

**COMMITTEE RECOMMENDATION FOR
College of Natural Science and Mathematics
Chemistry and Biochemistry Graduate Programs**

The UAF Department of Chemistry and Biochemistry offer 2 PhD degrees 1) Biochemistry and Neurosciences (B&N) and 2) Environmental Chemistry (E-Chem). They also offer an MS with these two areas of concentration in chemistry. The MS degree mainly uses the same courses as PhD for efficiency.

STRENGTHS:

- Biochemistry and Neuroscience (B&N) PhD contributes to the One Health research community in Biomedicine research and includes Arctic-specific niches in neurosciences and biochemistry. Both of these degrees are well in line with the UAF Mission and contribute to the goal of being a Tier 1 research university (Strategic plan goal).
- Environmental Chemistry (E-chem) PhD faculty are leaders in Arctic research.
- Program faculty have brought in more than 40 million dollars to UAF in the past 5 years which has supported the graduate programs and in turn the graduate programs support the grant funded research. To put it in biochemical terms it is a symbiotic relationship in which both parties benefit and could not survive without each other.
- The graduate students in these programs provide a rich pool of talented teaching assistants and undergraduate student research mentors so they in-turn enhance the undergraduate experience which serves as part of another goal of the strategic plan to “modernize the student experience”. Using graduate students as mentors makes the ACS (American Chemical Society) accreditation for the BS degree possible.
- While the Department does not currently have a sufficient number of FTEs to support a nationally competitive PhD program in Chemistry, they have been able to offset this by offering two targeted degrees (Biochemistry & Neuroscience and Environmental Chemistry). This enables the Department to attain national recognition, particularly in Arctic-focused research. Having both areas of graduate students allows the Department to cover TA needs, whereas either program alone would not be able to fulfill the needed TA expertise. Per the Dean of CNSM, they have the highest student to faculty ratio within the College of Natural Science and Mathematics.
- On average the Department produces 3.4 PhD and 2.6 MS graduates per year. These students are in high demand, specifically in Alaska, employees appreciate that these students graduate with good, practical skills.
- ACS (American Chemical Society) accreditation: The graduate program contributes to the requirements to maintain accreditation (this is only accredited Chemistry degree program in Alaska) for the undergraduate program. This accreditation further assists in the Engineering ABET accreditation.

- The Department faculty are leaders in their fields and contributed to the opening of the UAF Center for Innovation, Commercialization, and Entrepreneurship (Center ICE) and have successfully launched startup companies and obtained patents.
- In addition to all of the other benefits already mentioned of the graduate programs, all of the faculty for these programs also teach for the undergraduate program and they also offer two 1-credit professional development courses. Overall the graduate programs constitute 18% of the Department's teaching and the graduate tuition generated exceeds the cost of teaching these grad courses.
- Public Service: Service on the Air Quality Stakeholders Group – working on solutions to our wintertime air quality problems, leadership of the NSF "Navigating the New Arctic" pollution research program.

WEAKNESSES:

- Loss of faculty prevents the Department from taking on more graduate students and makes it difficult to offer all topics needed. Recent losses have disrupted undergraduate offerings requiring faculty to be spread thinner into topics that are not in their usual areas of strength. If lost faculty are not replaced, teaching capacity will be reduced which will affect the opportunity to teach graduate and STEM- necessary undergrad courses.
- The total number of TA positions was cut in half in fall 2020. This diminishes the number of graduate students the Department can support. This reduction causes upper division lab courses to have no TA support. This shifts tasks that could be done by a TA to more expensive faculty members so increases costs.
- There is no funding for upkeep of instruments causing downtime and less utilization. Their facilities in the Advanced Instrumentation Lab (AIL) are breaking and need tech support. This has caused the recent departure of one faculty member and impairs the ability to recruit new faculty.

OPPORTUNITIES:

- 5 year BS/MS programs: The Department has been working on a "fast track" BS/MS program.
- Enhanced UA Collaboration: The Department could do more to work with complementary graduate programs.
- Funding opportunities unique to Arctic environmental research are increasing and NSF (National Science foundation) , NASA (National Aeronautics and Space Administration), and NOAA (National Oceanic and Atmospheric Administration) are seeking to fund research in Alaska.

THREATS:

- Losing faculty due to lack of funding threatens the programs. Current faculty numbers are insufficient to meet the demands of undergraduate and graduate teaching needs without compromising quality of both teaching and research. This

decreases the ability to compete for research funding to support graduate students. Cuts in TA's available and failing lab equipment make it difficult to recruit new grad students.

- Departing faculty have taken their research expertise with them, this reduces the amount of Arctic research funding coming to UAF.
- Both Biochemistry & Neuroscience and Environmental Chemistry graduate programs are essential to maintaining the ACS-accredited undergrad degree in chemistry, which is the only one in the state. These graduates serve many state workforce needs. If departed faculty are not replaced, the graduate and undergraduate degree programs will not be sustainable.

CENTRALITY TO MISSION:

Chemistry is a required topic for any research in the areas of Land, Sea, and Space science. Much of the research that goes on specifically within the Department focuses on Northern issues, contributing to the Universities mission to emphasize the circumpolar North. The Chemistry Department also provides public service crucial to helping deal with issues of living in cold environments such as the air quality problems. The Chemistry Department and specifically the graduate programs under review here touch on every single one of UAF's core themes.

INDICATORS OF QUALITY:

The number of students served both within (majors) and outside (other science related majors) is considerable, the satisfaction of employers of graduates from the programs, and the success of the students post-graduation are all indicators of the success of these programs. The faculty are leaders in their fields of research.

COST-EFFECTIVENESS:

SCH

Metric	Detail	FY16	FY17	FY18	FY19	FY20
SCH	CHEM - Lower	3916	3685	3202	2827	2477
SCH	CHEM - Upper	907	1081	1219	1145	810
SCH	CHEM - Grad	603	535	534	569	458
SCH	CHEM - External	735	595	651	670	558

Majors

Metric	Detail	FY16	FY17	FY18	FY19	FY20
Majors	BA Chemistry	10	9	12	5	3
Majors	BI Premajor - Chemistry	4	3	1	1	0
Majors	BS Chemistry	75	63	68	53	58

Majors	MS Chemistry	13	12	15	15	10
Majors	PHD Biochemistry & Neuroscience	13	17	16	14	15
Majors	PHD Environmental Chemistry	12	12	8	10	9

Degrees

Metric	Detail	FY16	FY17	FY18	FY19	FY20
Degrees	BA Chemistry	0	0	0	1	1
Degrees	BS Chemistry	10	6	12	7	6
Degrees	MS Chemistry	4	2	2	4	1
Degrees	PHD Biochemistry & Neuroscience	1	1	5	1	3
Degrees	PHD Environmental Chemistry	1	2	0	1	2

FTEs

Metric	Detail	FY16	FY17	FY18	FY19	FY20
FTEs	Adjunct FTEs	0.3	0.4	0.4	0.7	0.9
FTEs	Faculty FTEs	6.7	6.2	7.2	7.1	7.4
FTEs	Staff FTEs	2.4	2.5	2.5	2.5	2.2
FTEs	Student FTEs	7	5.9	6	6.1	4.7

Expenditures

Metric	Program	Detail	FY20
Instructional Expenditures	CNSM Chemistry & Biochemistry	Restricted	3258.7
Instructional Expenditures	CNSM Chemistry & Biochemistry	Unrestricted	1797892.7
Research Expenditures	CNSM CDR Chemistry & Biochemistry	Designated	1563.7
Research Expenditures	CNSM CDR Chemistry & Biochemistry	Restricted	447073.9
Salaries and Benefits	CNSM Chemistry & Biochemistry	Restricted	418.2
Salaries and Benefits	CNSM Chemistry & Biochemistry	Unrestricted	1717585.2

Per the committee's interview with the department, the expenditures given from PAIR were only the CNSM part from the department so it doesn't show all of the funding from other sources including joint appointments.

One concern is that the lack of funding to maintain and replace equipment has already cost the loss of one faculty member; this lack of funding is potentially damaging to all of the chemistry programs. Our committee recommends looking for funding to maintain and replace lab equipment. Voting results are summarized in the following tables for each degree under review.

Chemistry MS

RECOMMENDATION:	ADDITIONAL COMMENTS:	DATE FOR FOLLOW-UP:
Continuation: 4 votes		
Continuation w/ improvement plan: 3 votes		
Abstain: 1 vote		

Biochemistry and Neuroscience PhD

RECOMMENDATION:	ADDITIONAL COMMENTS:	DATE FOR FOLLOW-UP:
Continuation: 6 votes		
Continuation w/ improvement plan: 2 votes		

Environmental Chemistry PhD

RECOMMENDATION:	ADDITIONAL COMMENTS:	DATE FOR FOLLOW-UP:
Continuation: 3 votes		
Continuation w/ improvement plan: 5 votes	Develop a plan to decrease time to graduation.	Report in 2 years.