl-1,10-phenanthroline or an *N*-(8-quinolinyl)amide synthesized for intramolecular C-H bond activations. *Abstracts of Papers*, 257th National Meeting of the American Chemical Society, Orlando, FL, March 31 – April 4, 2019; American Chemical Society: Washington, DC, 2018, INOR 299.

Donalson, G. R.; Probsdorfer, B.; Gilmore, K. M.; Thompson, J. E.; Sleck, M.; Ohlson, D.; Curry, N. A.; Murphy, H. R.; Rodriguez, O. A.; Saucedo Chavez, K.; Rheingold, A.; Weinberg, D. R. Gold(III) complexes for intramolecular functionalization of strong, sp^3-hybridized C-H bonds. *Abstracts of Papers*, 255th National Meeting of the American

Chemical Society, New Orleans, LA, March 18-22, 2018; American Chemical Society: Washington, DC, 2018; INOR 245.

Weinberg, D. R.; Gilmore, K. M.; Thompson, J. E.; Sleck, M.; Ohlson, D.; Marley, R. L.; Rheingold, A. Gold(III) complexes of 2-*tert*-butyl-1,10-phenanthroline and of *N*-(8-quinolinyl)amides: Syntheses, structures, and a green gold(III) complex. *Abstracts of Papers*, 254th National Meeting of the American Chemical Society, Washington, DC, August 20-24, 2017; American Chemical Society: Washington, DC, 2017; INOR 724.

Gilmore, K. M.; Marley, R. L.; Thompson, J. E.; Donalson, G. R.; McCormick, A. R.; Owens, C.; Weller, S. R.; Nizalowski, L.; Rheingold, A.; Weinberg, D. Synthesis of gold(III) complexes containing phenanthroline- or quinoline-based ligands. *Abstracts of Papers*, 253rd National Meeting of the American Chemical Society, San Francisco, CA, April 2-6, 2017; American Chemical Society: Washington, DC, 2017; INOR 391.

Thompson, J.; Gilmore, K.; Marley, R.; McCormick, A.; Heine, E.; Owens, C.; Curry, N.; Brown, A.; Robbins, E.; Phillips, M.; Rheingold, A.; Weinberg, D. Synthesis of gold(III) complexes for chelation-assisted functionalization of strong, *sp*3-hybridized C-H bonds. *Abstracts of Papers*, 251st National Meeting of the American Chemical Society, San Diego, CA, Mar 13 - 17, 2016; American Chemical Society: Washington, DC, 2016; INOR 405.

Miller, R.; Thompson, J.; Sleck, M.; Brown, A.; Summi, S.; Ohlson, D.; Williams, B.; Brown, I.; Nissen, E.; Stutzriem, T.; Rheingold, A.; Weinberg, D. R. Development of gold(III) complexes containing ligands designed for chelation-assisted functionalization of strong, sp3-hybridized C-H bonds. *Abstracts of Papers*, 249th National Meeting of the American Chemical Society, Denver, CO, Mar 22-26, 2015; American Chemical Society: Washington, DC, 2014; INOR 204

Thompson, J. E.; Summi, S.; Brown, A.; Barajas, J.; Wilson, S.; Ohlson, D.; Stutzriem, T.; Settle, A.; Miller, R.; Bradford, E.; Sleck, M.; Rheingold, A. L.; Weinberg, D. R. Gold(III) complexes for chelation-assisted functionalization of strong, sp3-hybridized C-H bonds. *Abstracts of Papers*, 248th National Meeting of the American Chemical Society, San Francisco, CA, Aug 10-14, 2014; American Chemical Society: Washington, DC, 2014; INOR 345

Weinberg, D. R.; Brown, A.; Sleck, M.; Ohlson, D.; Felix, B. A.; Edmonds, J.; Bradford, E. "Ligands and complexes for chelation-assisted gold(III) activation of strong, sp3-hybridized C-H bonds." *Abstracts of Papers, 245th National Meeting of the American Chemical Society*, New Orleans, LA, April 7-13, 2013; American Chemical Society: Washington, DC, 2013; INOR 160.

Russell, M.; Ogden, J. M.; Edmonds, J.; Schrader, T.; Weinberg, D. R. "Evaluation of Possible Electrocatalysts for the Reduction of Carbon Dioxide and/or Protons Utilizing Cyclic Voltammetry." *Abstracts of Papers, 245th National Meeting of the American Chemical Society*, New Orleans, LA, April 7-13, 2013; American Chemical Society: Washington, DC, 2013; CHED 688.

Brown, A.; Sleck, M.; Ohlson, D.; Felix, B. A.; Edmonds, J.; Bradford, E.; Weinberg, D. R. "Utilization of chelating ligands to direct gold(III) functionalization of strong, sp3-hybridized C-H bonds." *Abstracts of Papers, 245th National Meeting of the American Chemical Society*, New Orleans, LA, April 7-13, 2013; American Chemical Society: Washington, DC, 2013; INOR 479.

Weinberg, D. R.; Chen, Z.; Shearer, A. J.; Meyer, T. J. "Electrocatalytic Carbon Dioxide Reduction at Thin Polymeric Films Containing Either Pd(0) or Rh(0) Particles." *Abstracts of Papers*, 240th National Meeting of the American Chemical Society, Boston, MA; American Chemical Society: Washington, DC, 2010; INOR 512.

Weinberg, D. R.; Hazari, N.; Labinger, J. A.; Bercaw, J. E. "Synthesis and Characterization of Iridium Complexes Containing a Diphenolate Imidazolyl-Carbene Ligand" *Abstracts of Papers, 238th* National Meeting of the American Chemical Society, Washington, DC; American Chemical Society: Washington, DC, 2009; INOR 266.

Weinberg, D. R.; Labinger, J. A.; Bercaw, J. E. "Homogeneous Platinum-Based Catalysis for Direct Conversion of Methane to Methanol: A Comparison of Potential Oxidants." *Abstracts of Papers*, 8th Natural Gas Conversion Symposium: Natal, Brazil, 2007.

Weinberg, D. R.; Labinger, J. A.; Bercaw, J. E. "Competitive Oxidation and Protonation of Aqueous Monomethylplatinum(II) Complexes: Comparison of Oxidants." *Abstracts of Papers*, 229th National Meeting of the American Chemical Society, San Diego, CA; American Chemical Society: Washington, DC, 2005; INOR 390.

Grants:

"C-H Bond-Breaking Reactions with Novel Gold(III) Complexes." Colorado Mesa University Faculty Professional Development Grant; October 25, 2017 - August 1, 2018; $1,000.

"Chelation-Assisted Gold(III) Activation of Strong, sp^3-Hybridized C-H Bonds, Similar to Those Found in Alkanes." American Chemical Society Petroleum Research Fund Undergraduate New Investigator Research Grant; May 1, 2014 - August 31, 2017; $50,000 plus $5,000 for capital equipment.

"Acquisition of an LCMS-ELSD System for Undergraduate Research and Instruction at Colorado Mesa University." National Science Foundation Major Research Instrumentation Grant; *submitted in 2014 and denied; modified and resubmitted in 2015 and denied.*

"Chelation-Assisted Gold(III) Activation of Strong, sp^3-Hybridized C-H Bonds, Similar to Those Found in Alkanes." Colorado Mesa University Faculty Professional Development Grant; October 17, 2013 - August 1, 2014; $2,400.

"The Use of Directing Groups for Gold(III) Functionalization of Highly Unreactive C-H Bonds." Colorado Mesa University Faculty Professional Development Grant; September 20, 2012 - August 1, 2012; $2,000.

"The Development of Electrocatalysts for CO_2 Reduction." Colorado Mesa University Faculty Professional Development Grant; September 20, 2012 - August 1, 2012; $1,000.

Scholarship Related to Pedagogy in Discipline
Online Publications:
Weinberg, D. R. "Distinguishing Between Metal Catalysts for Inner- and Outer-Sphere C-H Bond Functionalization." [Online] July 18th, 2012. VIPEr: Virtual Inorganic Pedagogical Electronic Resource. https://www.ionicviper.org/classactivity/distinguishing-between-metal-catalysts-inner-and-outer-sphere-c-h-bond-functionalizati

Weinberg, D. R.; Goldman, E.; Gerard, R.; Lovelace-Cameron, S. "Recyclable Catalyst for Conversion of Carbon Dioxide into Formate Attributable to an Oxyanion on the Catalyst Ligand" [Online] July 19th, 2012. VIPEr: Virtual Inorganic Pedagogical Electronic Resource. https://www.ionicviper.org/literaturediscussion/recyclable-catalyst-conversion-carbon-dioxide-formate-attributable-oxyanion-cat

Professional Memberships
2013 - 2018: Member of the American Chemical Society

Service 2003-Present:
University
2019:
Assessment Committee Chair

2018:
Assessment Committee Chair

Assessment Committee Subgroup tasked with addressing faculty burnout on assessment

Tenure and Promotion Committee Member

CMU Student Showcase Facilitator

Helped with an interview workshop for the GEMS Club

2017:
Assessment Committee Member

Assessment and Essential Learning Committees Subgroup tasked with the development of a system for assessing quantitative literacy in Essential Learning courses

CMU Student Showcase Facilitator

2016:
Assessment Committee Member

Assessment and Essential Learning Committees Subgroup tasked with the development of a system for assessing quantitative literacy in Essential Learning courses

CMU Student Showcase Facilitator

Gave a lecture on CVs, résumés, and cover letters to the GEMS Club

Held weekly office hours at the Maverick Innovation Center during the Spring semester

2015:
Assessment Committee Member

Leader of Assessment Committee Subgroup tasked with developing an Information Literacy SLO

CMU Student Showcase Facilitator

Committee to review results of Written Communication and Critical Thinking rubric assessments

Committee to develop an innovation center on campus

Gave a lecture on CVs, résumés, and cover letters to the Saccamano Research Institute's Summer Internship Program

Held weekly office hours at the Maverick Innovation Center during the Fall semester

Panel member for discussion on graduate schools, Saccamano Research Institute's Summer Internship Program

Presented my research at the Maverick Innovation Center Open House

2014:
Assessment Committee Member

CMU Student Showcase Facilitator

Panel member for discussion on graduate schools, Saccamano Research Institute's Summer Internship Program.

Search Committee Member, Tenure-Track, Ceramics, April - May.

2013:
Assessment Committee Member

CMU Student Showcase Facilitator

Panel Member for Discussion on Graduate Schools, Saccamano Research Institute's Summer Internship Program

2012:
Assessment Committee Member

Member of Faculty Discussion Group Focused on Money-Making Ventures for CMU

Met with a Representative from the Colorado Environmental Coalition to Discuss Possible Connections Between the Coalition and CMU

Sodexo Food Services Focus Group Participant

Speaker, "A Controlled Burn: An Energetics Road Map for the Conversion of Natural Gas Into Liquid Fuels and Chemicals," Physics Seminar

Speaker, "Improving the Utilization of Natural Gas and Solar Energy via Conversions Into Liquid Fuels," Faculty Colloquium

2011:
Participated in Two Stampede Weekend Events

Department
2018:
Organized, composed sections, and edited the Chemistry Program Review

Chemistry Program Coordinator tasked with coordinating efforts within the chemistry program; this includes organizing and composing the chemistry program's course schedule as well as hiring part-time and temporary instructors; it also involves tasks such as organizing program review efforts.

Led the effort to purchase a new NMR spectrometer

Participated in two Chemistry Cram events for Chemistry Club in which I helped students study for exams

Search Committee, Tenure-Track Biochemistry Faculty Member, Chemistry. Fall, 2017 - Spring, 2018

2017:
Chemistry Program Coordinator tasked with coordinating efforts within the chemistry program; this includes organizing and composing the chemistry program's course schedule as well as hiring part-time instructors

Organized and promoted three chemistry program seminars and hosted the visiting speakers

Participated in three Chemistry Cram events for Chemistry Club in which I helped students study for exams

Search Committee, Tenure-Track Biochemistry Faculty Member, Chemistry. Fall, 2017 - Spring, 2018

Search Committee, Full-Time Faculty Member, Chemistry. Spring, 2017

2016:
Chemistry Club Advisor during the spring semester

Chemistry Program Representative and Tour Guide at a Mesa Experience

Composed, collected feedback, and submitted the chemistry program's three-year summary report on assessment

Organized and promoted three chemistry program seminars; hosted the the two speakers from off-campus

Organized a chemistry program meeting to discuss the updated chemistry assessment plan

Reformatted, revised, implemented, and compiled the report for the Chemistry Program's Assessment Plan

2015:
Chemistry Club Advisor

Chemistry Program Representative and Tour Guide at a Mesa Experience

Organized a chemistry program meeting to discuss the updated chemistry assessment plan

Revised, implemented, and compiled the report for the Chemistry Program's Assessment Plan

2014:
Chemistry Club Advisor

Chemistry Program Representative at the Major and Graduate School Fair

Chemistry Program Representative and Tour Guide at a Mesa Experience

Helped Compose Chemistry Program Overview Brochure Aimed at Prospective Students

Revised and Organized the Implementation of the Chemistry Program's Assessment Plan

Search Committee Chair, Tenure-Track, Chemistry. Fall, 2013 - Spring, 2014

Search Committee, Tenure-Track, Ceramics. Spring, 2014

2013:
Chemistry Club Advisor

Chemistry Program Representative at the Major and Graduate School Fair

Chemistry Program Representative at the May Scholars Preview

Chemistry Program Representative and Tour Guide at Two Mesa Experiences

Helped Revise the Chemistry Reference Section at the CMU Library

Revised and Organized the Implementation of the Chemistry Program's Assessment Plan

Rewrote the Description for the Departmental Program Sheet

Search Committee Chair, Tenure-Track, Chemistry. Fall, 2013 - Spring, 2014

2012:
Chemistry Club Advisor

Chemistry Program Representative and Tour Guide at Two Mesa Experiences

Composed the First Draft of the Chemistry Program's Assessment Plan

Composed Titles, Course Descriptions, Topics, and Student Learning Outcomes for Four New Courses

Conceived of, Organized, and Participated in a Golf Outing for Graduating Seniors

Search Committee Member, Tenure-Track, Chemistry. Fall, 2011 - Spring, 2012

2011:
Chemistry Program Representative at the Choosing a Major Fair

Chemistry Program Representative and Tour Guide at Two Mesa Experiences

Conceived of, Organized, and Participated in a Chemistry Game Night for Recruiting Chemistry Majors

Search Committee Member, Tenure-Track, Chemistry. Fall, 2011 - Spring, 2012

Community/Region/State

2017:
Judge for the Western Colorado Regional Science Fair

2016:
Judge for the Western Colorado Regional Science Fair

Presenter on Chemical Energy Applications for the Zombie Apocalypse, CMU STEM Camp

Speaker, "Energy," Junior Scientist Series at the Mesa County Library

Tour Guide for Local Middle School Students of the CMU Chemistry Labs

2015:
Judge for the Western Colorado Regional Science Fair

Speaker, Presentation on Energy to Middles School Students at Math and Science Center

2014:
Collected and Organized Chemicals for Demonstrations at the Math and Science Center

Speaker, "Chemistry in Action," Junior Scientist Series at the Mesa County Library

Speaker, Presentation on Energy to Middles School Students at Math and Science Center

Tour Guide for Local Middle School Students of the CMU Chemistry Labs

2013:
Judge for the Western Colorado Regional Science Fair

2012:
Judge for the Western Colorado Regional Science Fair

Speaker, "Energy: It's What Moves You!," Junior Scientist Series at the Mesa County Library

Professional Organization(s)
2017:
Section chair for the Wednesday morning Organometallic Chemistry section at the Fall of 2017 National Meeting of the American Chemical Society

2015:
Peer Reviewer on Article for the Journal of Visualized Experiments

Peer Reviewer on two ACS PRF Grant Application

2014:
Peer Reviewer on Article for the Journal of Visualized Experiments

Advising 2003-Present:
University level
2018:
Major and Graduate School Fair: 1

Mesa Experience Events: 1

New Student Orientation Sessions: 2

2017:
Major and Graduate School Fair: 1

Mesa Experience Events: 1

New Student Orientation Sessions: 1

2016:
Club Advisor: Chemistry Club during the spring semester

Major and Graduate School Fair: 1

Mesa Experience Events: 1

New Student Orientation Sessions: 1

2015:
Club Advisor: Chemistry Club

Mesa Experience Events: 1

New Student Orientation Sessions: 1

2014:
Club Advisor: Chemistry Club

Major and Graduate School Fair: 1

Mesa Experience Events: 2

New Student Orientation Sessions: 2

2013:
Club Advisor: Chemistry Club

Major and Graduate School Fair: 1

Mav Scholars Preview Event: 1

Mesa Experience Events: 2

New Student Orientation Sessions: 3

2012:
Club Advisor: Chemistry Club

Mesa Experience Events: 2

New Student Orientation Sessions: 2

2011:
Mesa Experience Events: 2

Major Fair Sessions: 1

Stampede Weekend Events: 2

Department level
2011 - 2018:
Student Advisor: 89 - 94 students

Honors and Awards 2003-Present:

Local
2016:
Colorado Mesa University Faculty Exemplary Rating

2015:
Colorado Mesa University Maverick Award for Academic Advisor of the Year

Colorado Mesa University Coleman Fellow for promoting entrepreneurship on campus

2013:
Colorado Mesa University Faculty Exemplary Rating

2003:
Dow Travel Fellowship, California Institute of Technology

Professional Experience:

2008 - 2011:

Postdoctoral Scholar. Department of Chemistry, The University of North Carolina at Chapel Hill, Chapel Hill, NC. Advisor: Thomas J. Meyer.

2001 - 2008:

Graduate Research Assistant. Division of Chemistry and Chemical Engineering, California Institute of Technology, Pasadena, CA. Advisors: John E. Bercaw and Jay A. Labinger.

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

	Books	**Book Reviews**		**Creative Publications**
5	**Journal Articles**	**Performances**		**Patents**
14	**Conference Presentations**	**Exhibitions**	6	**Grants-funded and non-funded**
	Sabbaticals	**Fullbright**		**Book Chapter**
2	**Other (related to discipline)**	Online Publications Related to Pedagogy in Chemistry		

Appendix VIII

Curricula Vitae for Full-Time Faculty

Name:

Suzanne C Kenney

Start Year: 2006

Program:
Physical Sciences

Department:
Physical and Environmental Sciences

COLORADO MESA UNIVERSITY

Full-time Faculty Vita

Faculty Rank

○ Professor ○ Assistant Professor

○ Associate Professor ◉ Instructor

Highest Degree

MS	Clarkson University	Civil Engineering	2000

Education: (List all degrees beginning with most recent-include post docs and external certificates)

MS, Civil Engineering, Clarkson University, 2000

BS, Chemical Engineering (Concentration in Mathematics), Clarkson University, 1996

Teaching 2003-Present:

Courses Taught

CHEM100, Chemistry and Society (Lecture, ONLINE and Hybrid)

CHEM121, Principles of Chemistry

CHEM121L, Principles of Chemistry Lab

CHEM123, Principles of Environmental Chemistry (Lecture and Hybrid)

CHEM131, General Chemistry 1

CHEM131L, General Chemistry 1 Lab

CHEM132L, General Chemistry 2 Lab

CHEM151, Engineering Chemistry

CHEM151L, Engineering Chemistry Lab

ENVS221, Science and Technology of Pollution Control

Evidence of Continuous Improvement

October 20, 2018: Dr. Tyler DeWitt, Educational Consultant
McMillian Learning Webinar
Meeting Students Where They Are

September 20, 2018: Dr. Jean Twenge, San Diego State University
Pearson Higher Education Webinar
iGen: Teaching the Smartphone Generation: This generation is growing up more slowly as adolescents, and are more extrinsically and less intrinsically motivated, necessitating new strategies for reaching them in the classroom.

September 19, 2018: CMU Teacher to Teacher (T2T) Workshop

Effective and Efficient Writing Assignments
Efficient Assessment of Writing

August 17, 2018: CMU Faculty Development Workshop
People, Performance, Process: Making the Most of Your Strengths

January 12, 2018: Elizabeth Long Lingo, PhD
Innovative Leadership Workshop

June 2017: Art and Chemistry Teaching Workshop (Walla Walla, WA)
Using art to teach general chemistry. Application accepted for the week long NSF funded workshop.

January 15, 2016: CMU Faculty Development Workshop
Professionalism & Classroom Management Strategies
Strategies for how faculty can model professional behavior and engender it in our students.
Panelists: Blake Bickham, Morgan Bridge, and Russ Walker

Effective Constructive Criticism
Strategies for helping students understand, embrace and apply constructive criticism in the classroom.
Panelists: Jeremy Franklin, Eli Hall, and Paul Kraft

Dealing with Volatile Students
Strategies for diffusing highly charged conversations, emotionally charged conversations or confrontational students.
Panelists: Bob Lang, Pua Utu, Dana VandeBurgt, and Steve Werman

November 2015: CMU Teacher to Teacher (T2T) Workshop
Milestone Class - Speed Dating (find a teacher to co-teach a milestone course)
Milestone Class - The Next Steps (how to propose and design a co-taught milestone course)

October 2015: CMU Distance Education Workshop, Introduction to Panopto Video Software
Learn how to incorporate Panopto video lectures into an online class taught in S2L.

March 3-4, 2015: United in Safety
Campus Safety and Active Threat Response
Suicide Prevention Efforts and Related Resources
Sexual Assault Prevention Efforts, mandatory Reporting and Related Resources

August 2014: Leslie Myers, Chestnut Hill College
Keeping the Garage Door Open: Understanding and Applying Concepts of Neuroscience to Teaching and Learning in the Higher Education Classroom
Batteries for the Garage Door Opener: Strategies that Enhance Student Learning and Engagement in the Higher Education Classroom

April 2013: CMU Workshop by Distance Education
Introduction to D2L for online teaching (2 sessions)
Open computer help sessions (2 sessions)

April 29-30, 2010: Kathryn Ley, University of Houston - Clear Lake
Improving Online Communications Quality
Helping Online Students Learn and You Teach

January 14 - 15, 2010: Patricia Phelps, University of Central Arkansas
Restoring the Joy in Teaching
Ways to Promote Learning

April 30 - May 1, 2009: Keith Bailey, Pennsylvania State University
Thinking about Online Learning
Rethinking Your Current Design and Delivery Approach
Quality Assessment of Online Courses
Strategizing Your ROI for Online Learning

January 15 - 16, 2009: Barbara Millis, University of Nevada - Las Vegas
Using Groups and Academic Games for Learning and Assessment
Course Redesign Revitalization

May 1 - 2, 2008: Ed Neal, University of North Carolina
Designing Courses that Promote Critical Thinking
Teaching Critical Thinking: Active Learning
Evaluating Critical Thinking
Classroom Management: Dealing with Difficulties

May 2007: FYI Chemistry Conference (ICUC sponsored):First Year Undergraduate Chemistry Education International Conference
Global Communication for a Sustainable World, University of Colorado at Boulder, 2007.

May 3 - 4, 2007: Linda Nilson, Clemson University
Reaching the 75% of the Students Who Don't Do the Readings
My Top 10: The Worst Teaching Practices I've Ever Seen
Fast but Fair Methods to Grade Writing
A Self-Directed Guide to Designing Courses for Significant Learning

Scholarship and Creative Work, 2003-Present:
Scholarship Related to Discipline

Textbook:
Principles of Chemistry Laboratory Manual 2nd Ed, Fountainhead Press (2016)
Principles of Chemistry Laboratory Manual, Fountainhead Press (2014)

Book Reviews
Introductory Chemistry Online by Paul R. Young, Open Educational Resources, 2014 (2014)
21st Century Chemistry 1st edition, Waldron, Roberts and Company, 2014 (2012-2013)
McGraw Hill Connect; Online Adaptive Learning System (2012)

Other
Authored Learning Curve question set (adaptive learning) for 21st Century Chemistry 2nd Ed, Waldron, Macmillian (2019)
Authored Learning Curve question set (adaptive learning) for Investigating Chemistry. Johll, Macmillian (2018)
Assessment of Treatment Technologies for Noble Energy's Produced Water; Ayers, Kenney, Walker, 2009.

Professional Memberships
American Chemical Society (2004 - 2010, 2017-Present)

Service 2003-Present:

Service to CMU
Sustainability Council, Active Member (2007-2009)

Service to Department
Search Committee Member - Biochemist (2016)
Search Committee Member - Chemistry Instructor (2016)
Search Committee Member - Chemistry Instructor (2014)

Search Committee Member - Chemical Stockroom Director (2011)

Service to Community
Science Fair Judge - Wingate Elementary (2007, 2008, 2014)
Science Fair Judge - Regional Science Fair hosted at CMU (2007, 2008, 2013, 2014)

Advising 2003-Present:

Honors and Awards 2003-Present:

National

Regional

Local

Professional Experience:

Saint Lawrence University (2004 - 2006): Chemical Stockroom Director, Chemical Hygiene Officer, Radiation Safety Officer, and Hazardous Waste Manager

Certifications: 40-hr Hazwoper, RCRA/DOT Hazardous Waste Management, 40-hr Radiation Safety Officer, Chemical Hygiene Officer

Stockroom Duties:prepared all solutions for weekly general chemistry and organic chemistry undergraduate labs; supervised five student employees that helped with solution preparation and chemical inventory

Chemical Hygiene Officer Duties: conducted annual chemical/lab safety training for all science faculty; updated university's Lab Safety plan; managed the hazardous waste for the university; controlled 90 day hazardous waste storage facility; coordinated all waste pickups; conducted lab safety inspections

Alcoa (2002-2004): Senior Process Engineer

air pollution, wastewater treatment, regulatory compliance (federal and NY state), project management, bench scale and full scale experimentation for process improvements, modeling of fluoride absorption on alumina vs. temperature for dry scrubber efficiency study.

Corning Inc. (1998 - 2001): Senior Process Engineer, Process Engineer

Specialty Material Division Engineer: supported multiple glass/ceramic manufacturing plants; full scale experimentation/ process improvements; wrote many Corning confidential technical publications; six-sigma greenbelt certification; project management training

Clarkson University (1996-1998)

Teaching Assistant: lecture, field trip, bench-top experiment, and grading.

Taught two part senior level civil engineering laboratory. Sampled river water and measured the dissolved oxygen (DO) content. Spiked the river water with a sample collected from the town's wastewater and determined the biological oxygen demand (BOD). This simulated a point source impact of the WWTP on the local water supply.

Research: Biodegradation of Coal Tar Polycyclic Aromatic Hydrocarbons by Pseudomonas Stutzeri in the Presence of Nonionic Surfactants

Eastman Kodak (Fall 1994, Summer 1995, Summer 1996): Engineer Intern

Environmental Technology Department: Database design for incinerator trial burn at industrial wastewater treatment plant; dissolved oxygen testing for potential risk of chemical spills into industrial wastewater treatment plant; constructed pilot unit and determined efficiency of UV treatment of contaminated water.

Synthetic Chemicals Division: Database design for data collected in pilot study for air pollution control bioreactor

Please record the number "items/events" you have listed above in the following categories.
If you specify items/events under "other," please provide an explanation/definition.

2	**Books**	3	**Book Reviews**	0	**Creative Publications**
0	**Journal Articles**	0	**Performances**	0	**Patents**
0	**Conference Presentations**	0	**Exhibitions**	0	**Grants-funded and non-funded**
0	**Sabbaticals**	0	**Fullbright**	0	**Book Chapter**
3	**Other (related to discipline)**	Authored adaptive learning chapter question sets for publishing company			

Philip M. Kiefer, Ph.D.

Dept. of Physical and Environmental Sciences
Colorado Mesa University
100 North Ave, Grand Junction, CO 81501
pkiefer@coloradomesa.edu

Education:

Dec. 1996	Ph. D. Physics (Biophysics), University of Calif. at San Diego.
Dec. 1991	M. S. Physics, University of Calif. at San Diego.
June 1990	B. S. Applied Physics with Honors, University of Calif. at Davis.

Awards:

May 2000-Oct. 2000	Ministère de l' Éducation du Québec Merit Fellowship.
April 1998-Mar. 2000	NIH Postdoctoral Fellowship.
April 1991- Mar. 1996	NIH Biophysics Graduate Trainee Fellowship.
Summer 1989	Undergraduate Research Fellowship, Associated Western Universities, Crocker Nuclear Lab, Davis, CA.

University Teaching Experience:

August 2015 – Present	Lecturer, Dept. of Physical and Environmental Sciences Colorado Mesa University
June 2009-June 2016	Lecturer, Dept. of Chemistry and Biochemistry University of Colorado at Boulder
Sept. 1990- June 1991	Teaching Assistant and lab coordinator, Physics Dept. University of Calif. at San Diego (upper and lower division Elec. & Mag., optics, and electronics labs)

Classes Taught at CMU: (Faculty & Course Evaluations available upon request)

Fall 2018	1st Semester Biochemistry
Fall 2018	Biochemistry Laboratory (4 sections)
Spring 2018	2nd Semester Biochemistry
Spring 2018	Introductory Chemistry (prealgebra based chemistry)
Spring 2018	2nd Semester General Chemistry Laboratory (3 Sections)
Fall 2017	1st Semester Biochemistry

Fall 2017	Biochemistry Laboratory (3 sections)
Fall 2017	1st Semester General Chemistry Laboratory (1 Section)
Spring 2017	2nd Semester Physical Chemistry (Quantum Mechanics, Statistical Mechanics)
Spring 2017	Introductory Chemistry (prealgebra based chemistry) Spring 2017
Spring 2017	Introductory Chemistry Lab 2nd Semester General Chemistry Laboratory (2 Sections)
Fall 2016	Introductory Chemistry (2 Sections) (prealgebra based chemistry)
Fall 2016	Introductory Chemistry Lab (2 Sections)
Spring 2016	2nd Semester Physical Chemistry (Quantum Mechanics, Statistical Mechanics)
Spring 2016	Introductory Chemistry (prealgebra based chemistry)
Spring 2016	Introductory Chemistry Lab (1 Sections)
Spring 2016	2nd Semester General Chemistry Laboratory (2 Sections)
Fall 2015	Introductory Chemistry (2 Sections) (prealgebra based chemistry)
Fall 2015	Introductory Chemistry Lab (2 Sections)

Classes Taught at CU Boulder: (Faculty & Course Evaluations available upon request)

Summer 2016	1st Semester Physical Chemistry (Thermodynamics and Kinetics)
Summer 2015	1st Semester Physical Chemistry (Thermodynamics and Kinetics)
Spring 2015	2nd Semester Physical Chemistry (Quantum Mechanics, Statistical Mechanics)
Summer 2014	1st Semester Physical Chemistry (Thermodynamics and Kinetics)
Fall 2011	2nd Semester General Chemistry Laboratory Instructor
Fall 2011	1st Semester General Chemistry Instructor
Summer 2011	2nd Semester Physical Chemistry (Quantum Mechanics, Statistical Mechanics)
Summer 2011	1st Semester Physical Chemistry (Thermodynamics and Kinetics)
Summer 2010	2nd Semester Physical Chemistry (Quantum Mechanics,Statistical Mechanics)
Summer 2010	1st Semester Physical Chemistry (Thermodynamics and Kinetics)
Fall 2009	2nd Semester General Chemistry with Laboratory

Summer 2009	2nd Semester Physical Chemistry (Quantum Mechanics, Statistical Mechanics)
Summer 2009	1st Semester Physical Chemistry (Thermodynamics and Kinetics)

Research Experience:

July 2012-August 2015	Senior Research Associate, Dept. of Chemistry and Biochemistry University of Colorado at Boulder
Jan. 1997-June 2012	Research Associate, Dept. of Chemistry and Biochemistry University of Colorado at Boulder.
Dec. 2005-July 2007	Chercheur, École Normale Supérieure, Département de Chimie Paris, France
Jan. 2000-Aug. 2001	Research Associate, Molecular, Cellular, and Developmental Biology University of Colorado at Boulder
May 2000-Oct. 2000	Ministère de l'Éducation du Québec Merit Fellow Visiting Scholar, Concordia University, Montréal, Québec
Sept. 1995-Nov. 1996	Research Assistant, Dept. of Biochemistry Division of Molecular and Experimental Medicine The Scripps Research Institute
July 1990- Mar. 1996	Research Assistant, Depts. of Chemistry and Physics University of Calif. at San Diego
Sept. 1989-June 1990	Undergraduate Research Assistant, Dept. of Physics, University of Calif. at Davis
Summer 1989	Nuclear Chemistry Undergraduate Research Fellow Associated Western Universities, Crocker Nuclear Lab, Davis, CA
Sept. 1987-June 1989	Undergraduate Research Assistant Depts. of Animal Science and Nutrition, University of Calif. at Davis

Publications (30; list available upon request).

Member of the American Chemical Society since 1997.

Reviewed several articles for ACS Omega, Journal of Physical Chemistry, Israel Journal of Chemistry, and Journal of Physical Organic Chemistry.

Grants:

- The Physiological Role of Carbonic Acid and Lactic Acid as Protonating Agents of Amine and Nitrogen Bases in Model Biological Environments, NIH, 4/12-12/16. Combined theoretical (w/ J.T. Hynes CU) and experimental (w/ E. Pines BGU) study of the viability of carbonic acid and lactic acid as mobile buffers *in vivo*.

  Role: Senior Key Personnel

- Peptide Bond Formation in the Peptidyl Transferase Center, NSF (Organic and Macromolecular Chemistry), 8/06-7/09. Theoretical study of the mechanism of the title topic.
  Role: Senior Key Personnel

Professional References:

Professor James T. Hynes
Dept. of Chemistry and Biochemistry Campus Box 215
University of Colorado Boulder, CO 80309-0215
(303) 492-6926
Fax: (303) 492-5894
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epines@bgu.ac.il

Emeritus Professor Kevin Peters Dept. of Chemistry and Biochemistry
Campus Box 215
University of Colorado Boulder, CO 80309-0215
Kevin.Peters@colorado.edu

Andrew Vinyard

135 Carlitos Avenue, Grand Junction, CO 81501
770-861-9673
wvinyar1@gmail.com

Education

University of Utah
Ph.D. Chemistry, Biochemistry Division (August 2018)
University of West Georgia
Summa Cum Laude ACS Certified B.S. Chemistry (December 2012)

Experience

Full Time Chemistry Instructor, Fall 2018-present, Colorado Mesa University
Responsible for preparation and presentation of all course work
Lectured Chem 121: introduction to Chemistry
Became proficient at identifying students struggling with the course material
Instructor for Chem 121L: introduction to chemistry lab
Instructor for Chem 151L: Engineering Chemistry Lab

Graduate Research, 2016-present, Dr. Cynthia Burrows
Research title: Connecting G-quadruplex formation to gene expression in plants
Became proficient at identifying potential G-quadruplex sequence (PQS)
Familiarized myself with structural characterization techniques including but not limited to thioflavin T assays (ThT), Circular Dichroism (CD), Nuclear Magnetic Resonance (NMR), UV-VIS difference, thermal melt (Tm) assays
Expanded culturing techniques for growing *C. rendhardti*
Became proficient in transforming *C. rendhardtii* with exogenous DNA
Developed a nuclear extraction method
Developed an in vitro expression system for *C. renhardtii*
Learned additional PCR cloning technique for incorporating G-quadruplex sequences
Became efficient operating and understanding high purification liquid chromatography (HPLC) purification of oligonucleotides
Improved my writing and critical thinking skills by developing and defending an original research proposal

Senior ChemSAC Co-chair, 2016-present
Advocated and successfully got dental and vision insurance for all graduate students
Developed and held the first ChemSAC mental health seminar
Organized and attended prospective faculty luncheons
Organized and held summer BBQ for first-year graduate students
Organized and held the student choice seminar
Hosted Dr. Peter Dedon from MIT
Reviewed faculty hiring and collected students reviews on perspective hires

Andrew Vinyard•770-861-9673•wvinyar1@gmail.com

Junior ChemSAC Co-chair, 2015-2016

Learned the basic procedure for retention promotion and tenure review
Learned the review process for perspective faculty
Worked with fellow graduate students to develop a healthy work life balance
Worked alongside Victoria to instate the monthly bagels and coffee

Graduate Research, 2013-2016, Dr. Matthew Kieber-Emmons

Research title: Probing the origin of ethylene response in plants
Became proficient in membrane protein purification, functionality assays, overexpression techniques, and growth of yeast strains
Received additional mentoring and grew as a mentor through teaching undergraduate researchers
Learned XANES and EXAFS X-ray absorption structural characterization techniques
Improved my writing and critical thinking skills by developing and defending my second year seminar and my preliminary oral exam.

General chemistry lab Teaching Assistant, 2010-2012

Assisted and guided students in the lab
Was responsible for managing and dictating proper use of lab equipment
Acted as a mentor for developing young scientist
Developed the lab experiments and protocols

Private tutor 2010-2013

Tutored AP high school students; tutored fellow general and organic chemistry students at University of West Georgia.

UWise mentor, Fall 2011

Meet with students during office hours
Guided freshman students, previously enrolled in the summer bridge program towards fields of study which could possible fit their current interest.

University of West Georgia Institutional STEM Excellence (UWise) Assistant, Summer 2011 and 2012, University of West Georgia, Department of Chemistry, Dr. Sharmistha Basu-Dutt Phone: 678-839-6018: email: sbdutt@westga.edu

Summer bridge program focusing on the retention of science majors
Assisted professor with conducting, planning and setting up lab experiments
Answered questions and gave direction on lab handouts
Led study and tutoring sessions for participating students in the UWise program

Organic Chemistry Teaching Assistant, University of West Georgia, Department of Chemistry; Dr. Victoria Geisler (fall 2011 and spring 2012) Phone: 678-839-6025: email: vgeisler@westga.edu

Led problem set sections in Organic Chemistry
Followed student progress and provided individual tutoring
Monitored and assisted students needing help during POGOL style lectures

Analytical Chemistry Teaching Assistant, Fall 2011-2013, University of West Georgia, Department of Chemistry, Dr. Hansen email jhansen@westga.edu

Acted as liaison between Dr. Hansen and his students, resulting in deepened development of interpersonal skills
Extensively tutored individual students
Gained experience in strengthening student understanding on concepts such as complex equilibrium, gravimetric procedures, acid base chemistry of both polyprotic and monoprotic acids, photochemistry including Beer's Law and basic to moderate level electrochemistry, etc.

Research Assistant, Fall 2010-2013, University of West Georgia, Department of Chemistry; Dr. Hansen, Phone: 678-839-6021, email jhansen@westga.edu
Title of Research Project: Proton transfers in super-cooled solutions.

Provided aid in aligning laser with sample holder
Responsible for setting up photospectrometer
Handled the collection and interpretation of data and pre-experimental preparations, such as mixing and weighing of solutions
Aided in rebuilding and maintaining of cryostat apparatus
Independently applied proof of concept for a new photospectroscopy technique, which was used previously for collecting data on the deprotonation of glycerol in the glass phase

Workshop Assistant, 2010-2011, University of West Georgia, Department of Chemistry Dr. Lucille B. Garmon. Phone: 678-839-6017; email: lgarmon@westga.edu

Responsible for planning and leading workshops in which the students were guided in solving problems on their own.
Each workshop session emphasized collaboration and group problem solving for entry level chemistry students.
Workshops led included Principles of Chemistry 1 and 2

Graduate Teaching Experience and Presentations

Guest lectured Bioinorganic chemistry (CHEM 7150)
Title: Photosystem II: Role of the Dangler Manganese
Guest lectured Nucleic Acid chemistry (CHEM 7470)
Title: Editing the Genome without Double Strand Breaks
Poster presented at the G4thering
Title: Connecting G-quadruplex Formation to Gene Expression in Plants

Honors and Activities

Attended and presented a poster at the G4thering in Prague, Czech Republic (summer 2017)
Refugee mentor program (Catholic Community Services) 2016-2018
National Science Foundation Graduate Research Fellow (2014-2017)
Completed bioreactor training at Utah State (Fall 2014)
Founding member of M.A.S.A (Multi Asian Student Association)
Fiction award and publication of short story (2011 English Department)

Dean's list 2009-2012
National Honors of Collegiate Scholars
Ben W. Griffith Fiction Prize (2011 English Department)
Department of Chemistry scholarship 2012
Science Smart Grant 2010-2011
William L. Lockhart Scholarship 2011
NASA- Georgia Space Grant Consortium Scholarship, March 31, 2011
Analytical Chemistry Award 2011
Organic Chemistry Book Award 2010

Publications

1. Vinyard, A., Ding, Y., Fleming, A. M., Burrows, C.J. (2018) *Identification and characterization of G-quadruplexes in Chlamydomonas reinhardtii and the stabilization effects of physiologically high polyamine concentrations in solution.* (Publication pending.)

2. Light, K. M., Wisniewski, J. A., Vinyard, W. A., and Kieber-Emmons, M. T. (2016). *Perception of the plant hormone ethylene: known-knowns and known-unknowns.J.Biol. Inorg. Chem.* 21, 715–728. doi: 10.1007/s00775-016-1378-3

3. Vinyard, A., Hansen, K.A., Byrd, R., Stuart, D.A., Hansen, J.E. (2014) *Design of a Simple Cryogenic System for Ultraviolet–Visible Absorption Spectroscopy with a Back- Reflectance Fiber Optic Probe*, Appl. Spec. 68(1): 118-123. doi: 10.1366/13-07129.

ANDREW R. WOLFF, Ph.D.

(630) 828-4206 (days) / (970) 248-1161 (office) / (970) 549-0448 (evenings)
AWolff@coloradomesa.edu https://www.linkedin.com/in/drandrewwolff

SUMMARY

Experienced industrial chemist with a strong record of innovation, research, and teaching accomplishments. Demonstrated proficiency in general, inorganic, polymer, surfactant, and organic chemistry. Demonstrated ability to manage research and development groups. Effective team player. Strong interpersonal skills. Experience in specialty chemicals, energy, and microelectronics industries. Familiar with USPTO database, Microsoft Office, Lotus Notes, Blackboard, and a variety of instrument-specific software packages.

TEACHING EXPERIENCE

Instructor of Chemistry: Colorado Mesa University. 2017 – present
Taught Intro and General Chemistry lectures and labs. Courses were taught using D2L for communication and assignments as well as Sapling (McMillan Publishing) automated homework assignments.

Adjunct Professor: Waubonsee Community College, 2010 – 2014
Taught Chem 100, Chem 101: *Introduction to Chemistry* and *Introduction to Chemistry Lab*. This is an introductory chemistry course for students with no previous exposure to chemistry. Teaching included use of Blackboard for communication with students.

Adjunct Professor: Benedictine University, 2005 – 2007
Taught Chem 114/Chem 124: *Chemistry Laboratory for Majors and Pre-Medical students.*

Lecturer: College of DuPage, 2000 – 2005
Part-time faculty (evenings). Taught *Introduction to Chemistry for Majors* (CHEM 151); *Introduction to Chemistry for Pre-Nursing Students* (CHEM 111); and *Introduction to Organic Chemistry for Pre-Nursing Students* (CHEM 112). Elected to **Who's Who in American Teachers** in 2004 and 2005.

Visiting Assistant Professor: Cleveland State University, 1986-1989
Taught *Freshman Chemistry for Science and Engineering Majors*; Designed and taught *Chemistry Of The World Around Us*, a course for humanities students with accompanying laboratory.

Contributor to: www.Socratic.org www.Humbot.io www.Quora.com

INDUSTRY EXPERIENCE

Scientist IV: Cabot Microelectronics, 2013 – 2016
Responsible for development of integrated circuit polishing slurries using nanoparticulate silicates with adjuvants and performance modifiers. Received 2016 Gold-Level Innovation award for work on hydrogen peroxide characterization and decomposition. Three patent applications have been filed, one additional is in preparation.

ANDREW R. WOLFF

Chief Chemist: Benetech, Inc., 2001-2013
Responsible for all aspects of raw material specification, blending, quality control, product reformulation, and new product development. Supervised up to five associates. Secondary duties include training new hires on chemical product line, analysis and recommendations for field non-conformances, EPA compliance, Hazardous materials compliance, Intellectual Property management, and generation/maintenance of MSDS files. Reformulated entire dust suppression product line in 2005, resulting in an approximate 8% increase in Earnings Before Interest, Taxes, Depreciation, and Amortization. Developed and implemented quality control system for chemical products. Four US patents have issued on this work.

Sr. Research Scientist: Turtle Wax, Inc., 1998-2001
Responsible for strategic research in automotive care products. Sole responsibility for new product launched in 2000; technology contributions to several other products launched in 2000. Primary duties include product conception, chemistry selection, prototype design, performance testing, optimization of formula, and competitive performance analysis. Ancillary duties include direction and oversight of academic research, and specification of new instrumentation.

Sr. Research Chemist: PPG Industries/BASF Specialty Products, 1990-1998 Responsible for the development of novel polysiloxanes. Successfully developed high performance silicone lubricants, silicone surfactants, and novel low molecular weight polysiloxanes for a variety of industries. Duties included scale-up through pilot plant to production, interactions with external customers, and technical direction of subordinates. Twelve US patents have issued on this work. PPG sold this business unit to BASF in December 1997.

Senior Polymer Chemist, Master Builders Technologies, 1989-1990
Research into expanding polymerization reactions. Involved search for polymers whose density was less than that of their monomers. The goal was to produce a super-adhesive for construction. Tools included molecular mechanical modeling of polymer and monomer volumes.

Visiting Researcher, NASA Lewis Research Center, 1986-1989
Research into polymeric precursors to ceramics. Successfully used a silane condensation catalyst to polymerize vinyl silane which then could be pyrolyzed to a mixed SiC/C ceramic.

Postgraduate Researcher, California Space Institute, 1984-1986
Modeled rocket engine performance and economics of silane/O_2 vs H_2/O_2 rocket engines in near- lunar space. Additionally supervised one undergraduate researcher and proposed the existence of croconic acid in the Venus atmosphere to account for unexplained UV absorbance.

Research/Teaching Assistant, University of Wisconsin, Madison, 1978-1984.

EDUCATION

Ph.D., Inorganic Chemistry. University of Wisconsin, Madison, 1984
Thesis title: "The Structure and Reactions of High Molecular Weight Polysilanes" Research included ^{29}Si NMR characterization and evaluation of photoinitiator efficiency of polysilanes.

BS Chemistry. University of California, Santa Barbara, 1978 Graduated with Honors

ANDREW R. WOLFF

PROFESSIONAL

American Association for the Advancement of Science

PATENTS

US Patent #9,937,523: "Dust suppression formulas using plasticized cellulose ethers" A. R. Wolff, M. T. Such, April 10, 2018

US Patent #9,850,403: "Cobalt Polishing Accelerators" S. Kraft, A. Wolff, P. Carter, K. Hayes, B. Petro, December 26, 2017

US Patent #9,834,704: "Cobalt Dishing Control Agents" S. Kraft, A. Wolff, P. Carter, B. Petro, December 5, 2017

US Patent #9,688,885: "Cobalt Polishing Accelerators" S. Kraft, A. Wolff, P. Carter, K. Hayes, B. Petro, June 27, 2017

US Patent #9,267,063: "Dust suppression formulas using plasticized cellulose ethers" A. R. Wolff, M. T. Such, February 23, 2016

US Patent #9,017,767: "Method of suppressing dust in piles and railcars using plasticized cellulose ethers" A. R. Wolff, M. T. Such, April 28, 2015

US Patent #7,976,724: "Method of preventing emanation of dust from a coal pile or railcar" A.R. Wolff, July 12, 2011

US Patent #6,790,245: "Control of Dust" A. R. Wolff; J. P. Pircon; M. E. Freetly September 14, 2004

US Patent #6,187,863: "Curable compositions based on functional polysiloxanes" T. F. Wilt; D.N. Walters; J. A. Claar; K. D. Donnelly; J. M. Carney; A. R. Wolff, February 13, 2001

US Patent #6,136,928: "Curable compositions based on functional polysiloxanes" T. F. Wilt; D.N. Walters; J. A. Claar; K. D. Donnelly; J. M. Carney; A. R. Wolff, October 24, 2000

US Patent #6,103,838: "Curable compositions based on functional polysiloxanes" T. F. Wilt; D.N. Walters; J. A. Claar; K. D. Donnelly; J. M. Carney; A. R. Wolff, April 15, 2000

US Patent #6,103,824: "Curable compositions based on functional polysiloxanes" T. F. Wilt; D. N. Walters; J. A. Claar; K. D. Donnelly; J. M. Carney; A. R. Wolff, April 15, 2000

US Patent #6,054,535: "Acetoacetate functional polysiloxanes" T. F. Wilt; D. N. Walters; A. R. Wolff, April 25, 2000

US Patent #6,048,934: "Curable compositions based on functional polysiloxanes" T. F. Wilt; D.N. Walters; J. A. Claar; K. D. Donnelly; J. M. Carney; A. R. Wolff, April 11, 2000

US Patent #6,046,296: "Curable compositions based on functional polysiloxanes" T. F. Wilt; D.N. Walters; J. A. Claar; K. D. Donnelly; J. M. Carney; A. R. Wolff, April 4, 2000

US Patent #6,040,394: "Curable compositions based on functional polysiloxanes" T. F. Wilt; D.N. Walters; J. A. Claar; K. D. Donnelly; J. M. Carney; A. R. Wolff, March 21, 2000

US Patent #5,952,443: "Acetoacetate functional polysiloxanes" T. F. Wilt; D. N. Walters; A. R. Wolff, September 14, 1999

US Patent #5,939,491: "Curable compositions based on functional polysiloxanes" T. F. Wilt; D.N. Walters; J. A. Claar; K. D. Donnelly; J. M. Carney; A. R. Wolff, August 17, 2000

US Patent #5,916,992: "Polysiloxane polyols" T. F. Wilt; D. N. Walters; K. D. Donnelly; A. R. Wolff, June 29, 1999

World Patent #9906487: "Curable coating composition for primer, color and clear coats - comprises reactive poly (hydroxyalkylated) siloxanes, polymers, oligomers and a curing agent." T. F. Wilt; D. N. Walters; J. A. Claar; K. D. Donnelly; J. M. Carney; A. R. Wolff

World Patent #9906472: "New polysiloxane polyol - used in ambient and thermal cure coating compositions." T. F. Wilt; D. N. Walters; K. D. Donnelly; A. R. Wolff

World Patent #9906471: "New acetoacetate functional polysiloxane - prepared from polysiloxane tetrol and an acetoacetate; useful in primer coating compositions." T. F. Wilt; D. N. Walters; A. R. Wolff

US Patent # 5,248,789: "Epoxy Silicone Coatings with Good Bloom and Scratch Resistance and High Gloss," A. R. Wolff, September 28, 1993

US Patent # 4,569,953: "Photoactivated Polymerization of Vinyl Monomers by Polysilanes," R.C. West and A. R. Wolff, February 11, 1986

Publications

ADMIXTURES, R. L. Harris, F. D. Kinney, M. A. McFarland, C. M. Nelson, E. J. Siebert, A. R. Wolff, A. M. Young; Cements Research Progress, 1988 (1990)

"Croconic Acid: An Absorber in the Venus Clouds?" K. Hartley, A. Wolff, L. Travis, Icarus, **77**, 382-390 (1989).

"A High Char-Yield Polymeric Binder for RBSN Matrix Composites," K. Schofalvi, M. Freedman, A. Wolff, 13'Th Annual Conference on Composites Materials and Structures, January 18-21, 1989, Cocoa Beach, Florida.

"Polymer-Derived Ceramic Composite Materials," F. I. Hurwitz, P. J. Conroy, L. P. Cornell, J. Z. Gyekenyesi, A. L. Waters, A. R. Wolff, High Temperature Engine Materials Technology

Program First Annual Review, November 9 & 10, 1988. NASA Lewis Research Center, Cleveland, Ohio.
"Silicon-29 Nuclear Magnetic Resonance of Dialkylpolysilanes," A. R. Wolff, J. Maxka, R. West, Journal of Polymer Science, Polymer Chemistry Edition, 26, 713-720 (1988)

"^{29}Si NMR of Dimethyl- and Phenylmethyl-Containing Polysilanes," A. R. Wolff, I. Nozue, J. Maxka, R. West, Journal of Polymer Science, Polymer Chemistry Edition, 26, 701-712 (1988)

"Photoinitiation of Vinyl Polymerization by Polysilanes," A. R. Wolff, R. West, Applied Organometallic Chemistry, **1**, 7, (1987)

"Polysilanes as Photoinitiators for Vinyl Polymerization," R. West, A. R. Wolff, D. J. Peterson, Journal of Radiation Curing, **13**, 35-40 (1986).

"Polysilanes: A Novel Class of Photoinitiators for Vinyl Monomer Polymerization," A. R. Wolff, R. West, D. J. Peterson, XVII Organosilicon Symposium, April 3, 1984, Schenectady, New York.

REFERENCES

Phillip Carter
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abatek@yahoo.com

Appendix IX

Curriculum Vitae for the Laboratory Coordinator

Scott Aaron Kalbach 970-308-0789 skalbach@msn.com

Education:

2006-present: Colorado State University Fort Collins, CO PhD candidate (currently writing dissertation for defense)
1402 Center Ave Mall Fort Collins, CO 80521

2001-2004: Mesa State College Grand Junction, CO BS emphasis in chemistry (cum lauda)
1100 North Ave, Grand Junction, CO 81501

1987-1992: Mesa College/Mesa State College Grand Junction, CO incomplete studies with declared major of chemical engineering
1100 North Ave, Grand Junction, CO 81501

1980-1984: Jefferson County High School Dandridge, TN (diploma)
115 W Dumplin Valley Rd, Dandridge, TN 37725

Work Experience:

2016 to Present: Colorado Mesa University – duties include preparing laboratories for all chemistry classes. Prepare organic, inorganic, and biochemical reagents and solvents. Clean equipment and properly dispose of chemical waste. Maintain an inventory with MSDS readily available. Repair or arrange for repair of equipment and instruments. Purchase chemicals and equipment as needed in reasonable time. Stay within a defined budget for all purchases and repairs. Purchase gases for instrumentation and organic/organometallic synthesis. Maintain reasonable communication with all laboratory instructors providing special information or instruction. Teach chemistry laboratories at both general chemistry and organic levels. Job goals include assuring good instruction to both students and student employees that contributes to the completion of their education. Make sure laboratories have all the chemicals and equipment necessary for students to have the opportunity to learn at a higher level.

2015-2016: Intervention Inc. – duties include managing minimum risk and low medium risk misdemeanor and felony probation or deferred judgement cases. Maintaining a prefessional appearance and demeanor. Keep legal records of each appointment with each client, and supervise the client to completion of all Court ordered sanctions. Complete legal documents such as summons & complaints or warrants. Attend court appearances, and generate reports for victim and domestic violence cases. Communicate with therapy providers, and administer urinalysis for clients following a chain-of-evidence protocol. The goal of the job is successfully to assist people to completion of their probation by coaching, warnings, and sanctions.
(Kerin Dyer 970-257-9000)
150 W Main St Ste D, Grand Junction, CO, 81501

2014-2015: Kingdom Metals LLC – duties require preparing and pouring assays at temperatures greater than 2000 F, using wet chemistry to remove all metals from ore, and identify content via XRF. Other duties require running pilot scale process for treating the ore, using a small tube furnace at 2000 F, grinding ore using a lab scale grinder, a crusher, and a bell cone crusher. Main

process input as far as safety, order of operation, etc are also required. The final products were collector metals and glass slag.
(Foster Scott 719-557-2846)
Wilbarger St., Vernon, TX, 76384.

2006-2014: Colorado State University – duties included teaching and lab research. Responsible for the day-today-day function of the lab including: ordering, waste removal, equipment maintenance, training, and safety compliance. Projects completed were simian immunodeficiency virus fusion protein mimetic and peptide surface mobility and recognition using a designed mumps and human immunodeficiency virus fusion protein mimetic.
(Dr Alan Kennan 970- 491-6046)
Chemistry Building 1301 Center Dr Fort Collins, CO 80521

2004-2006: Boulder Scientific – duties included preparing reactor for batch record procedure (this included houses, valves, dip legs, and pumps), keeping log during operating procedure, packaging of intermediates and final products (in fiber packs, drums, and cylinders), and loading of raw materials.
(Larry Barton 970-535-4494)
598 3rd St, Mead, CO 80513

2001-2004: Mesa State College – worked as undergraduate researcher and stockroom assistant. Completed experiments identifying organic molecules extracted from plant material and helped set up the undergraduate general chemistry labs.
(Dr Craig Dodson – formerly of Mesa State College)
1100 North Ave, Grand Junction, CO 81501

1985-2001: City Market Warehouse – duties included: unloading trailers, order selection, janitorial, forklift operator, trailer loading, and foreman. Used electric flat motors, hand jacks, and stand-up forklifts. Selected orders from paper tags at rates of 200 to 320 cases per hour. Fork lift "let downs" to pick slots were completed at 20 to 25 an hour.
(business no longer exists)
559 Sandhill Ln, Grand Junction, CO 81505

1984-1985: Construction work for Aspen Valley Heating and Plumbing, Specialty Stone, and UniCal. Job duties included picking rock in the mountains, cutting and laying concrete pipe, and carrying tools for welders as needed.

Equipment Skills:

Rock Crusher, grinder, vacuum pumps, circular dichroism, HPLC, HF cleave apparatus, flat motors, hand jacks, forklifts, mass balance, pH meters, UV-Vis, and XRF. Some experience in mass spec, analytical ultracentrifugation, NMR, copper cell, and calorimetry.

Personal Skills:

Proficient with math, Excel, Word, Power Point, Adobe suite, precise measurements, calculated dilutions, and experimental design. Learn quickly and self-starter. Capable of working on equipment with proper diagrams and schematics. Skilled at researching a topic (for equipment/lecture/laboratories/miscellaneous). Capable of seeking assistance when I encounter a problem in which I have limited or no experience.

Team Skills:

Start by understanding the goal of the project. Give input on team concept projects. Can give/receive input to presented ideas for either team or personal projects. Understand that other people's point of view and input are necessary for a successful project.

Goals:

I am seeking positions that will allow me to use my diverse set of skills at any level. I believe that I can do any job regardless of physical requirements or required knowledge base. I feel I can contribute on multiple levels drawing on my past experience at different occupations while adjusting to the desired goals of the employer.

External Review Report

Submitted By:

Anna G. Cavinato
Professor of Chemistry, Eastern Oregon University

For

Program Review AY 2018-2019

At

Colorado Mesa University

Department of Physical and Environmental Sciences

Chemistry Program

Visit Date: February 18, 2019

Program Description

Bachelor of Science in Chemistry

Bachelor of Science in Chemistry with a Biochemistry Concentration

NARRATIVE

This report is based on my site visit on February 18, 2019. Prior to the visit, I was provided with a comprehensive Program Self Study compiled by the Chemistry faculty. During my visit I had the pleasure to meet with Aparna Palmer, Assistant Vice President for Academic Affairs for Student and Faculty Success; Kurt Haas, VP for Academic Affairs; Chemistry Faculty Sam Lohse, Joe Richards, James Ayers, Tim D'Andrea, and Dave Weinberg; Chemistry Stockroom and Lab Coordinator Scott Kalbach; Morgan Bridge, Assistant Vice President of Academic Affairs for Assessment and Accreditation; Sylvia Rael, Library Director and Jamie Walker, Head of Technical Services; Jeremy Brown, VP of Information Technology; and five chemistry seniors. I toured the classrooms and laboratories located in the Wubben Science Center, library and other facilities. I also observed a Principles of Chemistry lecture taught by Sam Lohse and Organic Chemistry II lecture taught by Joe Richards. I greatly appreciate the welcoming atmosphere that I experienced throughout my visit and the time and effort that was invested by all those involved in planning and participating in the review. I left Colorado Mesa University with a clear understanding of the strengths and weaknesses of the Chemistry program which will be addressed in my report.

I would like to note that while several references will be made in this report to the American Chemical Society (ACS) Guidelines for Bachelor's Degree Program accreditation (1), these guidelines will be used only for the purpose of establishing points of comparison. The CMU Chemistry degree is not currently accredited by ACS. However, these standards are nationally accepted and can provide a benchmark for commendations to the program as well as suggestions for improvement.

Lastly, I would like to emphasize the importance for CMU to offer a chemistry degree and how the chemistry program helps the university's significant impact on regional economic development.

Introduction and Overview

The Colorado Mesa University Chemistry Program is a strong and rapidly growing program. Since the establishment of the Bachelor of Science in Chemistry in fall of 2013 the number of majors has steadily increased, rising to 103 (fall 2018). The Program is well-functioning, mutually supportive and collegial. The faculty is very hard-working, dedicated to student learning and student success. Faculty is active in research and, in the past six years, there has been a dramatic increase in the number of students' presentations at conferences, including national and regional meetings of the American Chemical Society. Chemistry students are enthusiastically supportive of the chemistry program. They greatly value the individual interactions they have with the chemistry faculty, especially in the context of smaller upper-level classes and individualized research activities. Students specifically mentioned that they appreciated the attitudes and values that the chemistry faculty fostered, especially high

expectations, hard work, and quality outcomes. Most of all, students valued that the chemistry faculty cared for them as individuals and for their success during college and afterwards. The curriculum is fairly lean and traditional, but provides a comprehensive grounding of fundamental and applied chemistry topics. The Program has defined a set of broad program learning outcomes (PLO's) in line with institutional outcomes and more specific student learning outcomes (SLO's), and there is a strong program assessment in place. Beyond regular assessment of its courses, the Program conducts alumni surveys to determine curricular improvements to better serve students who either wish to enter the chemical workforce immediately after graduation or move on to graduate or professional school. The main challenge faced by the Program is limited number of staff and potential "burn-out." Staffing increasing numbers of laboratory sections and accommodating a broader range of students takes significantly more time than in the past. Undergraduate research has dramatically increased and there is currently more demand for research opportunities by students than there is faculty capacity. Likewise, chemistry is a very instrument-based discipline, and it takes significant time and effort to maintain and repair the Program's instrument holdings. It is vital for the health of the Program, especially if curricular innovation is desired and student research levels are to be sustained or increased, that the number of faculty within the program is at least maintained or increased and that adequate support staff for stockroom, lab prep, and instrumentation maintenance is available.

I. Observations pertaining to curriculum

Contribution to University Curriculum

The program provides a wide array of courses in support of other programs. Five of these courses can be used to fulfill the Essential Learning requirement in the Natural Sciences. Because of university-wide increased enrollments, these courses, particularly at the 100 level, have seen a large increase in enrollment and student credit hours. In the past five years, about 80% of the enrollment in chemistry came from 100-level courses.

Program curriculum

The program offers a solid and traditional curriculum, similar to many other chemistry programs nationwide. Although the program is not certified by the American Chemical Society, its structure reflects the five foundational areas of chemistry for ACS-approved undergraduate programs (analytical, biochemistry, inorganic, organic, and physical). The program offers lecture-based courses in all five areas and laboratory courses in three of the areas (separate inorganic and physical chemistry labs are not currently offered).

Curriculum updates

Following recommendations from the 2012 review, the program established a Bachelor of Science in Chemistry in 2013, followed by a new Biochemistry Concentration for the Bachelor of Science in Biochemistry which was offered for the first time in fall 2016. This led to the addition of CHEM 316, Biochemistry II which is a required course for Biochemistry majors and a restricted elective for the Chemistry majors. As part of the recommendations from the 2012 review, the program now offers Instrumental analysis and the associated lab and Inorganic Chemistry on a yearly basis. Although no separate Inorganic or Physical Chemistry laboratory

courses are currently offered, CHEM 341, Advanced Laboratory I, provides exposure to experimental topics of physical and inorganic nature. The recent revision of ACS Guidelines for program approval and major certification (1) states that an ACS-certified degree can be awarded to students who complete a one semester course in the five foundational areas of chemistry, lab courses in four of the five foundational areas, and four additional courses of in-depth work (often a second semester in a foundation area or research). Thus, as far as curriculum requirements, there seems to be an opportunity in the future for the Program to develop an ACS-certified chemistry degree track if one additional laboratory (either physical or inorganic) were to be developed. It would also be beneficial to develop a Chemical Safety course that emphasizes current safe practices in the undergraduate chemical laboratory. The course would provide training in the safe use and disposal methods for chemicals and in the handling of specialized equipment required for doing chemistry. It should be a required course for students working in the stockroom. Although I understand that current requirements restrict undergraduates from being hired as teachings assistants (TAs), students trained in chemical safety would provide valuable assistance, particularly in lower division laboratories where direct supervision of 24 students by one instructor appears challenging.

One great addition to the curriculum is CHEM 442, Communicating in the World of Chemistry. The course was added to address needs emerged by institutional assessment data to improve communication skills. Taken concurrently with CHEM 341, Advanced Laboratory I, the course provides training in technical writing and presentations, resume writing, and job-hunting skills.

During my visit, faculty lamented that students' writing skills are often poor and that writing classes don't necessarily teach proper grammar and punctuation. To that extent, the program could scaffold writing assignments in multiple courses and create a seminar course where students research a topic from the scholarly literature, write a technical paper that is reviewed by faculty and peers, and present the research topic in a lecture-style presentation.

Research is an essential ingredient in the education of any future scientist. The program has dramatically increased the number of students involved in research, although this effort is limited in part by lab space, access to working instrumentation and, most notably, by lack of faculty time. These are all essential requirements to support and sustain effective undergraduate research environments (2). One approach to remediate time limitations is to develop course-based undergraduate research experiences (CUREs) (3). In this approach, research projects are integrated into laboratory course work, affording students opportunities to make discoveries that are of interest to the broader scientific community or other stakeholders outside the classroom (4, 5). CUREs also engage students in iterative work, during which they repeat and build on aspects of their own and others' work in order to ensure the reliability of their findings and generate meaningful scientific knowledge. Projects could be built around different faculty expertise or developed in collaboration with community partners. Exposure to increased research experiences would benefit students going to graduate school or entering the workforce. The faculty promotes research internships opportunities to students and this effort should be continued and expanded.

The curriculum for the Chemistry minor has also been upgraded since the last review with more flexible course choices to accommodate students from other majors or students with diverse interests.

Program delivery vehicles, locations, and format

Except as noted below, all chemistry courses are delivered in classrooms or labs on the CMU main campus. The faculty does an excellent job at maintaining relatively small class sizes even in light of a major increase in enrollments. Multiple sections of general chemistry and organic chemistry supported by multiple laboratory sections (28 sections as of fall 2018) help maintain the "personal approach" commitment reflected in the CMU institutional mission.

Conversations with faculty pointed to adoption of some active and student-centered teaching pedagogies including group work, mastery quizzes, clickers, etc. However, personal observation of classroom instruction demonstrated limited use of these tools. For example, in a lower-division course the instructor provided group work sheets but did not provide any directions to students to form groups. As a consequence, students completed their work individually, although the instructor circulated throughout the classroom providing assistance. In a second instance, the class was held as a traditional lecture with occasional questions by the instructor which were routinely answered by a limited number of students. I recommend that the program continues to investigate and implement pedagogies that enhance more active student learning. As the pool of potential college applicants changes, the diversity of teaching pedagogies that are proven to be effective for all students will become increasingly important (6).

One course (CHEM 100 – Chemistry and Society) has been offered online and in hybrid format as well as in a traditional setting by a part-time instructor at the CMU campus in Montrose. No conversations regarding online teaching ensued during my visit. Obviously, this could be an area of major expansion for the program which would have to be supported by institutional investments in hiring additional staff. CHEM 121, 121L – Principles of Chemistry – was previously offered by high school teachers with supervision by CMU faculty but this effort only lasted through 2012 and 2013. It is unclear as to why it was discontinued.

II. Observations pertaining to student success

Observations of program growth

In the past five years, the Chemistry Program has experienced a large growth in the overall number of students served by the program as well as number of majors. From AY13 to AY18 the majors have increased by 27% with an average of 10.7 graduates/year. The chemistry minor has also experienced a very large growth with a 238% increase in the number of students completing the minor, an average of 20.7/year.

A large portion of the faculty FTE is invested in providing chemistry courses for other majors. Since all courses include a lab component and labs are capped at 12 to 24 depending on the course, faculty spend a large proportion of their time teaching labs.

Enrollment trends

The Chemistry Program is currently operating close to full capacity. From AY13 to AY18, average course enrollments and student credit hours have increased by approximately 30%. Eighty percent of this enrollment comes from lower-division courses, particularly at the 100-level, which are service courses for other majors. There has been a significant increase in enrollments also at the upper-division level, reflecting the growth in the number of chemistry majors. Although the faculty does not anticipate a large growth in the number of majors and minors in the near future, they have expressed concern that any additional growth, at any level, will not be accommodated without a significant investment in additional staff and resources, particularly lab space.

III. Observations pertaining to program resources

Full-time equivalent faculty-to-student ratio and course/student credit hours

As of fall 2018 the program consists of five tenured/tenure-track faculty, three permanent full-time instructors, one temporary full-time instructor, one laboratory coordinator/instructor, and three part-time instructors. The program is conducting a search for one additional tenure-track faculty who will replace a previous biochemistry faculty member. Currently, only 54% of the faculty is on a tenure-track line. From AY13 to AY18 the full-time equivalent students (FTES) have increased at a faster pace than the full-time equivalent faculty (FTEF) with a FTES:FTEF of 27.6 in AY18. This is a very large number when comparing to national averages and other institutions in Colorado. According to data released in 2011 by the National Center for Education Statistics (7), the national FTES:FTEF average for 4-year institutions is 15.1 and for 2-year institutions is 21.1. The same source reports that in Colorado the FTES:FTEF average for 4-year institutions is 9.6 and for 2-year institutions is 22.4. Thus the program is carrying a load that surpasses what faculty would experience at a community college.

Because student demand for chemistry courses has grown significantly, class sizes have also increased along with the number of lab sections and increased demand for undergraduate research experiences. This growth is posing a significant strain on the program with high teaching loads of 14-16 contact hours/week, not taking into account the fact that faculty only receive credit for two hours when teaching a three hour lab.

These high teaching loads represent a factor that would prevent offering an ACS-certified chemistry degree in the future. According to the ACS guidelines "Fifteen contact hours is an upper limit, and a significantly smaller number should be the normal teaching obligation, particularly for faculty supervising undergraduate research" (1). Faculty also expressed concern that larger class sizes are resulting in a decrease in personalized attention to students, particularly at the lower-division level. Faculty have less time to devote to helping students outside the classroom while time invested in grading continues to increase.

This situation is exacerbated by CMU's policy that forbids use of student teaching assistants. I find this particularly troubling in large lab sections where one instructor supervises 24 students. **To improve safety in the laboratory, at least one trained student assistant should be**

available to provide additional support. ACS guidelines encourage use of students' assistance. " The participation of upper-class chemistry undergraduates and graduate students in the instructional program as teaching assistants both helps them reinforce their knowledge of chemistry and provides a greater level of educational support for students they supervise" (1).

Overall, there is concern with the potential for faculty fatigue within the Program. The faculty is delivering courses to an increasing number of students who enter college with a wide variation of preparedness. The faculty has limited time to engage in the development, implementation, and assessment of new evidence-based pedagogical approaches. And all tenured/tenure-track faculty are engaged in research activities with students, which is not figured into student-credit-hours or student-to-faculty ratios. This overall high level of performance seems to be resulting in fatigue due to increased demands.
Continued support from the administration is needed to maintain the teaching and research momentum of the Chemistry Program. And the Program needs to be vigilant in prioritizing their tasks, concentrating on the most important efforts and letting go of those with the least impact.

Faculty recognitions
Over the years, faculty have been recognized with awards, including the Distinguished Faculty Award and Academic Adviser of the Year. The level of research activity in the Program is growing with faculty involving undergraduate students in their research programs with an average of six to seven students per year. One faculty was awarded recently an ACS Petroleum Research Grant that supported stipends for undergraduate researchers.
The number of faculty publications is also increasing with some faculty reporting an excellent track record of publications which has helped raise the profile of the Program at the national level. Students and faculty regularly present their work at local, regional, and national meetings and the number of poster presentations has increased dramatically since the last review. One recommendation would be to work towards converting student/faculty poster presentations to student co-authored original publications. Increasing the rate of original research publications, which are considered significant products by federal granting agencies, may help the Program secure more external support to fund research programs and instrumentation.

Funding and budget observations
Based on the self-study, the operating budget for the program appears to be adequate for the day-to-day operation. However, no budget is in place to replace equipment. There seems to be flexibility in accommodating on-time requests for funding, particularly in case of emergency situations. An example was the approval by the administration of a new nuclear magnetic resonance spectrometer after the old one failed and cost of repair was not worth the investment.

Interestingly, the Chemistry program does not collect lab fees which is a very common practice for programs across the nation. Rather, the administration provides a dollar amount based on previous year enrollments. This practice certainly constitutes a great advantage for the students.

Faculty have been active in seeking external funding to support their research at CMU with mixed results. The current teaching loads represent a major barrier in finding time to submit competitive research proposals.

Library assessment

Based on data provided in the self-study and by library staff during the site visit, chemistry faculty and students have access to and make good use of their library resources. They can access journals published by the American Chemical Society through the ACS Web Editions database. They also have access to Academic Search Complete, a general subject academic journal database containing nearly 600 full-text peer reviewed journals related to chemistry. In addition, the SciFinder database provides access to chemistry related information, including chemical substances, reactions and literature references through articles. According to usage statistics provided by library staff, 1,621 journal articles were downloaded between July 2017 and June 2018. During 2018, SciFinder had 27 registered users, 21 sessions, 90 searches, and 16 total outputs. Journals not available through these databases or other CMU library resources can be obtained in a few hours through the InterLibrary Loan Department.

The library collection also provides access to reference titles, monographs, e-books, DVDs, films on Demand and federal documents. All these resources are vital to accessing current information and should be kept in place.

As noted in Appendix D of the self-study, one area of improvement will be to augment the library resources in the area of biochemistry. Since this is a growing concentration offered by the program with a new potential faculty member, it should be an area of high priority.

Physical facilities

The Chemistry program is housed in the Wubben Science Center. Classrooms across campus are used to deliver courses while all lab facilities are on the third floor of the Science Lab wing of the Wubben Science Center. Classrooms I observed during the site visit seemed to be well equipped with computers and projection screens. The single chair configuration allows for flexible layout conducive to small group work. Current lab facilities include:

- Two 24-student labs for general chemistry, each with six two-person fume hoods
- One 22-student lab for organic chemistry with hood space for all students and for waste
- One 16-student lab for other courses with three two-person hoods
- Two labs for faculty and student research, with four fume hoods and space for 14 people
- An instrument room housing most of the program's analytical instrumentation
- A stockroom and prep room
- A storage room on the first floor of the Wubben Science Center for solvents

According to the chemistry faculty this space was originally allocated to the program in 1998 with no additional space added, in spite of a large increase in enrollment. As of fall 2018, four lower-division courses (CHEM 121, 131, 132 and 151) account for 23 lab sections in addition to 5 sections for organic chemistry. Some lab setups have to be moved from one room to another in the middle of the week, adding to the workload of the laboratory coordinator. Labs are offered

every day of the week, in morning, afternoon and evening hours, leaving very little room to meet additional lab demand if enrollment continues to increase.

All upper-division labs, including the biochemistry, analytical, instrumental, and advanced labs, are held in one laboratory facility that can house 16 students. Such inadequate space poses limitations to the instructional capability of the program. Often advanced labs, especially if they involve projects that span over multiple days or weeks, may require the setup of special equipment or apparatus, making the space particularly crowded. Considering the limited lab space, it may not be feasible for the program to offer a physical or inorganic lab which would be a step in the right direction to obtain ACS certification.

The lab space devoted to research also appears to be problematic. Currently, five tenured/tenure track and one non-tenure-track faculty members share approximately 900 square feet with four fume hoods and limited space to set up experiments. When the sixth tenure-track faculty member will join the program, the problem of space will become even worse. Assuming an average of four students per faculty member, there could be as many as 24 students trying to conduct experiments in such limited space. This is an issue of concern both in terms of safety and quality of research experience for the students.

Chemical safety

The stockroom and lab prep resources appear to be stretched very thin. The extraordinary work load of ordering supplies, preparing reagents and setting up such a large number of lab sections, and managing waste disposal falls on one individual who has additional instructional duties. Although I did not perform an inspection of the facility, the stockroom appeared crowded and in disarray. Faculty lamented that often experiments fail in the teaching labs because of wrong setups or reagents. Student helpers are available but their training poses additional strain on the stockroom staff. It is unclear that waste is being properly disposed of which may become a serious liability for the institution. It should be a very high priority for the institution to add at least one full-time staff to help coordinate the stockroom efforts.

Instructional technology and equipment

Modern chemistry is highly dependent on instrumentation, and students need hands-on usage as part of their training. Conversations with chemistry majors indicated that students highly value the opportunity to operate advanced instrumentation and that they wished more functional equipment were available. The program has access to optical atomic and molecular spectroscopy, X-ray fluorescence, high-pressure liquid chromatography and ion chromatography, equipment for electrochemical measurements, and most recently, an ozone analyzer. In general, the equipment appears to be aging and some may not have been operational. A new 400 MHz NMR is being purchased which will be a great asset to instruction and advanced research. A major missing piece of equipment is an operational gas chromatograph. An existing GC with thermal conductivity detection needed repair. No mass spectrometry capability is currently present.

Adequate equipment maintenance is a challenge for the program. In theory, the stockroom staff is also responsible for equipment maintenance and repair but, because of being overworked with

other stockroom duties, it appears that instrument maintenance falls as responsibility of faculty, creating additional drains on their time. This can impact faculty productivity in other areas. It is essential that an instrument technician be available for routine maintenance, troubleshooting, and repair. Without such a position, faculty spend their time doing these tasks at the expense of teaching and research, maintenance will not be done with the same level of professionalism, and instruments will become inoperable sooner. An instrument technician position will pay for itself in repair and purchase costs down the road.

IV. Observations pertaining to student learning outcomes and assessment

The program has in place a solid assessment plan with a clear articulation of five programmatic student learning outcomes (SLOs) which are aligned with the university-wide SLOs (Specialized Knowledge, Quantitative Literacy/Critical Thinking, Applied Learning, Information Literacy and Communication Fluency). The curriculum map shows that assessment of the five SLOs is scaffolded across multiple courses and is implemented with a variety of assessment tools including tests, reports, presentations, laboratory work, analysis of data and proposed experimental procedures. Each SLO is assessed at two levels, providing additional insights on student learning. In addition to these assessment tools, the faculty also relies on alumni surveys and information of how readily students obtain positions after graduation. The faculty reviews assessment data on a yearly basis and implements curricular changes accordingly.

One concern was raised in regard to the scores obtained in the ETS Major Field Test (MFT) in 2016-17 and 2017-18. This comprehensive examination is administered to graduating seniors and it is used to compare their basic knowledge in chemistry sub-disciplines, including physical, organic, inorganic and analytical chemistry to other schools across the nation. In 2016-17 the overall percentile, as well the percentile in each individual field, dropped dramatically and in 2017-18 remained below the typical percentile scored in the past. The faculty is aware of changes that occurred at the national level in the way the MFT has been administered, which could account for the decreased performance of CMU students in spite of no curricular changes. The faculty may consider discontinuing the MFT and using the ACS standardized exams as final exams at the end of specific courses, as they see appropriate. This will also create an incentive for students to perform well on the tests since currently the MFT is administered outside the coursework.

EXECUTIVE SUMMARY

Table 3. Executive Summary Template for External Reviewer's Observations

Program Review Element	Check the appropriate selection				Provide explanation if not agree with element and/or why unable to evaluate
	Agree	Not Agree	Unable to Evaluate	Not Applicable	
The program's self-study is a realistic and accurate appraisal of the program.	X				
The program's mission and its contributions are consistent with the institution's role and mission and its strategic goals.	X				
The program's goals are being met.	X				Most of the program goals are being met – at least one additional faculty line is needed for the program to be able to achieve its goals.
The curriculum is appropriate to the breadth, depth, and level of the discipline.	X				The current curriculum is appropriate but could be expanded in the areas of inorganic and/or physical chemistry laboratory.
The curriculum is current, follows best practices, and/or adheres to the professional standards of the discipline.	X				
Student demand/enrollment is at an expected level in the context of the institution and program's role and mission.		X			Student demand for chemistry offerings is approaching capacity and the FTES:FTEF ratio is extremely high.
The program's teaching-learning environment fosters success of the program's students.	X				
Program faculty members are appropriately credentialed.	X				
Program faculty members actively contribute to scholarship, service and advising.	X				
Campus facilities meet the program's needs.		X			The program is operating with limited lab and stockroom space, raising

					concern for safety and instructional effectiveness.
Equipment meets the program's needs.		X			Adequate budget for maintaining and updating key equipment is an ongoing concern.
Instructional technology meets the program's needs.	X				
Current library resources meet the program's needs.	X				

Recommendations and Commendations

Following is a summary of the strengths and challenges of the Colorado Mesa University Program in Chemistry. Recommendations for future action are provided, along with commendations.

Recommendation 1. It is recommended that, as resources become available, an additional tenure-track position be added. In the self-study, faculty identified the need for additional expertise in the area of biochemistry and organic chemistry. Such addition will alleviate, in part, the high teaching loads and will provide more opportunities for undergraduate research and the development of upper division laboratory courses. This will position the program to potentially seek accreditation by the American Chemical Society. Additional part-time faculty may also be necessary to cover the increasing number of lab sections, so to keep the number of contact hours for tenured/tenure-track faculty within a reasonable level (no more than 15 contact hours per week). The program invests a large amount of resources in offering courses including labs for other majors. Faculty should reevaluate their program priorities and time allocation, concentrating their efforts in growing and strengthening the chemistry and biochemistry degrees.

Recommendation 2. It is recommended that the Program find a way to use undergraduates as lab assistants to increase safety and personalized attention in the laboratory, particularly at the lower division level. Such experience will also be highly beneficial to the lab assistants, deepening their knowledge of the discipline and building leadership skills while providing additional support to their peers.

Recommendation 3. It is recommended that additional lab space be allocated to the program. The program is operating close to capacity, offering a large amount of lab sections, with little room for growth. Space for research is extremely limited, hindering expansion of faculty and student research efforts. The number of fume hoods available in the research area is insufficient to accommodate the experiments and needs to be addressed in light of students and faculty safety. Additionally, leaks from the roof, particularly in proximity of the exit door from the research lab need immediate attention.

Recommendation 4. Instrumentation needs a long-term plan for maintenance and replacement. It is recommended that a dedicated fund in the operating budget for instrumentation maintenance and repair be established. Consideration should be given to hiring an instrumentation maintenance/repair specialist. The Program should establish a two-fold strategy for obtaining new instrumentation: (i) submission of NSF-MRI (or other agencies) grant proposals by Chemistry/Biochemistry faculty members (realistically unfeasible in light of very high teaching loads), and (ii) fund-raising and/or long budgeting for major instrumentation replacement.

Recommendation 5. There is an urgent need to provide additional staff for the safe and efficient operation of the stockroom. Currently, the stockroom operates with only one staff member. The staff's duties include prepping all lab sections, ordering supplies, managing and disposing of chemical waste, maintaining the instrumentation, and supervising and training undergraduates to assist in the stockroom. Currently eight students assist on a part-time basis. In addition, the staff member teaches two organic chemistry lab sections. These duties are onerous for one individual to carry on. Faculty voiced frustration with the quality of lab prepping. Experiments need troubleshooting and often do not work the first time. The stockroom space is limited which contributes to the clutter. Most importantly there seems to be confusion on waste disposal and only recently has the Program been designated as a "Small Quantity Generator". To alleviate this situation, an Environmental Health and Safety officer should be hired to take over the waste disposal responsibility. This individual could oversee multiple departments/programs including biology, environmental science, etc. If hiring an EH&S officer is not possible at this time, the stockroom staff should receive Resource Conservation and Recovery Act (RCRA) training along with DEQ and DOT training. These courses are available online. An additional staff member should be hired to assist with lab preparation and instrument maintenance.

Commendations:

Commendation 1. The faculty of the Chemistry Program is very hard-working and committed to the success of their program. They are highly qualified and supportive of the Program mission. It is evident that they care about student outcomes and strive to provide personalized education. They are supportive of one another, collegial, respectful, and friendly.

Commendation 2. Since the last review, the faculty has implemented many programmatic changes to strengthen the curriculum. Particularly noteworthy is the establishment of the Biochemistry concentration which has contributed to a large increase in the number of majors, along with the creation of other courses to enhance students' laboratory experience and communication skills.

Commendation 3. The Program has developed an impressive assessment plan that informs programmatic changes. All faculty is actively involved in assessment and reviews results on a yearly basis.

Commendation 4. Undergraduate research is a year-round activity with documented outcomes that benefit students, faculty, the University, and the discipline.

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This program chose not to prepare a rejoinder because factual errors were not present in the external review.