

# University of Regina

*CHEMISTRY & BIOCHEMISTRY*

*ACADEMIC UNIT REVIEW SELF STUDY REPORT*

*2017 - 2018*

## Contents

Section		Page
1.	Background	1
2.	Staffing and Resources	3
3.	Scholarly Output	8
4.	Community Service Initiatives	12
5.	Programs Offered	13
6.	Unit Budget	18
7.	SWOT Analysis	20
Appendix I	Short CVs of Faculty Members and Laboratory Instructors	25
Appendix II	Statistics on Department of Chemistry & Biochemistry	70
Appendix III	Department Program Information	78
Appendix IV	Faculty of Science STATS for Summer Regina and Off-campus Courses (La Ronge, Swift Current, Yorkton) 201220-Present	85

## 1.0 BACKGROUND

The unit started as a Department of Chemistry in 1965 and continued as a department of Chemistry when the university became an independent institute in 1974. The department has had a focus on teaching and research in areas of chemistry and biochemistry. The last departmental review for the Department of Chemistry was completed in 1997, covering both programs in chemistry and biochemistry. In 2000 the department name was changed to the Department of Chemistry & Biochemistry and in 2009 a major curriculum review at a workshop session was conducted which resulted in updating of our programs, changes in course codes and elimination of some course offerings. The Department of Chemistry & Biochemistry has a curriculum review committee which consists of chemistry and biochemistry faculty and laboratory instructors that makes recommendations for department approval of required changes or updates in our program on a timely and continual basis. Some additional course code changes were made in 2015 to better accommodate the biochemistry program along with elimination of some inactive courses or course codes in more recent years.

The Department offers programs leading to M Sc and Ph D degrees in the following research areas: analytical/environmental chemistry, biophysics of biological interfaces, enzymology/chemical biology, inorganic/organometallic chemistry, proteomics and bioinformatics, supramolecular organic photochemistry and photophysics, synthetic organic chemistry, and theoretical/computational chemistry. Historically the department recommended no centralized specialized area of research and hired new faculty members to meet the needs of both teaching and research in different discipline areas of chemistry & biochemistry, and this approach has continued for the past 10 years. As of the winter 2018, the department of Chemistry & Biochemistry consists of 7 chemistry faculty members, 4 biochemistry faculty members, 4 laboratory instructors (with one additional term laboratory instructor), one technician, and one administrative assistant. There are currently 9 M Sc and 8 Ph D graduate students, 8 post-doctoral fellows/research associates, 1 visiting scholar and 6 adjunct faculty members who are involved in research within the department.

The undergraduate laboratories and laboratory instructor offices are primarily located in the Laboratory building (LB) while faculty offices and research laboratories are distributed between the LB and the Research & Innovation Centre (RIC), with most faculty members relocating to new research lab spaces in RIC in late 2009. LB, including spaces in the Chemistry & Biochemistry department, is currently undergoing renovations including updating of undergraduate laboratories and research spaces (particularly fumehoods and sprinklers), which took place over the summer 2017 period. Specialized laboratory spaces for the 300 MHz spectrometer and a department research instrument room are also located in RIC. The 500 MHz liquid chromatography-nuclear magnetic resonance spectrometer (LC-NMR, housed in Greenhouse Gas Technology Centre (GGTC)) was purchased in 2002 and was funded by a CFI grant with the Faculty of Engineering and Applied Science and Faculty of Science (co-PI Wee). Our departmental technician (Jamieson) is the NMR manager and is responsible for its operation and maintenance. Costs for operation of the 500 MHz NMR spectrometer are shared between the Faculty of Science and the Faculty of Engineering and Applied Science. The department with the Dean of the Faculty of Science is developing a long-term strategy for the eventual need to replace the 300 MHz NMR spectrometer (~16 years old) in a projected 3-5 year time period.

Chemistry and Biochemistry courses are offered primarily by the Faculty of Science at the University of Regina, however there are several off-campus offerings of CHEM100, CHEM104, or CHEM140 at the First Nations University of Canada (FNUC) or off-campus locations in conjunction with the Centre for Continuing Education (Swift Current, La Ronge, Prince Albert, and Yorkton) pending sufficient enrolments. Laboratories for CHEM104 and CHEM140 are also offered at these locations in conjunction with course offerings. The Department of Chemistry & Biochemistry provides advice and guidance for sessional instructors for these off-campus offerings as required. BIOC200 (a web based open elective course, Medicinal Plants and Culture) is taught and offered jointly with the Department of Chemistry & Biochemistry and FNUC. A new chemistry course, CHEM101, Chemistry of Cooking (an open elective with lab) is expected to be offered through First Nations University of Canada in the fall of 2018. A new research experience class (CHEM/BIOC391) was approved in 2013-10 with the first student in 2013-30 (science or open elective) and this course is also available to be offered at First Nations University with departmental approval.

Our department is adaptive. We have seen changes in personnel, renovations, and relocation of research laboratories, and handled significant increases in enrolment in our programs. There was one new biochemistry hire which replaced another faculty member who resigned, and one additional biochemistry faculty member who was the prior VP Research. Listed retired adjunct faculty members from our department did not teach in the past 10 years, while 2 laboratory instructors retired and one resigned in the past 10 years. Our administrative assistant also retired and was replaced. In addition we had a number of replacements of our departmental technician. These changes in personnel were due to retirements, leaves, or resignations. In addition, the department added a new term laboratory instructor in 2016-2017 to accommodate enrolment increases, and added a lecturer position in our department (starting in 2009). The department has successfully completed these searches in a timely manner with active departmental participation. Our department remains collegial with numerous faculty research collaborations as well as the development of collaborations with members of other departments, faculties within the university, and other researchers throughout North America and Europe.

The department has also managed significant increases in enrolment particularly since 2015, initially due to enrolment increases in the Faculty of Engineering & Applied Science, but more recently also due to pressures of increased enrolment from within the Faculty of Science and from students declared in pre-professional programs. Experimental learning continues to be a key component of our programs at all levels including the addition of a new research experience class for undergraduate students (21 students since 2013-30) and continuation of our honours program (40 students since 2008-10) which has a two semester thesis/research project.

## 2. STAFFING AND RESOURCES

### 2.1. Staffing - faculty, instructors, lab instructors, technicians, and support staff

Name	Position and Rank	Notes
<b>Babu, Mohan</b>	Associate Professor, Biochemistry	CIHR New Investigators Award
<b>Cai, Jianxin</b>	Laboratory Instructor I	Term position
<b>Chan, Andrew</b>	Laboratory Instructor II	Term 2016-2017, tenure-track July 2017
<b>Cheng, Stephen</b>	Lecturer, Chemistry	
<b>Dahms, Tanya</b>	Professor, Biochemistry	
<b>Dibble, Teri</b>	Administrative Assistant	Retired Nov 2014
<b>Draper, Donna</b>	Laboratory Instructor III	Retired Jun 2011
<b>East, Allan</b>	Professor, Chemistry	
<b>Fitzpatrick, Dennis</b>	Professor, Biochemistry	Former VP Research
<b>Friebel, Marg</b>	Administrative Assistant	Nov 2014-present
<b>Freywald, Andrew</b>	Assistant Professor, Biochemistry	Resigned April 2011
<b>Jamieson, Rebecca</b>	Technician	
<b>Lukoyanova, Olena</b>	Laboratory Instructor II	Leave 2016-2017, Resigned Mar. 2017
<b>Mihichuk, Lynn</b>	Associate Professor, Chemistry	
<b>Murphy, R. Scott</b>	Professor, Chemistry	
<b>Ng, Danny</b>	Laboratory Instructor III	Retired Dec 2014
<b>Raina-Fulton, Renata</b>	Professor, Chemistry	Dept. Head
<b>Smith, Erika</b>	Laboratory Instructor II	
<b>Sterenber, Brian</b>	Associate Professor, Chemistry	
<b>Suh, Dae-Yeon</b>	Professor, Biochemistry	
<b>Tymchak, Mark</b>	Laboratory Instructor III	
<b>Wang, Chuanzhong</b>	Technician	Hired 2007, Resigned Dec 2014
<b>Wee, Andrew</b>	Professor, Chemistry	
<b>Yee, Henry</b>	Laboratory Instructor III	
<b>Yu, Joy</b>	Technician	Term-2015
<b>Adjunct Faculty Members</b>		
<b>Ashton, Neil</b>	Adjunct Faculty	Retired from Dept. of Biology
<b>Belyk, Murray</b>	Adjunct Faculty	Retired from Bayer Crop Science
<b>Hudson, John</b>	Adjunct Faculty-retired	Retired from RCMP lab and Sciex
<b>Johnson, Keith</b>	Adjunct Faculty	Retired from Dept. of Chemistry & Biochemistry
<b>Kelln, Rod</b>	Adjunct Faculty	Prior Dean Graduate Studies and Research, Retired from Dept. Chemistry & Biochemistry
<b>Lee, Don</b>	Adjunct Faculty	Retired from Dept. Chemistry & Biochemistry
<b>Thirunavukkarasu, Ondiveerpan</b>	Adjunct Faculty	Senior Standards Engineer, Environmental & Municipal Management Services Division, Water Security Agency (Regina, SK)
<b>Chandler, David</b>	Emeritus Faculty	Retired from Dept. Chemistry & Biochemistry

## 2.2. Resources

### 2.2.1. Teaching Space

Room	Capacity	Function
<b>LB320 (shared lab space with biology – chemistry &amp; biochemistry has fall semester)</b>	40	organic chemistry, and other labs such as inorganic chemistry when available. –Fumehood capacity in LB313 is also required.
<b>LB313</b>	Under renovations	CHEM330, CHEM340, CHEM411
<b>LB312</b>	24	BIOC undergraduate laboratories and walk-in cold room/ some inorganic labs for CHEM230
<b>LB309</b>	40	Organic Chemistry Laboratories and CHEM330
<b>LB310/LB307</b>	Shared with other labs	Instrument Rooms shared use for all laboratories (see 2.2.3)
<b>LB308/LB306</b>	16	Physical Chemistry/Analytical Chemistry & Inorganic Laboratories, CHEM250, 251, 210, 312, 230
<b>LB321</b>	48	General Chemistry Laboratories CHEM104/105
<b>LB326</b>		Computer Facilities for undergraduate laboratories
<b>LB327</b>		Chemical Storage

### 2.2.2. Research Space

Room	Function	Principal Investigators	Funding agency
<b>RIC231/232/232.1</b>	Research Spaces/Level 2 Lab	Babu, Mohan	
<b>RIC236</b>	Research Space flow Cytometry	Babu, Mohan	
<b>RIC541</b>	Research Space-Proteomics and Genomics Core Facility	Babu, Mohan	
<b>RIC233(East)/235</b>	Research Space/ Level 2 Lab	Dahms, Tanya	
<b>RIC016/RIC535</b>	Research Space –Explorer AFM	Dahms, Tanya	<i>CFI</i>
<b>RIC308.2</b>	Research Space	East, Allan	
<b>RIC337(West)</b>	Research Space	Mihichuk, Lynn	
<b>RIC337 (East)/340</b>	Research Space/Dark Lab	Murphy, R. Scott	
<b>LB145</b>	Research Space Laser Lab	Murphy, R. Scott	
<b>LB314</b>	Trace Analysis Facility-class 100 cleanroom laboratory	Raina-Fulton, Renata	<i>CFI, NSERC</i>
<b>LB322/LB315</b>	Research space/student space/supply storage	Raina-Fulton, Renata; Adjunct Faculty member: Belyk, Murray	
<b>LB261/258</b>	Research space –Cleanroom class 1000/balance room	Raina-Fulton, Raina	
<b>RIC337 (Central)</b>	Research Space	Sterenberg, Brian	
<b>LB418/421/422/422.1/426.5</b>	Research space -Moss research facilities	Suh, Dae-Yeon; Adjunct Faculty Member: Ashton, Neil	
<b>RIC233(West)/237</b>	Research Space	Suh, Dae-Yeon	

<b>RIC335</b>	Research Space	Wee, Andrew	
<b>RIC338</b>	Dept. Shared Instrument Room Space	Jamieson, Rebecca	
<b>RIC339</b>	300 MHz NMR Room	Jamieson, Rebecca	
<b>RIC240</b>	Autoclave Room	Science	
<b>RIC239.1</b>	Cold Room (Dept. Research Use)	Science	

### 2.2.3. Specialized teaching equipment and instrumentation

Equipment/Instrumentation	Model # (Company)	Location	Notes (courses utilized –CHEM unless noted)
<b>Gas Chromatograph (Quad EI-MSD, autosampler, FID, and NPD)</b>	7820A and 5977 (Agilent)	307	215, 312, 330, 340, 441
<b>Total Organic Carbon analyzer with NDIR</b>	Vario TOC select (Elementar)	307	future 210
<b>Fluorescence Spectrometer</b>	Perkin-Elmer 203	308	251
<b>Refractometer</b>	ABBE (Optic ivymen)	308	250
<b>Refractometer</b>	Reichert Mark III (Ametek)	308	250
<b>Magnetic Susceptibility Balance</b>	Sherwood Scientific	309	330
<b>Refractometer x2</b>	ABBE (Optic ivymen)	309	140, 340, 441
<b>Rotary evaporators x4</b>	Rotavapor-R110 (Buchi)	309	all organic
<b>Atomic Absorption Spectrometer (Flame)</b>	SpectrAA 20 (Varian)	310	312
<b>Atomic Absorption Spectrometer (Graphite Furnace, autosampler, Zeeman)</b>	SpectrAA 220Z (Varian)	310	312
<b>Capillary Electrophoresis with DAD</b>	PA 800 (Beckman Coulter)	310	312
<b>Capillary Electrophoresis with UVD</b>	PACE MDQ (Beckman Coulter)	310	312
<b>Diode Array UV-vis spectrophotometer</b>	HP 8452A	310	215, 241, 312, 330, 340, 441
<b>Diode Array UV-vis spectrophotometer</b>	HP 8452A	310	215, 241, 312, 330, 340, 441
<b>Diode Array UV-vis spectrophotometer with temperature control</b>	Cary 8454 (Agilent)	310	215, 241, 330, 340, 441
<b>FTIR spectrophotometer with ATR cell</b>	Nicolet iS5 (ThermoScientific)	310	all organic chemist, 215
<b>Gas Chromatograph with FID</b>	HP 5890	310	312
<b>HPLC with DAD</b>	Waters 590, Agilent G1314A	310	312
<b>HPLC with Quad pump, autosampler, DAD, and FLD</b>	1200 Series (Agilent)	310	312
<b>Autoclave</b>	Sterilmatic (Market Forge)	312	all biochem
<b>Capillary Electrophoresis with DAD</b>	ProteomeLab PA 800 (Beckman)	312	BIOC 221
<b>Centrifuge, refrigerated and superspeed</b>	Sorvall RC-5B (Du Pont Instruments)	312	all biochem
<b>DNA electrophoresis apparatus</b>		312	BIOC 220, BIOC 321
<b>Gel Imager</b>	Gel Doc EZ (Bio-Rad)	312	all biochem
<b>Incubator Shaker</b>	New Brunswick Scientific	312	BIOC 321
<b>Laser Induced Blast Spectroscopy (LIBS) system</b>	Spectrolaser (XRF Scientific)	312	230
<b>Microplate Spectrophotometer</b>	xMark (Bio-Rad)	312	BIOC 221, BIOC 321
<b>PCR x2</b>	Gene Cyclor (Bio-Rad)	312	BIOC 321
<b>Polyacrylamide gel electrophoresis</b>		312	BIOC 321

<b>apparatus</b>			
<b>Water purifier</b>	AG-3 Corning	312	all biochem, 312
<b>pH meters (many)</b>	various	306, 312, 321	all biochem, 105, 210
<b>UV-vis (and just vis) spectrophotometers (many)</b>	Various	306, 312, 321	all biochem, all first year, 210, 250, 251
<b>500 MHz NMR spectrometer (three channels, broadband, PFG, VT, indirect probe)</b>	Inova 500 (Oxford, Varian)	GGTC 112.1	all organic, 215
<b>300 MHz NMR spectrometer (broadband, XHF, PFG, variable temp)</b>	Mercury 300 (Oxford, Varian)	RI 339	all organic, 215

#### 2.2.4. Research equipment and instrumentation

Equipment/Instrumentation	Location	Funding agency	Notes
LC-MS/MS, GC-NCI-MS, GC-NCI/EI-MS/MS	LB314	CFI, NSERC RTI	Trace Analysis Facility, Raina-Fulton
µLC-Orbitrap Elite/new TSQ LC-MS/MS to be installed	RIC514	University of Regina/CIHR	Babu
BioMatrix pinning robotics and Tecan Growth Curve Machine	RIC541	CFI LOF 2013	Babu
Cell Culture Imaging/Cell Counter	RIC232.1	UofR	Babu
Ultracentrifuge	RIC231	Science for repair	Babu
-80 Freezers (3)	RIC 2 <sup>nd</sup> floor hallway/ RIC541	UofR and RQHR	Babu
Refrigerated shaker/incubator (Eppendorf Excella E42R) Refrigerated centrifuge (Eppendorf 5810R)	RIC233	NSERC RTI	Dahms/Suh
AFM Confocal and epifluorescence microscopes	RIC535	CFI LOF 2011 CFI LEF 2008	Dahms Dahms (co-PI), Leavitt PI Biology
Microplate reader	RIC333	NSERC RTI 2015	Dahms co-PI, Cameron PI Biology
Dextrose and Entropy Supercomputers	Data Centre AdHum106	CFI Leading EdgeFund/IRF Sask 2009	East PI
Cary 100 UV-vis Absorption Spectrometer	RIC340	NSERC RTI 2008	Murphy
FTIR	RIC338	Department	Excalibur FTS 3000 (Digilab)
UV-vis (DAD, flow cell, kinetics program)	RIC338	Department	DU 800 (Beckman Coulter)
Liquid Chromatograph (UVD)	RIC338	Department	LC Module 1 plus (Waters)
Gas Chromatograph (FID)	RIC338	Department	CP-3380 (Varian)
Polarimeter	RIC335	NSERC RTI	Wee
500 MHz NMR spectrometer*	GGTC 112.1	CFI, current operation Faculty of Engineering and Applied Science & Faculty of Science	NMR Manager: Jamieson
300 MHz NMR spectrometer*	RIC339	Department	NMR Manager: Jamieson

\*NMR spectrometers used for both teaching and research purposes

### 2.2.5. Research institutes, clusters, or specialized labs

#### *Cellular Impacts Facility, RIC 535 and PI Dr. Dahms AFM Facility*

The Nanowizard AFM (CFI LOF 2012) is housed in the [Cellular Impacts facility](#) of Institute of Environmental Change & Society and is semi-permanently mounted on a Zeiss Axio observer A1 inverted research microscope with differential interference contrast. The Nanowizard AFM (PI Dr. Dahms) can be mounted on two other microscopes housed in the same room: a Zeiss Axio observer Z1 automated inverted fluorescence research microscope and a Zeiss confocal laser scanning microscope (LSM 780) with 34 GaAsP detector channels, seven excitation lasers spanning the UV and visible range, and a Ti:Sapph laser for two-photon excitation for deep tissue imaging and fluorescence (cross) correlation spectroscopy (FCS/FCCS). Dr. Tanya Dahms, also has an additional AFM, the Explorer AFM (CFI 2000), housed in RIC (016) for optimizing AFM sample preparation and for generation of high quality images for publication.

#### *Data Centre: Dextrose and Entropy Supercomputers, PI Dr. East*

(<https://www.uregina.ca/external/communications/feature-stories/current/2016/03-31.html>)

The CFI 2008 Leading Edge Fund competition (awarded June 2009, with Govt Sask matching funds awarded January 2010) provided the department (since July 2010) with: Dextrose, a 408-processor VXPPO R2834-TB cluster supercomputer with 2 TITAN R1220-TB graphics nodes, and 816 Gb of distributed memory, and Entropy, a 72-processor FUSION shared-memory supercomputer, with 144 Gb of shared memory. Dextrose appeals to the computational chemists for massively parallel computing, while Entropy appeals to the computer scientists and mathematicians for large-memory computing. The software available on these machines includes Gaussian09, MATLAB, and GAP, and software compilers for Java, Fortran, C/C++, and the Intel Cluster Studio.

*NMR Lab Facilities* –NMR instrumentation is essential to the support of both teaching and research endeavours in our department. The 300 MHz NMR spectrometer (RIC339) is operated by the department (utilizing department funds with support for repairs through Science) and the 500 MHz NMR spectrometer (GGTC112.1) is jointly funded by the Faculty of Engineering & Applied Science and Faculty of Science. Both the 300 and 500 MHz were purchased in 2002.

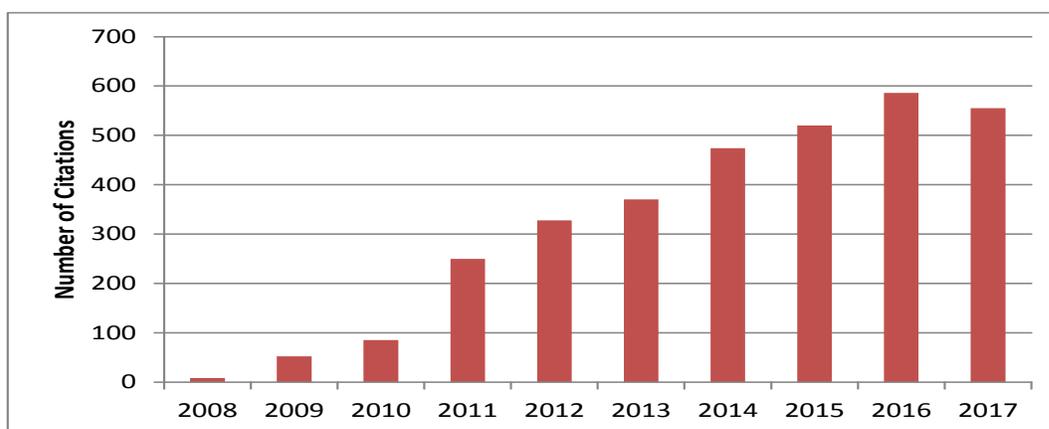
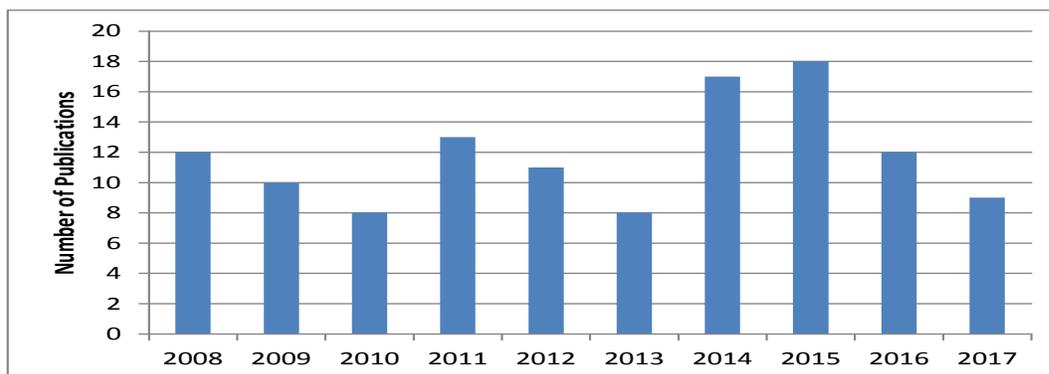
*Proteomics and Genomics Core Facility* (<http://uregina.ca/~babu200m/pgcf/>), RIC541 (PI: Dr. Babu) -Analyses in the facility is focus on large-scale proteomics and genetics screens, tag or antibody-based affinity purifications, protein identification with high mass accuracy, post-translational modifications, proteomic profiling, targeted quantitative proteomics, and characterizing full length proteins. (Thermofisher Scientific  $\mu$ LC-Orbitrap Elite (high-resolution MS) and a TSQ LC-MS/MS that is expected to be installed shortly). The facility also performs bioinformatics analyses.

*Trace Analysis Facility* (<https://www.uregina.ca/science/chem-biochem/facilities/TAF1/Index.html>), LB314 (PI: Dr. Raina-Fulton) CFI funded in 2001 and also houses Dr. Raina-Fulton's (CFI and NSERC RTI instrumentation). This is a class 100 cleanroom with a Waters Quattro Premier LC-MS/MS (low mass resolution), Waters Quattro Micro GC-EI/NCI-MS/MS, and a Agilent GC-EI/NCI-MS system along with the sample preparation requirements for environmental samples with the focus on trace analysis (very low sample concentrations) of organic contaminants. In addition the facility has a Varian (first generation) ICP-MS. LB261 is also a class 1000 cleanroom for sample loading/unloading and gravimetric analyses.

### 3. SCHOLARLY OUTPUT

#### 3.1.1. Summary

A web science search was conducted and included research active faculty members in the rank of associate professor or professor (Babu, Dahms, East, Mihichuk, Murphy, Raina-Fulton (Raina), Sterenberg, Suh, and Wee) for citations from journal publications included in the web science search engine database during the period of 2008-2017. There were 118 publications with a total of 3228 citations with 29 publications having 20 or more citations per article and 43 publications having more than 10 citations per article, and the average citations was 27.23 per article (H-index 26). The number of citations during 2015-2017 ranged from 520-586 citations/yr excluding any publications published prior to 2008. Not all departmental publications were included with this search engine as there were a total of 180 journal publications (all members) during 2008-2017 with more than an additional 650 citations and 10 additional papers having >20 citations each (based on google scholar citations). The top ranked cited publication (Babu) had 865 citations and Babu also received the CIHR New Investigator award (2013-2018). Publications in the department covered a wide range of chemistry and biochemistry disciplines including publications in Science and Nature (see CVs). Research is also conducted within the research themes of the university (Energy and the Environment; Health; and Informatics). A number of books or book chapters were also published with top ranked book chapter receiving over 22000 downloads mostly from countries outside of Canada.



3.1.2. Statistical summary of published and accepted scholarly work over the last ten years (2007-present: see Appendix I-CVs for more detail)

	Number	Notes
Refereed journal articles	180	9 papers have department co-authors
Refereed conference proceedings	187	Based on annual review information
Technical reports	5	Not listed in short CVs –counted those from contracts
Book chapters	17	See Babu, Dahms, Raina-Fulton CVs
Books	2	See Dahms and Murphy CVs
Professional creative activity (specify):		
Performance of Original Dance Works, Various Events, New Dance Horizons	10	See Dahms CV (2000 – present)
Other scholarly output (specify):		
GenBank sequence depositions	3	See Suh CV
Patent	3	See Babu, Sterenberg, Wee CVs

3.1.2. Grants and Contracts (2008-2017)

Principal Investigator(s)	Funding Agency	Total Amount (% Assigned To Unit)	Dates
<b>Babu, Mohan</b>	CIHR Foundation Grant	\$1977535	2017/7-2022/6
<b>Babu, Mohan</b>	CIHR Project Grant	\$1123815	2016/10-2021/9
<b>Babu, Mohan (co-PI)</b>	NIH-R01	\$3059640 (Share \$101714)	2015/6-2019/5
<b>Babu, Mohan</b>	CIHR New Investigator	\$300000	2013/10-2019/9
<b>Babu, Mohan</b>	NSERC Discovery	\$155000	2012/4-2018/3
<b>Babu, Mohan</b>	CIHR Operating Grant	\$785135	2013/4-2018/3
<b>Babu, Mohan</b>	SHRF Spinal Cord Injury Research Grant	\$69000	2015/12-2018/1
<b>Babu, Mohan (co-PI)</b>	CCSRI	\$200000	2016/2-2018/1
<b>Babu, Mohan (co-PI)</b>	NIH-R01	\$973254 (Share \$384157)	2013/11-2018/5
<b>Babu, Mohan</b>	ARACS project funding	\$169000	2015/6-2016/5; 2017/10-2018/9
<b>Babu, Mohan</b>	Parkinson-society of Canada-Pilot Project	\$45,000	2014/10-2015/9
<b>Babu, Mohan</b>	SK-CIHR Regional Partnership Program Grant	\$312116	2013/10-2015/9
<b>Babu, Mohan</b>	SHRF Establishment Grant	\$120000	2012/7-2015/7
<b>Babu, Mohan</b>	SHRF-Phase 1 Group Grant	\$40000	2014/1-2014/12
<b>Babu, Mohan</b>	IG Maud Menten New PI Prize	\$1000	2013/10-2014/9
<b>Babu, Mohan</b>	NSERC RTI	\$42000	2013/4-2014/3
<b>Babu, Mohan</b>	CFI-Leaders Opportunity Fund	\$305089	2013/6-2014/6

<b>Babu, Mohan</b>	CIHR Regional Partnership Program Grant	\$94958	2012/10-2013/3
<b>Babu, Mohan</b>	UofR, start-up fund	\$150000	2012/7-2013/7
<b>Cheng, Stephen (PI) with one co-PI</b>	TD Friends of the Environment Foundation Grant	\$10000	2016/7-2017/6
<b>Cheng, Stephen (co-PI)</b>	Indigenous Advisory Circle's Indigenization Fund	\$1000	2016/1-2016/12
<b>Chen, Stephen (co-PI)</b>	NSERC PromoScience Grant	\$10200	2015/1-2015/12
<b>Cheng, Stephen (co-PI)</b>	UofR President's Teaching and learning Scholar Grant	\$4000	2011/1-2012/12
<b>Cheng, Stephen (co-PI)</b>	UofR President's Teaching and learning Scholar Grant	\$3775.20	2010/1-2011/12
<b>Dahms, Tanya</b>	NSERC Discovery	\$130000	2012/4-2017/3
<b>Dahms, Tanya</b>	UofR Sustainability and Community Engagement Fund	\$120	2017/1-2017/12
<b>Dahms, Tanya (co-PI)</b>	NSERC RTI	\$49046	2015/4-2016/3
<b>Dahms, Tanya (co-PI)</b>	NSERC RTI	\$21948	2015/4-2016/3
<b>Dahms, Tanya</b>	NSERC Engage	\$25000	2015/6-2016/6
<b>Dahms, Tanya</b>	UofR Partnership Research Grant	\$5000	2015/1-2015/12
<b>Dahms, Tanya</b>	UofR Sustainability and Community Engagement Fund	\$4360	2015/1-2015/12
<b>Dahms, Tanya</b>	UofR President's fund	\$5000	2014/1-2014/12
<b>Dahms, Tanya</b>	UofR Sustainability and Community Engagement Fund	\$5000	2014/1-2014/12
<b>Dahms, Tanya</b>	CFI LOF	\$230400	2011/1-2011/12
<b>Dahms, Tanya</b>	UofR Research Trust fund	\$2000	2010/1-2010/12
<b>Dahms, Tanya</b>	NSERC RTI	\$19195	2008/4-2009/3
<b>Dahms, Tanya (co-PI)</b>	CFI LEF	\$5600000	2008/6-2009/6
<b>East, Allan</b>	NSERC Discovery	\$140000	2017/4-2021/3
<b>East, Allan</b>	NSERC Discovery	\$175000	2012/4-2017/3
<b>East, Allan</b>	NSERC Discovery	\$172000	2006/4-2011/3
<b>East, Allan (PI , other co-PIs)</b>	CFI Leading Edge Fund/ IRF Saskatchewan	\$506647	2009/1-2009/12
<b>Mihichuk, Lynn</b>	UofR Faculty of Science Research Grant	\$110000	2007/1-2011/12
<b>Murphy, R. Scott</b>	Max Planck MPSD Grant	12500 EUR	2017/1-2017/12
<b>Murphy, R. Scott</b>	UofR, Clean Energy Research Grant	\$100000	2017/1-2019/12
<b>Murphy, R. Scott</b>	NSERC Engage Grant	\$25000	2016/1-2017/1
<b>Murphy, R. Scott</b>	UofR Support for NSERC DDG grant	\$7000	2016/4-2018/3

<b>Murphy, R. Scott</b>	NSERC DDG grant	\$20000	2016/4-2018/3
<b>Murphy, R. Scott</b>	UofR President's Research Seed Grant	\$5000	2015/1-2017/1
<b>Murphy, R. Scott</b>	UofR President's Teaching and Learning Scholars Grant	\$8207	2015/1-2017/1
<b>Murphy, R. Scott</b>	Max Planck Institute MPSD Grant	17500 EUR	2014/1-2014/12
<b>Murphy, R. Scott</b>	PTRC STEPS Grant	\$150000	2012/1-2013/12
<b>Murphy, R. Scott</b>	ERIN Consulting Ltd. Contract	\$11720	2012/1-2013/12
<b>Murphy, R. Scott</b>	Max Planck Institute MPSD Contract	\$11500	2011/1-2012/12
<b>Murphy, R. Scott</b>	VP Research Scholarly Research Award	\$5000	2011/1-2011/12
<b>Murphy, R. Scott</b>	NSERC RTI Grant	\$18657	2008/4-2009/3
<b>Murphy, R. Scott</b>	NSERC Discovery Grant	\$81000	2007/4-2010/3
<b>Raina-Fulton, Renata</b>	NSERC DDG	\$20000	2017/4-2019/3
<b>Raina-Fulton, Renata</b>	UofRVP Research Support for NSERC DDG	\$4000	2017/4-2019/3
<b>Raina-Fulton, Renata</b>	UofR Faculty of Science Support for NSERC DDG	\$10000	2017/4-2019/3
<b>Raina-Fulton, Renata</b>	NSERC Discovery	\$168000	2011/4-2017/3
<b>Raina-Fulton, Renata</b>	Water Security Agency (SK)	\$26000	2014/6-2017/5
<b>Raina-Fulton, Renata</b>	Regina General Hospital Contract	\$1600	2016/3
<b>Raina-Fulton, Renata</b>	SK Environment, Ministry Grant	\$20000	2014/1-2015/12
<b>Raina-Fulton, Renata</b>	Environment Canada contract	\$23800	2011/1-2012/12
<b>Raina-Fulton, Renata</b>	HTC Purenergy contract	\$10000	2010/1-2010/12
<b>Raina-Fulton, Renata</b>	NSERC Discovery Grant	\$37050	2008/4-2010/3
<b>Raina-Fulton, Renata (co-PI Share)</b>	NSERC2008 Strategic Ecosystems Grant	\$32000	2008/1-2010/12
<b>Raina-Fulton, Renata</b>	NRC Contract	\$21000	2007/5-2008/1
<b>Sterenberg, Brian (co-PI)</b>	Canadian Hatching Egg Producers	\$33000 (\$9900)	2017/1-2019/1
<b>Sterenberg, Brian</b>	NSERC Discovery Grant	\$100000	2015/4-2020/3
<b>Sterenberg, Brian</b>	NSERC Discovery Grant	\$75000	2007/4-2010/3
<b>Sterenberg, Brian</b>	UofR, Faculty of Science Grant	\$78000	2010/1-2014/1
<b>Sterenberg, Brian</b>	CFI	\$19242	2009/1-2009/12
<b>Suh, Dae-Yeon</b>	NSERC Discovery	\$145000	2013/5-2017/4
<b>Suh, Dae-Yeon</b>	NSERC Discovery	\$140000	2008/5-2013/4
<b>Suh, Dae-Yeon</b>	NSERC Discovery	\$38000	2007/5-2008/4
<b>Wee, Andrew</b>	UofR President's Research Seed Grant	\$3908	2015/7-2017/6
<b>Wee, Andrew</b>	NSERC Discovery	\$140000	2008/4-2013/3
<b>Wee, Andrew</b>	NSERC Discovery	\$108000	2003/4-2008/3
<b>Wee, Andrew</b>	NSERC RTI	\$28787	2008/4-2009/3

#### 4. COMMUNITY SERVICE INITIATIVES

*A variety of initiatives were taken by members of the department with a focus on promoting science to the community in Saskatchewan and beyond –the focus of the activities listed below are at community service to students at the high school and university levels.*

Science Rendezvous, Faculty of Science (Annually)

(for more detail see <https://www.uregina.ca/science/events/rendezvous.html>)

Dr. Cheng was coordinator for Science Rendezvous 2011-2014 and co-organizer 2014-present. A number of our members have participated with demonstrations for this event or volunteered in open houses or student visits (Chan, Cheng, Murphy, Smith, Sterenberg, Tymchuk including the often highlighted Chemistry Magic Show: Smith and Yee)

Assistant to students with experimental projects for science fairs: Chan, Cheng

Regina Science Fair – numerous members of the department act as judges or did demonstrations on an annual basis

Canada-wide Science Fair, 2017- Cheng, East, Sterenberg acted as judges

University of Regina Science Summer Camp Facilitator or Demonstrations/Experiments:

Cheng, Dahms, Smith, Tymchuk, Murphy

Tours and talks for High School students –examples include Dr. Babu’s tours of the Proteomics and Genomics Facility during 2016 to students from O’Neil and Kellihner School; Greenall/Indian Head Schools; and Winston Knoll Collegiate.

Experiments/Demonstrations for High School Students (Smith; Tymchuk):Examples include

Robert Southey School (Dec 2014) Smith & Cheng; Smith conducted experiment for CHEM30/100 Dual Credit high school students experiments in April 2016 with undergraduate assistants for O’Neill high school (20 students); Lumsden High School (20 students); Greenall High School (20 students); Indian Head High School (1 student); Winston Knoll Collegiate (20 students). Prior experiments for high school students by Tymchuk. Note: no demonstration/experiments for high school students were conducted in CHEM/BIOC undergraduate labs in summer 2017 due to renovations. Discussions on updating the CHEM30/100 credit are currently taking place.

Girl Guides chemistry demonstrations (Smith; Tymchuk); Boy Scout Demos (Smith)

South Saskatchewan district high school entries into the nation-wide Canadian Chemistry

Contest on yearly basis (Chan, Yee, East, Murphy). Distribution of tests to over 30 high schools for local proctoring, collecting the answers, forwarding them to the national office for grading, and reporting the results to the high schools involved. \$50 prize donation (East) to the top student in the district.

Miller Highschool multiyear research project: Dahms

Transition from High School to University Committee: Cheng member (2014-2017)

Faculty liason to BIOCHEM/CHEM Student Association (BCSA) (Yee, East) –aid in events and identify opportunities for support such as access to local CIC chapter resources.

CIC and ACPS: Dr. Murphy has been district coordinator for the CIC Canadian Chemistry Contest (2007-2016); Dr. Cheng is chair of CIC South Saskatchewan Local section (2012-present) and Dr. Murphy is Treasurer of the CIC South Saskatchewan Local section (2016-2017) and Director of the Association of Chemical Profession of Saskatchewan (ACPS). Dr. Wee was past secretary of CIC local section.

Lifelong Learning Centre at the Centre for Continuing Education –several presentations such as by Dr. Cheng (2013, 2015, 2016) including Chemistry of Cooking, and the National High Altitude Balloon Experiment: Science for Everyone.

## 5. PROGRAMS OFFERED

### 5.1. Programs

The department currently offers B Sc Major and B Sc Honours programs in Biochemistry and B Sc Major and B Sc Honours Program in Chemistry as well as a Co-Op program option and minors in both Biochemistry and Chemistry. Due to low enrolments (typically 0-3/yr) the combined B Sc in both Chemistry and Biochemistry or Biology and Biochemistry are no longer accepting students with currently enrolled students able to complete their programs. Further information on the undergraduate program is available on the Chemistry & Biochemistry webpage (<https://www.uregina.ca/science/chem-biochem/undergraduate/index.html>). These descriptions include links to degree requirements to our 4 programs (major and honours program in chemistry or biochemistry) and recommended sequence of course for students in a 4 year or 5 year program (see link with pdf file at the top of each of the program requirement page or see Appendix III). Undergraduate program advising is available by appointment with the Science Student Services Office, and also at the Department of Chemistry & Biochemistry.

The department offers research based courses (CHEM/BIOC391, research experience course) and CHEM/BIOC401/402 (honours research/honours thesis, 401 followed by 402 in 2<sup>nd</sup> semester) both requiring a faculty research supervisor. Approval of students to register in CHEM/BIOC 391 and CHEM/BIOC 401/402 is from the department Head. There is a coordinator of CHEM/BIOC401/402 that is responsible for scheduling submission of reports and oral defense. CHEM/BIOC391 has also been approved for delivery through First Nations University although no students have yet to enrol.

Service courses including CHEM100, CHEM104, or CHEM140 are offered through the department and at the First Nations University or off-campus locations in conjunction with the Centre for Continuing Education (Swift Current, La Ronge, Prince Albert, and Yorkton), pending sufficient enrolments (see Appendix IV). Laboratories for CHEM104 and CHEM140 are also offered at these locations in conjunction with course offerings. Other major courses that also service other departments include BIOC220/221 and CHEM105 and are only available from the department. The CHEM100 offering was switched to the fall semester in 2017 to better accommodate incoming students who require completion of CHEM104 during their first year. It is also anticipated that First Nations University will switch to offering CHEM100 only in the winter semester coinciding with the new chemistry course CHEM101 (Chemistry of Cooking, an open elective with lab) that is expected to be offered through First Nations University in the fall of 2018. BIOC200 (a web based open elective course, Medicinal Plants and Culture) is taught and offered jointly with the Department of Chemistry & Biochemistry and the First Nations University of Canada.

Undergraduate admission standards are set by the Faculty of Science for Biochemistry and Chemistry degrees, and by the department for the Co-op program. Admission standards for the graduate programs are set by the Faculty of Graduate Studies & Research. Placement of the students with prospective employers in the Co-op program is conducted by the Co-op office, University of Regina. The department has a co-ordinator for the Co-op program who is responsible for academic admission and for grading reports.

## 5.2. Service teaching in support of other programs

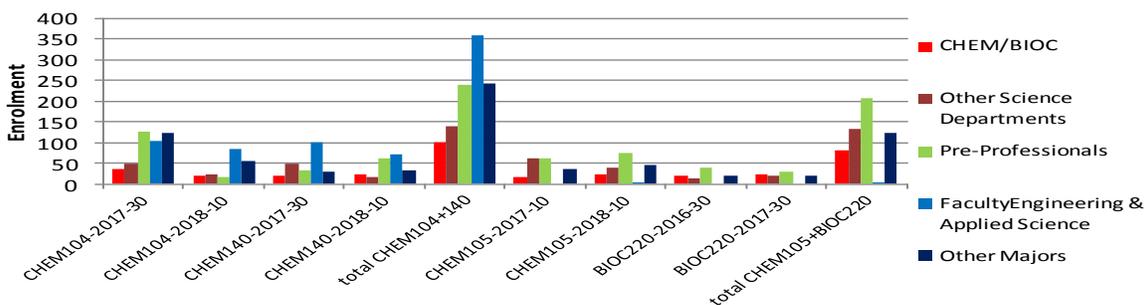
*Service to Faculty of Engineering and Applied Science:* requirements are CHEM104 (generally taken in year 1) and CHEM140 (generally taken in year 2).

*Service to other Faculties (Other Majors:* undeclared, Faculty of Arts, etc.~22% of enrolment) and Pre-professional programs (~22% of CHEM104+140; ~37% of CHEM105 + BIOC220) constitute a major fraction of enrolment. Students from other faculties may also take their laboratory based course requirements in chemistry, although it is anticipated that the major portion of enrolment is for pre-professional programs (declared or undeclared). CHEM104 and CHEM140 are the service courses in largest demand. CHEM105 and BIOC220 are also often taken by students outside the faculty, although these courses provide more service within the Faculty of Science than for Pre-Professional Programs. Students must have 65% in CHEM30 or CHEM100 to register in CHEM104. Prerequisites for BIOC220 include CHEM105 and BIOL100.

*Service requirements within Faculty of Science:* Biology (CHEM104, 105, 140); Geology (CHEM104, 105); Physics (CHEM104). Biochemistry majors and honours as part of degree requirements are required to take CHEM104, 105, 140, 241, 210, 215 or 250, and 241 and may also take BIOC312 (equivalent to CHEM312) as a BIOC3xx option. Chemistry majors and honours are required to take BIOC220.

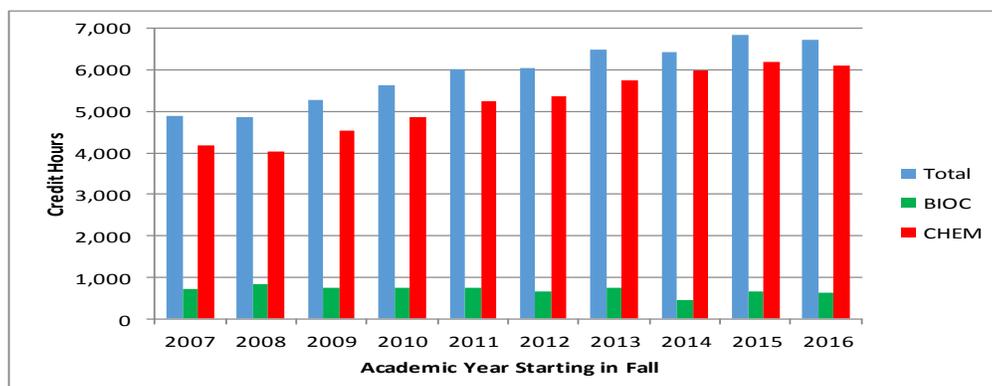
*Service to Pre-Professional programs* (<https://www.uregina.ca/science/programs/prep.html>). Students can take their pre-professional program admission requirements at the University of Regina. Service classes for all of these programs vary and some programs only recommend these requirements. Requirements for various programs include for dentistry (CHEM104, 105; BIOC220, 221); medicine (recommended CHEM104, 105, 140, BIOC220); optometry (CHEM104, 105, 140; BIOC 220,221); pharmacy (CHEM104, 140, 241); and the veterinary program (CHEM104, 105, 140; BIOC220). In general CHEM104 and CHEM140 are required but often BIOC220 and CHEM105 are also taken, and we have seen increasing demand on our 2<sup>nd</sup> year organic chemistry (CHEM241) due to pre-pharmacy requirements.

In the last 5 years we saw a rapid increase in enrolment demands for CHEM104 and we added in CHEM104 into the winter semester starting in 2015 (201510 enrolment 146; 201810 enrolment 201) to accommodate this demand particularly from the Faculty of Engineering & Applied Science. Shown below are the enrolments in the most recent two semesters for each service course. In both CHEM104 and CHEM140 we have made adjustments over the last three years to better balance the demand between the fall and winter semester to match our laboratory capacity. In recent years, the Faculty of Science enrolment has increased at a greater rate than the decline in enrolment observed in the Faculty of Engineering & Applied Science, and consequently the demand for service courses has remained at our maximum capacity (faculty/lab space) largely due to service within the Faculty and for pre-professional programs, along with enrolment from Faculty of Engineering which is still high. We anticipate that there will be further increases in demand in upcoming years for CHEM105 and BIOC220 (from service within the Faculty and for pre-professional programs).



### 5.3. Enrollment trends

The Department of Chemistry & Biochemistry has seen a 38% increase in the number of students in its programs both at the undergraduate and graduate levels since 2010 with 177 students in first majors in chemistry or biochemistry in fall 2017. Enrolments in the combined biochemistry and chemistry major declined from 4 to 1 and the option was removed from availability. There are generally between 2-4 and 1-4 undergraduate students/yr in minor and co-op program options in each of the chemistry and biochemistry programs, respectively. The number of credit hours (based on enrolment) in our undergraduate programs also significantly increased since 2010 from 4893 to 6858 credit hours in the 2015-2016 academic year (see below) and has remained near these levels, which are considered the department's limit of resources (lab space, and faculty and lab instructor complement). This increase in credit hours was largely due to undergraduate chemistry course requirements which include several high enrolment service classes (CHEM104, CHEM140 and CHEM105) for other departments in Science, other Faculties (particularly Engineering and Applied Science), and pre-professional programs. The department has made adjustments since 2015 to better balance teaching and laboratory needs between the fall and winter semesters. The number of convocations at the undergraduate level for 2008-2017 were 90 and 97 from the biochemistry (including combined biochemistry and chemistry major) and chemistry programs, respectively.



#### *Majors in Chemistry (not including minors, combined or co-op options)*

During 2010-2014 the number of majors in chemistry ranged from 50-54, increased to a maximum of 63 in 2015 and was at a similar level in 2017 (62). The number of convocations in the chemistry program since 2008 has ranged from 3 to 18 undergraduates/yr and increasingly students are leaving the program prior to completion for acceptance into pre-professional programs, which leads to a higher variability in convocation rates.

The graduate program enrolment has declined from a maximum of 16 during 2010 and 2011 to current levels of 6-7 per year, which are a function of external funding resources of faculty and sources of funding support for graduate students. Four of the seven chemistry faculty members currently supervise graduate students. There are currently 4 M Sc and 3 Ph D graduate students in the chemistry program. On average 1-5 M Sc and Ph D students graduate per year and this is typical of graduation rates in chemistry prior to 2008.

*Majors in Biochemistry (not including minors, combined, or co-op options).*

The number of majors in biochemistry declined after fall 2011 from 44 to a minimum of 35 (35-38 during 201230-201430) and was influenced by changes in requirements of pre-professional programs. With subsequent changes particularly for medical school (requiring completion of an undergraduate degree) and addition of new biochemistry faculty members (Babu and Fitzpatrick) in our department the enrolments increased again and have now exceeded prior enrolments with 82 majors in fall 2017. The number of convocations yearly in the biochemistry undergraduate program has ranged from 3-12 which is similar to prior years and is more heavily influenced by students entering pre-professional programs than the chemistry program.

The number of students in the graduate program has also increased to 10 in 201530 and 201630 and enrolments have ranged from 6-10 graduate students/yr since 2010. Three of the four faculty biochemistry members supervise graduate students with 5 M Sc (2 M Sc supervised by Raina-Fulton in bio-analytical/environmental projects) and 5 Ph D students currently in our biochemistry programs. On average 1-3 M Sc and Ph D students graduate per year from the program which is similar to years prior to 2008. All 3 research active faculty members have NSERC funding and submitted NSERC Discovery grant proposals in 2017.

(See Appendix II for additional statistics)

Enrolments in summer courses (CHEM100, CHEM104, and CHEM105) delivered on campus through CCE have remained similar over the last several years with CHEM104 and CHEM105 capped relative to laboratory section limitations. Our wait lists have indicated that an additional section is not needed during the summer semester. In summer 2017 CHEM104/105 were still offered, with renovations to this laboratory room delayed until completion of the course. Off campus course enrolments are more variable and although smaller, significant for outreach. (see Appendix IV for enrolments)

Examples of student successes from students graduated from our departmental programs in 2008-2017 are shown below.

University Positions: **P. Hall** (Ph D, 2010) Assistant Professor and Laboratory Director, Emory University, School of Medicine, Dept of Human Genetics, Emory University. 2015 Richard King Trainee Award for best publication in Genetics in Medicine.

**S. Posehn** (M Sc, 2012) Chemical and Laboratory Safety Advisor for Health, Safety and Wellness Unit at the University of Regina.

**R. Rajagopalan** (Ph D, 2014) Lecturer, United Arab Emirates University

**E. Smith** (M Sc, 2011) Laboratory Instructor II, Dept of Chemistry & Biochemistry, UofR

**B. Zhang** (PhD, 2010) Assoc. Professor of Chemistry, at Tianjin University, Tianjin, China.

PDFs: **S. Bhat** (Ph D, 2016) SHRF PDF UofR Biology (A. Cameron); **C. Colpitts** (M Sc, 2009) PDF, University College London awards include NSERC doctoral postgraduate scholarship 2009-2012; Alberta Innovates Health Solutions doctoral studentship 2011-2014; CIHR postdoctoral fellowship 2015-2018; Canadian Network on Hepatitis C postdoctoral fellowship 2016-2018; **A. Jayaraman** (Ph D, 2016) Université Laval (Fred Fontaine (Frédéric-Georges Fontaine)); **C. Lohans** (B Sc, 2009) – PDF, University of Oxford –awards include 2010-2011 - NSERC Alexander Graham Bell Canada Graduate Scholarship – Masters; 2011-2014 - NSERC Alexander Graham Bell Canada Graduate Scholarship – Doctoral; 2015-2017 - CIHR Postdoctoral Fellowship

Graduate and other programs: **P. Bews** (B Sc, 2017) B Sc (Kinesiology) student McGill;

**M. Cummings** (B Sc Hon, 2017) M Sc candidate UofS; **J. Hughes** (B Sc Hon, 2012) PhD

candidate Depart. of Chemistry, McGill University; **J. Moore** (B Sc, 2008) Graduate school SFU; **B. Paul** (M Sc, 2011) PhD candidate UC Davis; Veterinary medicine candidates Uof S:

**F. Boire** (B Sc Hon, 2015) and **E. Smith** (B Sc, 2017); Optometry candidate: **M. Mitschke** (M Sc and Co-Op Ed 2016) President's Medal & Luther College Medal of Distinction Award.

MD candidates Univ. of Saskatchewan: **H. Abou-tok** (B Sc Hon 2017); **A. Beler** (B Sc in wih distinction 2013, MA UBC); **K. Johnson** (B Sc Hon, 2015); **C. Madarati** (B Sc Hon, B A Kinesiology 2010); **C. Ripplinger** (B Sc Hon, 2017). MDs: **T. Bolton** (B Sc, 2008); **T. Nguyen** (B Sc, 2008); **B. Bushell** (B Sc, 2010); **A. McInnes** (B Sc, 2011); **J. Herriot** (BSc Hon, 2012; MD 2016 UofS) Resident physician UofT, Family and Community Medicine.

Professional Positions

**K. Annadi** (Ph D, 2015, PDF UofS) Research scientist at IntelliSyn, Montreal, QC

**S. Bagiana** (B Sc 2017) grants and fundraising chairperson, SEARCH and diet clerk Pasqua Hospital, Regina

**C. Berger** (B Sc, 2009, M Sc University of Alberta) Research scientist at Quantiam Technologies Inc., Edmonton.

**G. Berner** (B Sc, 2009) Quality operations technician, Bayer CropScience Inc., Regina

**A. Clay** (BSc Hon, 2009, M Sc UofG) Research Analyst , SK Health Authority

**B. Cuddington** (B Sc Hon, 2008; PhD McMaster U) Regulatory Affairs Associate at Intellijoint Surgical Inc.

**N. Dunn (Fergus)** (M Sc, 2012) Laboratory technologist, SK Disease Control Laboratory

**M. Etter** (M Sc, 2010) Manager toxicology, endocrinology and newborn screening and ref. testing, SK Disease Control Laboratory, Saskatchewan Disease Control Laboratory

**T. Fell** (B Sc, 2015) Quality control manager at Element Technical Services, Carlyle, SK

**D. Hurrell** (B Sc, Hon 2010) Kohl & Frisch Ltd, Regina, Healthcare Supply Management

**S. Kassir** (M Sc, 2015) Clinical research coordinator, RQHR, Regina

**J. Kehler**, (B Sc, Hon, 2014) Lab technician, K+S Potash Canada, Bethune mine

**G. Lightly** (B Sc Hon, 2010) Environ. controls specialist, Public Health Agency of Canada

**A. Pierce** (B Sc Hon, 2016) Research technician at Lallemand Plant Care

**L. Yang** (M Sc, 2016) Analytical development chemist, Septodont, Cambridge, Ontario

## 6. UNIT BUDGET

The Chemistry & Biochemistry budget is determined by the Faculty of Science on a yearly basis. The Department budget for the fiscal years 2008-2018 is shown below. Faculty positions are as budgeted (not as filled).

Fiscal Year	Expenditure Budget	Faculty/Staff Academic	Lab Instructors
2017-18	\$1,938,776	11	4
2016-17	\$1,862,027	11	4
2015-16	\$1,829,809	11	4
2014-15	\$1,708,085	10	4
2013-14	\$1,733,835	9	4
2012-13	\$1,507,456	9	4
2011-12	\$1,448,863	9	4
2010-11	\$1,465,064	9	4
2009-10	\$1,389,737	9	3
2008-09	\$1,210,713	9	3

### Operating /Expenditure Budget

FISCAL YEAR	ORIGINAL BUDGET	BUDGET SPENT	BALANCE
2017-2018	\$123,762		
2016-2017	\$124,254	\$124,644	\$-390
2015-2016	\$122,915	\$108,901	\$9,803*
2014-2015	\$119,616	\$129,527	\$-9911
2013-2014	\$116,037	\$116,817	\$-780
2012-2013	\$131,896	\$130,154	\$1,742
2011-2012	\$129,138	\$127,007	2,131
2010-2011	\$123,805	\$149,497	\$-24,692
2009-2010	\$123,805	\$153,431	\$-29,626
2008-2009	\$123,805	\$135,856	\$-12,051

\*late expenditures-funds were spent in 2016 in addition to original budget of 2016-2017

### 2016-17 Fiscal Year-From FAST

2016-17 Fiscal Year-from FAST listed Items	Budget
Teaching Assistants	\$45324
Invigilators	\$ 184
Benefits	\$ 2366
Undergrad Awards	\$ 1500
Masters Awards	\$ 2000
Ph D Awards	\$ 3754
Non-Capitals Expenditures (general materials, etc)	\$28700
Capital Expenditures (scientific lab equipment, work FM, etc)	\$43782

Expenditures for teaching assistants (TAs) were the largest portion of the departmental budget. Teaching assistantships are primarily available to graduate students and contribute to part of their funding support. The largest portion of the budget for TAs is used to support the delivery of the undergraduate laboratories. With increasing pressure on lecture class sizes and laboratory sections TA budget needs are expected to continue into the future.

General materials include replacement of glassware and chemicals for operation of undergraduate labs on an ongoing basis including helium and liquid nitrogen for the 300 MHz NMR spectrometer. Due to delays in purchase/delivery of smaller components in 2015-2016 into the subsequent fiscal year (such as for GC/MS installation) our non-capital and capital expenditures were delayed into 2016.

Our main focus of capital expenditures is replacement of aging equipment, repair components, and needs for operation of instrumentation. The department has also utilized buying used equipment to further upgrade the main instrument laboratories (LB310/LB307), and where necessary, build instrumentation over several years such as the newest HPLC system. In 2016-2017 scientific lab equipment expenditures in the department for undergraduate laboratories included replacement and addition of stools in some of the undergraduate laboratories coinciding with lab renovations, refractometer, magnetic balance, and Agilent 1100 autosampler for a used, but newer HPLC system (that was purchased in prior years as part of instrumental lab updating). In 2016-17, the Faculty of Science contributed \$11.5 K towards the purchase of the explosive proof refrigerators to replace aging refrigerators as well as additional funds for repairs to the 300 MHz (\$28 K), 500 MHz NMR (\$9 K), and a research ultracentrifuge (\$5K). The Faculty of Science also supported the cost of a GC/MS (also equipped with FID/NPD detectors) system in the 2015-2016 fiscal year (\$67K) and the department contributed an additional ~\$10 K towards this purchase and installation. Vincent Ignatiuk (Coordinator Science Operations) and Lee Aument (Faculty Administrator) in the Dean's office of Faculty of Science have also provided additional support to aid our department in purchasing instrumentation, coordination with other units, and resolving subsequent issues in delivery or quality.

The program delivery requires employing sessional lecturers primarily for the delivery of CHEM100 and 104 in past years to accommodate leave requests or term positions in other units (Cheng, CTL Faculty Associate, July 2014 – June 2017), leading to shortages in coverage of our courses with our current Faculty complement. In the current year for our on campus offerings we had no sessionals for the fall semester, and one sessional in the winter semester for CHEM104 delivered through Continuing Education (CCE) to accommodate a sabbatical request. Classes scheduled at non-traditional times (such as evenings) can be offered in partnership with CCE on a cost recovery basis for the Faculty. Spring/Summer offerings of CHEM100, CHEM104 and CHEM105 are delivered through CCE.

Donna Draper retired and the lab instructor position was filled by Erika Smith. Danny Ng retired and the laboratory instructor position was filled by Dr. Lukoyanova. Dr. Lukoyanova was on a leave and subsequently resigned in 2017. Dr. Chan joined the department as a term laboratory instructor in 2016 covering the leave period and is now a tenure-track Laboratory Instructor II (as of July 2017). A term Laboratory Instructor I (Jianxin Cai) was also added in 2016-2017 to address the increase in enrolment in general and organic chemistry (fall and winter), and with current enrolment trends this need is expected to continue. In summary the department is able to operate effectively within its budget allotment with additional support from the Faculty of Science for essential instrument repairs and purchase of new instrumentation for updating of the undergraduate laboratory facilities.

## 7. SWOT ANALYSIS (STRENGTHS, WEAKNESSES, OPPORTUNITIES, THREATS)

### 7.1 Strengths

*Academic Programs and Enrolments:* The Department of Chemistry & Biochemistry has seen a 38% increase in the number of students in its programs both at the undergraduate and graduate levels since 2010, with 177 students in first majors in chemistry or biochemistry in fall 2017. The Department provides essential service to other departments in the Faculty of Science (biology, geology, physics) as well as to other faculties, particularly the Faculty of Engineering & Applied Science and pre-professional programs, and has managed the needs from increasing enrolments, although this has placed more strain on time availability for research for many faculty members. The Department added CHEM104 into the winter semester starting in 2015 and managed the large increase in enrolment, not only in this course but other courses with the same number of faculty members, and an additional term laboratory instructor. The department provides hands-on laboratory experiences from general chemistry into the 3<sup>rd</sup> year of its programs, and on occasion either a lab or lab experience for 4<sup>th</sup> year classes. Enrolments in the Chemistry program remained strong throughout the 10 year period and although the Biochemistry program saw a dip in enrolment initially, they are now the highest the program has seen. Our success is partially due to the people and our strong interactions with our students in courses as well as research experiences supervised by our Faculty.

*Research:* Due to our teaching needs and size of our faculty complement, our department from its inception has taken the strategy to cover all areas of biochemistry and chemistry rather than having a single targeted research theme. It is essential for our undergraduates and graduates to have experimental learning experiences covering all disciplines. This approach allows us to provide the technical expertise and real-life experiences for teaching in our programs. Although our department does not have a centralized research theme it does have researchers that encompass the research strategies of the university that include Energy and the Environment (Dahms, East, Murphy, Raina-Fulton) and Health (Babu, Dahms, Murphy, Sterenberg, Suh) and Informatics (East, Babu). There are also more than one faculty member that can cover the area of inorganic chemistry (Mihichuk, Sterenberg), organic chemistry (Cheng, Murphy and Wee) and physical chemistry (Cheng, East, Murphy). For the size of our department our research productivity is strong. Babu, our newest biochemistry faculty member has received the CIHR New Investigator Award. A number of our faculty have research collaborations throughout North America and Europe. With further resources for graduate student funding we could improve our success rates for external resources, particularly at NSERC which in a relatively small department is critical to our ability to provide research experiences for our students. The Department has a history of building its research instrumentation capacity from CFI and NSERC RTI grants.

*Successful succession planning and hiring:* The department has been very active in completion of new hires. In the last 10 years our department has seen a number of changes in laboratory instructors (retirements: Draper and Ng; leave and resignation: Lukoyanova) and completed the hiring process for Cai (term); Chan (tenure track Laboratory Instructor II); Lukoyanova (tenure track Laboratory Instructor II who subsequently resigned); and Smith (Laboratory Instructor II). The department also had the retirement of the administrative assistant (Dibble) and hiring of Friebel both of whom are highly dedicated to the department. In addition, we had a number of changes in our departmental technician (Wang (resigned), Yu (term), with the subsequent hiring of Jamieson (also current NMR manager)). Historically (prior to 2008) we saw changes in our biochemistry faculty and this continued with Freywald resignation in 2011, however we have reached our full biochemistry faculty complement with Babu's hire and addition of Fitzpatrick (prior VP Research) into our department.

Cheng's position also transitioned from a term to tenured lecturer in 2013 (prior term lecturer since 2009). It is anticipated with potential retirements in the upcoming years that succession planning particularly in the area of faculty in chemistry is critical to our ability to address enrolment needs at UofR given the department is at its limits of our faculty complement to cover teaching and research needs.

#### *Updating of Undergraduate Laboratories*

The department has seen renovations to its undergraduate laboratories in the Lab building which included new fumehoods, lighting, and sprinklers that have improved the overall operation and safety of the laboratories. Most of the faculty members also re-located to new laboratory spaces in the RIC (Research and Innovation Centre) building in late 2009 (exception Raina-Fulton due to cleanroom laboratories). The department also has utilized its budget to further update and maintain instrumentation in areas of both biochemistry and chemistry undergraduate laboratories in conjunction with additional support from the Faculty of Science (including a new GC-MS system and repairs for the 300 and 500 MHz NMR spectrometers). The recent addition of a \$200,000 budget line item for equipment renewal in the Faculty of Science has led to some significant improvements in updating of undergraduate laboratories. The department needs to continue with its progress in updating the undergraduate laboratories, which is essential for new laboratory development and continued operations. We strongly recommend that the budget line item for Faculty of Science continue. Our next major anticipated instrument need, essential to our teaching and research activities, is the replacement of the 300 MHz NMR spectrometer. At present we are able to manage repairs, however replacement is expected in the next 3-5 years and the 300 MHz NMR spectrometer is in high demand and utilized in many of our undergraduate laboratories as well as for research purposes.

#### *7.2 Weaknesses and additional threats:*

**Critical Mass:** With increasing enrolments in our programs and the need for delivery of service courses, our department has been at the limit of its capacity for a number of years. Although we are able to provide an adequate number of instructors for course coverage it has been difficult to manage sabbaticals, leaves or other special requests and at times we have had to utilize sessionals for instruction particularly for CHEM100 and CHEM104 which can impact recruitment into our programs. Our upper level chemistry and biochemistry courses are difficult to fill with sessionals due to the technical expertise required and our pool of experienced sessionals has significantly declined in recent years. We are also a small department and at times this has led to higher workloads for some semesters of individual faculty members to manage our overall needs in a given year. The larger class sizes and demands for teaching in turn creates an imbalance with research which can impair NSERC success, and we are unable to accommodate workload adjustments near grant renewals times. There has also been little opportunity to create new courses in our program and we do not have specialized service courses in our programs such as general chemistry for Engineers.

Although teaching loads for most faculty have not changed, the number of students in a class has increased, with no budget for additional teaching assistantship support. If enrolments continue to increase at the current rates the department will need an additional faculty member to deliver its programs effectively. Our department members are devoted to curriculum development and program delivery and would like succession planning for potential retirements to be considered, despite current budget pressures at the University level to improve our ability to plan at the departmental level. The delivery of our program

and shifts in workloads for course coverage will be very difficult to manage in the future if retirements or other faculty workload accommodations are needed.

*Space:* If enrolments continue to increase it will be essential to find more laboratory space to accommodate particularly CHEM104 and CHEM105, which are currently both taught in the winter semester. It is recommended that the shared undergraduate laboratory with biology department (LB320) could be better utilized if it were available in the winter semester so that the department could increase its laboratory capacity in CHEM104 and CHEM105 by having these laboratories run in different rooms. These labs have less fumehood capacity needs that can be met in LB320. Our laboratory instructors also work well together providing additional support when needed and thus the proximity of LB320 to our other undergraduate laboratories on the 3<sup>rd</sup> floor of LB is beneficial. This additional lab space availability would allow us to re-arrange some of our other laboratory spaces for better utility and reduce laboratory conversion time for different courses taught. Our undergraduate laboratories also suffer from lack of space for storage of chemicals/instrumentation that makes switching over laboratories more time consuming. Along with space we would require additional laboratory instructor support beyond our current laboratory instructors (including the term position) with enrolments continuing to increase. The department also needs to maintain the space of LB313 (currently under renovation) to meet the needs of course delivery for CHEM330, 340, and 441.

*Graduate Student Funding and NSERC Success Rates:* Our department research activities have been impacted by NSERC Discovery success rates with 3 faculty members either preparing for future NSERC grant submissions or currently on NSERC DDG grants (2 year period). Our 3 biochemistry faculty members with current NSERC funding have NSERC Discovery proposal submissions currently under evaluation. Increasing our High Qualified Personnel (HQP) complement relative to other university institutions is a challenge with limited institutional graduate student funding and lack of provincial scholarships. A number of our faculty were able to take advantage of funding for graduate students from the Graduate Research Fellowship (GRF) program (started in fall 2014; Ph D \$25092; M Sc \$20854) but this was discontinued (only continued for those students in program). This program was replaced by URGF/URGA/URGS funding provided through the Faculty of Graduate Studies and Research, and subsequently allocated within the Faculty of Science based on current enrolment of graduate students not in maintenance status. Our current allocation is \$40 K/yr and consequently the department provides UR Graduate Scholarships (URGS) to allow as many eligible students as possible to receive this funding (\$4600/semester for Ph D and \$4134/semester for M Sc). An additional \$12150 supplement (expected only for current year) was provided in the winter 2018 semester which will be utilized for further support of graduate students during the summer semester. The department also provides a departmental scholarship for graduate students not on the old GRF program (Faculty minimum contribution \$7.5 K for M Sc and \$8K for Ph D; department contribution comes from TAs and top-up contribution \$8 K and \$9 K for M Sc and Ph D students). This match requirement is difficult for department members with no NSERC Discovery grant, with NSERC DDG funds or with high instrumentation/lab costs. Faculty can provide additional funds to increase stipends for students, which is often needed to make graduate funding competitive with other Canadian institutions. The department also contributes \$500 for NSERC USRA students. Although UofR scholarships are helpful to support graduate students with increasing tuition fees particularly for international students they are insufficient for faculty to maintain adequate HQP required for NSERC success without other resources. At current scholarship levels the

department is unable to provide URGS scholarships to all qualified students (80% minimum, not on maintenance status).

In addition to increasing the resources that Graduate Studies and Research has to provide for scholarships some further strategies for funding should be made for faculty attempting to regain NSERC Discovery funding or transition successfully from a NSERC DDG to NSERC Discovery funding. The VP Research Office does contribute some funds (\$2K/yr) to NSERC DDG grants, however for our research areas these funds are insufficient for adequate HQP support along with instrument/lab costs which are high in our department. HQP ranking is the largest research limitation in our department to being competitive at the national level and research activities are more heavily impacted by external funding reductions in a smaller department of the university.

*Emergency (backup) power* at the University has been an issue for a number of years. There have also been issues with the existing emergency power with respect to its proper functioning and hook-up and damage to infrastructure from unexpected power outages. This is a concern to both costly teaching and research infrastructure. With ongoing renovations and upgrades we hope this issue will be resolved as there are little resources available for researchers to repair damaged instrumentation.

*Security issues* –there have been a number of break-ins and attempted break-ins and the Chemistry & Biochemistry department has seen damage which included the theft of the GC-MS computer during its 1<sup>st</sup> year of operation. Although there have been fewer issues in the last year, the lab building is less secure than the RIC building. Addition of security cameras in hallways of LB, particularly near major infrastructure would aid in alleviating the situation and improving the safety and security during weekends and evenings.

*Supplemental Instruction (SI)* was cancelled by the Faculty of Science due to low participation rates. Individuals in the department have continued trying new smaller initiatives to reach those students who could benefit the most with mixed success, despite the investment in time. Particularly for our general and organic chemistry courses we need to re-examine our approach to improve success rates. This is a university wide issue where both human and financial resources are required to improve success rates.

### 7.3 Opportunities

*Continuation of the budget line item for Faculty of Science* for equipment renewal is essential for the continued operation and updating of our undergraduate laboratories. The department has a history of also contributing a significant portion of its budget to the operation and maintenance of undergraduate laboratories.

*Indigenization:* The department currently offers BIOC200 (Medicinal Plants and Culture) online through the UofR and First Nations University of Canada campuses. First Nation's Elders have actively participated in and consulted on the class, for which both quantitative and qualitative studies (see Dahm's CV) have shown the incorporation of traditional Elder Knowledge to motivate students of all ethnicities to study science, take an interest in STEM (Science Technology Engineering Math) and identify as a scientist.

Scholarship of teaching and learning is a strong interest of Dr. Cheng and along with term assistant professor Dr. Ziffle at First Nations University of Canada there are plans to incorporate Indigenous Knowledge and open pedagogy into a newly approved laboratory

based course CHEM101(Chemistry of Cooking), which will be delivered through FNUC in the fall of 2018. Traditional Knowledge of food preparation will be included along with interviews with some indigenous chefs. Students will perform experiments to understand chemistry using food and cooking followed by making real food using proven recipes supported by chemical principles. CHEM101 and CHEM/BIOC391 will build further science capacity at FNUC.

In addition the department has plans to revisit the curriculum of CHEM100 and include some components addressing indigenization with the course taught by Dr. Mihichuk in the fall of 2018. In future these changes could be incorporated to our off-campus course offerings. There are also discussions on the dual CHEM30/CHEM100 credit with high schools currently underway and this could allow us opportunities to further incorporate indigenization.

*Recruitment of other majors into our programs:* There are still opportunities for the department to recruit students in their 1<sup>st</sup> year into our programs, with ~22% of enrolment defined as other majors (including non-declared) as well as students enrolled in pre-professionals programs. The department could add a short component to a lecture about our programs and faculty research areas into our 1<sup>st</sup> and 2<sup>nd</sup> year courses to make students more aware of the opportunities in chemistry and biochemistry (department Head or faculty visits).

*Development of New Courses:* As our instrumentation in the department improves there are future opportunities for the development of additional experimental learning courses, particularly in areas of Environment Chemistry and Health that follow the research themes of the university. This would require the addition of a new faculty member and continued updating of our undergraduate laboratories. New courses could be designed to better meet the needs of industrial and pre-professional future employers and programs. This development may also lead to new research opportunities and external funding sources within the department and help to alleviate reductions in funding from NSERC. At the graduate level we are in early planning stages of re-development of a course designed to further assist our graduate students in scientific writing.

## Appendix I

## Short CVs of Faculty Members and Laboratory Instructors

Member	Rank
Babu, Mohan	Associate Professor, Biochemistry
Chan, Andrew	Laboratory Instructor II
Cheng, Stephen	Lecturer, Chemistry
Dahms, Tanya	Professor, Biochemistry
East, Allan	Professor, Chemistry
Fitzpatrick, Dennis	Professor, Biochemistry
Mihichuk, Lynn	Associate Professor, Chemistry
Murphy, R. Scott	Professor, Chemistry
Raina-Fulton, Renata	Professor, Chemistry
Smith, Erika	Laboratory Instructor II
Sterenberg, Brian	Associate Professor, Chemistry
Suh, Dae-Yeon	Professor, Biochemistry
Tymchak, Mark	Laboratory Instructor III
Wee, Andrew	Professor, Chemistry
Yee, Henry	Laboratory Instructor III

Dr. Mohan Babu  
Associate Professor  
[mohan.babu@uregina.ca](mailto:mohan.babu@uregina.ca), (306) 585-4192

### Education and Professional Development

1. Honors BSc. with distinction (1992-1996), TNAU, India; 2. MSc. with distinction (1997-1999), TNAU, India; 3. PhD. with distinction (1999-2002), TNAU, India; 4. Post-Doctoral Fellow (2002-2004), University of Toronto, Canada; 5. Post-Doctoral Research Associate (2004), The Ohio State University and University of California Davis, USA; 6. Postdoctoral Scientist (2005-2007), Agriculture and Agri-Food Canada and University of Western Ontario, Canada; 7. Postdoctoral Scientist and Senior Research Associate (2007-2012), Donnelly Centre, Canada

### Employment History

1. Associate Professor (July 2017 - Present), University of Regina, Canada  
2. Assistant Professor (July 2012 – June 2017), University of Regina, Canada

### Teaching History

#### I. Undergraduate

1. Sept 2012 - present BIOC321: Macromolecules, UofR (Course Coordinator)  
2. Sept 2016 - Dec 2016 BIOC 428AC - Cell Envelope Interactome Reading Class, Course Coordinator  
3. Sept 2016 - Dec 2016 BIOC 827AO - Mitochondrial Systems Biology, Course Coordinator  
4. Sept 2016 - Dec 2016 BIOC428AG - Network Medicine and Systems Biology, Course Coordinator

#### II. Graduate

Sept 2016 - Dec 2016 BIOC827AP - Network Medicine and Systems Biology (2016; hybrid with BIOC428AG), Course Coordinator

### Student Supervision

Name	Position	Dates of supervision
<b>A. Bachelor's [ n = 12 ]</b>		
Anna Pham	4th year Undergraduate, UofR	2017/5 - 2018/4
Ahmad Abedi	4th year Undergraduate, UofR	2017/9 - 2017/12
Sylvia Okonofua	3rd year Undergraduate, UofR	2017/9 - 2018/9
Kirsten Broderick	4th year Undergraduate, UofR	2017/5 - 2017/8
Nathan Fortin	4th year Undergraduate, UofR	2017/5 - 2018/4
Molly Cummings	Master's student, UofS	2016/9 - 2017/4
Chris Ripplinger	Medical Student, UofS	2016/1 - 2017/8
Hosam Abou-tok	Medical Student, UofS	2016/1 - 2017/4
Yuanjian Wang	Undergraduate, UofR	2016/9 - 2016/12
Emily Smith	1 <sup>st</sup> year Veterinary Medicine, UofS	2016/1 - 2016/4
Preston Bews	Bachelor's Student, McGill	2016/1 - 2016/8
Shavan Bagiana	Clinical Liaison Chairperson, UofR	2016/1 - 2016/4
Prasuna Kunasani	Agriculture and Agri-Food Canada, Regina	2014/5 - 2016/6
Naitik Patel	SIAST, Regina	2014/5 - 2014/12
Brandon Jacobson	UofS	2013/1 - 2013/12
Megan Vogelsang	Graduate Student in Nursing, UofR	2012/8 - 2012/12
<b>B. Master's Thesis [ n = 2 ]</b>		

Zhuoran Wu	Master's student, UofR	2016/9 - 2018/8
Sandy Kassir	Clinical Research Coordinator, RQHR, Regina	2012/8 - 2015/4
<b>C. Doctorate [n = 4]</b>		
Ali Hosseinnia	Doctoral Student, UofR	2017/1 - 2022/1
Qingzhou Zhang	Doctoral Student, UofR	2016/9 - 2021/8
Shahreem Amin	Doctoral Student, UofR	2016/9 - 2021/8
Ashwani Kumar	Doctoral Student, UofR	2013/1 - 2018/6
<b>D. Post-Doctorate [n = 9]</b>		
M. Taha Moutaoufik	Postdoctoral Fellow, UofR	2017/9 - 2019/8
Thiago Seraphim	Postdoctoral Fellow, UofR	2017/9 - 2019/8
Renyue Bao	Postdoctoral Fellow, University of Houston, Texas	2014/6 - 2015/8
D.H. Nguyen-Tran	Postdoctoral Fellow, University of Florida	2014/5 - 2015/8
Ramy Malty	Postdoctoral Fellow, UofR	2013/12 - 2018/8
Viktor Deineko	Postdoctoral Fellow, UofR	2013/10 - 2016/12
James Vlasblom	Chief Technology Officer, DNASTack, Toronto	2013/8 - 2015/6
Matthew Jessulat	Postdoctoral Fellow, UofR	2012/7 - 2018/6
Ke Jin	Quantitative Developer, CIBC, Toronto	2011/6 - 2015/5
<b>E. Research Associate [n = 11]</b>		
Larissa Höll	Associate Mass Spectrometrist, UofR	2017/11-2018/10
Sun-Young Kim	Research Associate, UofR	2016/12-2019/12
Xuejian Xiong	Computational Biologist, SickKids, Toronto	2015/11 - 2016/6
Zoran Minic	John Holmes Mass Spectrometry Facility, Univ. of Ottawa	2013/10 - 2017/9
Nancy Chang	Research Technologist II, SickKids, Toronto	2013/8 - 2014/5
Vishaldeep Sidhu	Genome Sciences Centre, BC Cancer Agency	2013/3 - 2014/5
Hiroyuki Aoki	Mass Spectrometrist, UofR	2012/8 - 2018/10
Gabriela Ridlová	Mass Spectrometrist, University of Waterloo	2012/7 - 2013/5
Krunal Lad	Business Marketing, Edmonton, Alberta	2012/7 - 2013/8
Sadhna Phanse	Research Associate, UofR	2012/7 - 2018/6
Chris Graham	Masters Student, University of Manitoba	2012/7 - 2013/12

### University and External Community Service

#### **1. Editorial Activities**

2016/1 - 2020/12	Editorial Board Member, BioEssays and BMC Microbiology Journals
2017/1 - 2019/1	Guest Editor for "Molecular Biosystems" Journal on Proteomics Themed Issues; Royal Society of Chemistry
2013/8 - 2015/11	Editor, Prokaryotic Systems Biology, Advances in Experimental Medicine and Biology: 1(883): 278. Krogan, N and Babu, M (Eds.). Springer International Publishing, United States

#### **2. Expert Activities:**

2012/11 - 2020/10	Advisory Consultant for KREO Technologies, Canada, Toronto; Advise on Advanced Automation for Genomics and Drug Screening Platforms.
2015/7 - 2016/6	Advisory Consultant for a Genomics-Based Drug Company, Compugen, Israel, Holon Advise New Methods for Receptor Discovery on Membrane
2012-present	Ad hoc reviewer for UK (MRC), ERC starting and advanced research grants (Europe), Ministry of Science Technology and Space (Personalized Medicine, Israel), NSERC discovery, CIHR doctoral and Canada research chairs program Canada
2012-present	Ad-hoc reviewer for American Journal of Physiology (Cell physiology), BMC Chemical Biology/Genomics/Systems Biology, Expert Review in Proteomics, FEMS Microbiology Letters/Reviews, Journal of Molecular Biology, Journal of Proteome Research, Journal of Proteomics, Molecular Biosystems, Molecular Cell, Molecular Systems Biology, Nature Protocol, Nature Scientific Reports, Nucleic Acid

Research, PLoS Computational Biology/ Genetics/One, Proteomics, Trends in Genetics/Microbiology, and Yeast journals  
 2014-Present Secretary Treasurer, Canadian Society of Microbiologists (CSM)  
 2014-Present CIHR doctoral research awards "A" peer-review committee member  
 2015-Present SHRF biomedical fellowship review committee member  
 2017-2020 CIHR college of reviewers

### **3. University Administrative Activities:**

#### **Committee Memberships**

09/2016 - Present Coordinator to shortlist student recipients for undergraduate scholarship awards  
 07/2012 - Present Graduate selection committee  
 07/2012 - Present Graduate studies department committee member  
 07/2016 - 07/2016 Search committee for a chemistry lab instructor term position  
 07/2016 - 07/2016 Chaired the SHRF and CIHR interactive Q&A session  
 03/2016 - 03/2017 CIHR selection committee member for graduate funding  
 06/2016 - 05/2017 Banting fellowship evaluation committee

#### **Graduate Examination Activities**

12/2012-Present, Committee member, External examiner, and PhD oral thesis examiner for Dept. of Chemistry and Biochemistry, and Biology; and 04/2013 PhD External Examiner, Department of Biological Sciences, University of Calgary

### **4. Youth Outreach, Community Engagement**

07/2015/7-05/2017 As part of youth outreach, I talked about my research and toured the lab and "Proteomics and Genomics Facility" to 83 high school students: O'Neill and Kelliher School (April 7, 2016; 22 students); Lumsden School (April 11, 2016; 20 students); Greenall/Indian Head Schools (April 13, 2016; 21 students); Winston Knoll Collegiate (April 15, 2016; 20 students). 08/2016-02/2017 1. I provided the opportunity for a PhD visiting scholar, Ms. Ednalise Cartagena from the University of Puerto Rico for a month (Aug 21-Sep 17, 2016) to learn and conduct proteomics experiments in my lab towards her PhD thesis. 2. Ms. Mara Zilocchi from the University of Insubria, Varese, Italy, who was offered a fellowship from Italian Proteomics Association (ItPA) visited my lab (Jan 14 - Feb 28, 2017) and completed part of her PhD thesis work on mitochondrial proteomics.

### Scholarly Research

See for complete list of published papers my bibliography at link provided below: Total: 66 (60 peer-reviewed articles, 6 book chapters); since 2012: 45. Shown below are a selection from 2016- present. Available from <https://www.ncbi.nlm.nih.gov/myncbi/browse/collection/51883657/?sort=date&direction=ascending>

1. Kuznetsova E, Nocek B, Brown G, Makarova KS, Flick R, Wolf YI, Khusnutdinova A, Evdokimova E, Jin K, Tan K, Hanson AD, Hasnain G, Zallot R, de Crécy-Lagard V, Babu M, Savchenko A, Joachimiak A, Edwards AM, Koonin EV, Yakunin AF. Functional Diversity of Haloacid Dehalogenase Superfamily Phosphatases from *Saccharomyces cerevisiae*: BIOCHEMICAL, STRUCTURAL, AND EVOLUTIONARY INSIGHTS. *The Journal of biological chemistry*. 2015; 290(30):18678-98.
2. Wan C, Borgeson B, Phanse S, Tu F, Drew K, Clark G, Xiong X, Kagan O, Kwan J, Bezginov A, Chessman K, Pal S, Cromar G, Papoulas O, Ni Z, Boutz DR, Stoilova S, Havugimana PC, Guo X, Maly RH, Sarov M, Greenblatt J, Babu M, Derry WB, Tillier ER, Wallingford JB, Parkinson J, Marcotte EM, Emili A. Panorama of ancient metazoan macromolecular complexes. *Nature*. 2015; 525(7569):339-44.
3. Li J, Ma Z, Shi M, Maly RH, Aoki H, Minic Z, Phanse S, Jin K, Wall DP, Zhang Z, Urban AE, Hallmayer J, Babu M, Snyder M. Identification of Human Neuronal Protein Complexes Reveals Biochemical Activities and Convergent Mechanisms of Action in Autism Spectrum Disorders. *Cell systems*. 2015; 1(5):361-374.
4. Kumar A, Beloglazova N, Bundalovic-Torma C, Phanse S, Deineko V, Gagarinova A, Musso G, Vlasblom J, Lemak S, Hooshyar M, Minic Z, Wagih O, Mosca R, Aloy P, Golshani A, Parkinson J, Emili A, Yakunin AF, Babu M. Conditional Epistatic Interaction Maps Reveal Global Functional Rewiring of Genome Integrity Pathways in *Escherichia coli*. *Cell reports*. 2016; 14(3):648-661.
5. Towards a functional definition of the mitochondrial human proteome Mauro F, Alberio T, Babu M, Lundberg E, Urbani A. *EuPA Open Proteomics*. 2016 March; 10:24-27.
6. Phanse S, Wan C, Borgeson B, Tu F, Drew K, Clark G, Xiong X, Kagan O, Kwan J, Bezginov A, Chessman K, Pal S, Cromar G, Papoulas O, Ni Z, Boutz DR, Stoilova S, Havugimana PC, Guo X, Maly RH, Sarov M, Greenblatt J, Babu M, Derry WB, Tillier ER, Wallingford JB, Parkinson J, Marcotte EM, Emili A. Proteome-wide dataset supporting the study of ancient metazoan macromolecular complexes. *Data in brief*. 2016; 6:715-21

7. Santiago E, Akamine P, Snider J, Wong V, Jessulat M, Deineko V, Gagarinova A, Aoki H, Minic Z, Phanse S, San Antonio A, Cubano LA, Rymond BC, Babu M, Stagljär I, Rodriguez-Medina JR. Novel Interactome of *Saccharomyces cerevisiae* Myosin Type II Identified by a Modified Integrated Membrane Yeast Two-Hybrid (iMYTH) Screen. *G3* (Bethesda, Md.). 2016; 6(5):1469-74.
8. Gagarinova A, Stewart G, Samanfar B, Phanse S, White CA, Aoki H, Deineko V, Beloglazova N, Yakunin AF, Golshani A, Brown ED, Babu M, Emili A. Systematic Genetic Screens Reveal the Dynamic Global Functional Organization of the Bacterial Translation Machinery. *Cell reports*. 2016; 17(3):904-916.
9. Samanfar B, Shostak K, Moteshareie H, Hajikarimlou M, Shaikho S, Omid K, Hooshyar M, Burnside D, Márquez IG, Kazmirchuk T, Naing T, Ludovico P, York-Lyon A, Szereszewski K, Leung C, Jin JY, Megarbane R, Smith ML, Babu M, Holcik M, Golshani A. The sensitivity of the yeast, *Saccharomyces cerevisiae*, to acetic acid is influenced by DOM34 and RPL36A. *PeerJ*. 2017; 5:e4037.
10. Yao Z, Darowski K, St-Denis N, Wong V, Offensperger F, Villedieu A, Amin S, Maly R, Aoki H, Guo H, Xu Y, Iorio C, Kotlyar M, Emili A, Jurisica I, Neel BG, Babu M, Gingras AC, Stagljär I. A Global Analysis of the Receptor Tyrosine Kinase-Protein Phosphatase Interactome. *Molecular cell*. 2017; 65(2):347-360. NIHMSID: NIHMS915075 PubMed [journal] PMID: 28065597, PMCID: PMC5663465
11. Sokolina K, Kittanakom S, Snider J, Kotlyar M, Maurice P, Gandía J, Benleulmi-Chaachoua A, Tadagaki K, Oishi A, Wong V, Maly RH, Deineko V, Aoki H, Amin S, Yao Z, Morató X, Otasek D, Kobayashi H, Menendez J, Auerbach D, Angers S, Pržulj N, Bouvier M, Babu M, Ciruela F, Jockers R, Jurisica I, Stagljär I. Systematic protein-protein interaction mapping for clinically relevant human GPCRs. *Molecular systems biology*. 2017; 13(3):918.
12. HIV-1 Gp120 clade B/C induces a GRP78 driven cytoprotective mechanism in astrocytoma López SN, Rodríguez-Valentín M, Rivera M, Rodríguez M, Babu M, Cubano LA, Xiong H, Wang G, Kucheryavykh L, Boukli NM. *Oncotarget*. 2017 July 22.
13. Rodionova IA, Zhang Z, Mehla J, Goodacre N, Babu M, Emili A, Uetz P, Saier MH Jr. The phosphocarrier protein HPr of the bacterial phosphotransferase system globally regulates energy metabolism by directly interacting with multiple enzymes in *Escherichia coli*. *The Journal of biological chemistry*. 2017; 292(34):14250-14257.
14. Gagarinova A, Phanse S, Cygler M, Babu M. Insights from protein-protein interaction studies on bacterial pathogenesis. *Expert review of proteomics*. 2017; 14(9):779-797.
15. Rizzolo K, Huen J, Kumar A, Phanse S, Vlasblom J, Kakihara Y, Zeineddine HA, Minic Z, Snider J, Wang W, Pons C, Seraphim TV, Boczek EE, Alberti S, Costanzo M, Myers CL, Stagljär I, Boone C, Babu M, Houry WA. Features of the Chaperone Cellular Network Revealed through Systematic Interaction Mapping. *Cell reports*. 2017; 20(11):2735-2748.
16. Babu M, Bundalovic-Torma C, Calmettes C, Phanse S, Zhang Q, Jiang Y, Minic Z, Kim S, Mehla J, Gagarinova A, Rodionova I, Kumar A, Guo H, Kagan O, Pogoutse O, Aoki H, Deineko V, Caufield JH, Holtzapfle E, Zhang Z, Vastermark A, Pandya Y, Lai CC, El Bakkouri M, Hooda Y, Shah M, Burnside D, Hooshyar M, Vlasblom J, Rajagopala SV, Golshani A, Wuchty S, F Greenblatt J, Saier M, Uetz P, F Moraes T, Parkinson J, Emili A. Global landscape of cell envelope protein complexes in *Escherichia coli*. *Nature biotechnology*. 2017
17. Kazmirchuk T, Dick K, Burnside DJ, Barnes B, Moteshareie H, Hajikarimlou M, Omid K, Ahmed D, Low A, Lettl C, Hooshyar M, Schoenrock A, Pitre S, Babu M, Cassol E, Samanfar B, Wong A, Dehne F, Green JR, Golshani A. Designing anti-Zika virus peptides derived from predicted human-Zika virus protein-protein interactions. *Computational biology and chemistry*. 2017; 71:180-187.
18. Rodionova IA, Goodacre N, Babu M, Emili A, Uetz P, Saier MH Jr. The nitrogen regulatory PII protein (GlnB) and N-acetyl-glucosamine 6-phosphate epimerase (NanE) allosterically activate glucosamine 6-phosphate deaminase (NagB) in *Escherichia coli*. *Journal of bacteriology*. 2017.
19. Maly RH, Aoki H, Kumar A, Phanse S, Amin S, Zhang Q, Minic Z, Goebels F, Musso G, Wu Z, Abou-Tok H, Meyer M, Deineko V, Kassir S, Sidhu V, Jessulat M, Scott NE, Xiong X, Vlasblom J, Prasad B, Foster LJ, Alberio T, Garavaglia B, Yu H, Bader GD, Nakamura K, Parkinson J, Babu M. A Map of Human Mitochondrial Protein Interactions Linked to Neurodegeneration Reveals New Mechanisms of Redox Homeostasis and NF- $\kappa$ B Signaling. *Cell systems*. 2017; 5(6):564-577.e12.
20. Kumar A, Rizzolo K, Zilles S, Babu M, Houry WA. Computational Analysis of the Chaperone Interaction Networks. *Methods in molecular biology* (Clifton, N.J.). 2018; 1709:275-291.
21. Omid K, Jessulat M, Hooshyar M, Burnside D, Schoenrock A, Kazmirchuk T, Hajikarimlou M, Daniel M, Moteshareie H, Bhojoo U, Sanders M, Ramotar D, Dehne F, Samanfar B, Babu M, Golshani A. Uncharacterized ORF HUR1 influences the efficiency of non-homologous end-joining repair in *Saccharomyces cerevisiae*. *Gene*. 2018; 639:128-136.

## Andrew Chan, PhD

Lab Instructor II  
 andrew.chan@uregina.ca, (306) 585-4276

### Education and Professional Development

*PhD, Analytical Chemistry, June 2013. University of Toronto*

*MSc, Analytical Chemistry, June 2006. University of Toronto*

*BSc, Chemistry and Forensics Science, June 2002. University of Toronto*

### Employment History

*Lab Instructor II – September 2016 to date. University of Regina, Regina, SK*

*Lab Technician – January 2015 to April 2015, September 2015 to August 2016. University of Toronto Mississauga, Mississauga, ON*

*Sessional Instructional Assistant – September 2013 to April 2015. University of Toronto Mississauga, Mississauga, ON*

### Teaching History

*CHEM104 (Lab Instructor) – General Chemistry I. September 2016 to date (University of Regina)*

*CHEM105 (Lab Instructor) – General Chemistry II. January 2017 to date (University of Regina)*

*CHEM105 (Sessional Lecturer) – General Chemistry II. May to June 2017 (University of Regina)*

*CHEM251 (Sessional Lecturer) – Physical Chemistry II, Kinetics. January to April 2017 (University of Regina)*

*CHM311 (Guest Lecturer) – Instrumental Analytical Chemistry. March 2016 (University of Toronto Mississauga)*

*CHM416 (Guest Lecturer) – Separation Science. March 2016 (University of Toronto Mississauga)*

*Sessional Instructional Assistant (Tutorial Leader, Lab Demonstrator, Marker) for Various Chemistry Courses (General Chemistry, Analytical Chemistry, Physical Chemistry) – 2013 to 2015*

*Teaching Assistant (Tutorial Leader, Lab Demonstrator) for Various Chemistry Courses (General Chemistry, Instrumental Analysis Lab) – 2008 to 2013*

### Student Supervision

Name	Position	Dates of supervision
<b>Various Graduate Students</b>	Teaching Assistants (9)	September 2016 to date
<b>Various Undergraduate students</b>	Work-Study Students (5)	September 2015 to August 2016

### University Service

*Member on Lab Instructor Review Committee, October 2017 to date, University of Regina.  
Assisted high school chemistry student with experiment project, April 2017, University of Regina.*

*Technical Support for on location TV commercial Shoot, August 2016, University of Toronto Mississauga.*

*Volunteer for University Open Houses, High School Student Visits, Science Rendezvous, 2008-2011, 2015 to 2016. University of Toronto Mississauga.*

*Volunteer for Graduate Student Recruitment Days, 2008 to 2012, University of Toronto Mississauga.*

*Member on Undergraduate Chemistry Lab Renovations Committee, 2009, University of Toronto Mississauga.*

#### Scholarly Research

Chan, A., Artuso, T. and Krull, U.J. "Sample Handling Protocols for Biosensor Applications" in Handbook of Sample Preparation. Editors, Pawliszyn, J and Lord, H.L. John Wiley & Sons, New Jersey, 2010, pg 385 - 418

Chan, A. and Krull, U.J. "A Method for the Selective Pre-concentration of DNA Targets by Capillary Affinity Gel Electrophoresis", 91<sup>st</sup> Canadian Chemistry Conference and Exhibition, Edmonton, AB, Canada, May 2008. Poster Presentation.

Chan, A. and Krull, U.J. "A Method for the Selective Pre-concentration of DNA Targets by Capillary Affinity Gel Electrophoresis", Gordon Research Conferences, Bioanalytical Sensors, Smithfield, RI, USA, June 2008. Poster Presentation.

## Stephen Cheng

Lecturer

[stephen.cheng@uregina.ca](mailto:stephen.cheng@uregina.ca), (306) 337-3290

### Education and Professional Development

NSERC Visiting Fellow. National Research Council of Canada. 1998 – 2000.  
 Ph.D. (Chemistry), University of Minnesota. 1998.  
 B.Sc. (Chemistry), Santa Clara University. 1992.

### Employment History

Lecturer (tenured), University of Regina, July 2013 – present.  
 CTL Faculty Associate, University of Regina, July 2014 – June 2017.  
 Lecturer (term), University of Regina, January 2009 – June 2013.  
 Sessional Lecturer III, University of Regina, September 2006 – December 2008

### Teaching History

CHEM 102/103 Chemistry: Fall 2006 (92 and 95 students), Fall 2007 (67 and 93 students), Fall 2008 (89 students), Winter 2009 (85 students)  
 CHEM 103 Chemistry: Winter 2008 (144 students), Winter 2009 (113 students)  
 CHEM 104 General Chemistry I: Fall 2009 (288 students), Fall 2010 (286 students), Fall 2011 (291 students), Fall 2012 (294 students), Fall 2013 (287 and 290 students), Fall 2014 (289 students), Fall 2015 (298 students), Fall 2016 (292 students), Fall 2017 (286 students)  
 CHEM 105 General Chemistry II: Winter 2010 (141 students), Winter 2011 (184 students), Winter 2012 (192 students)  
 CHEM 140/240 Organic Chemistry I: Winter 2008 (230 Students), Fall 2008 (12 students), Fall 2009 (141 students), Winter 2011 (131 students), Winter 2013 (131 students), Winter 2014 (219 students), Fall 2017 (232 students)  
 CHEM 250 Physical Chemistry I: Fall 2011 (32 students), Fall 2012 (47 students)  
 CHEM 251 Physical Chemistry II: Winter 2014 (19 students)  
 CHEM 260 Structure and Bonding: Fall 2007 (31 students)  
 CHEM 490AF Physical Methods and their Chemical Applications: Spring 2016 (1 student)

### Student Supervision

Name	Position	Dates of supervision
<b>Malin Hansen</b>	Research Associate	January 2016 – April 2017

Dr. Malin Hansen was under my supervision as a research associate at the Centre for Teaching and Learning when I was the CTL Faculty Associate.

### University Service

Chemistry and Biochemistry Co-op Coordinator (2011 – present)  
 Chemistry and Biochemistry Seminar Coordinator (Fall 2012 and Fall 2017)  
 Member of Introductory Chemistry Committee, Department of Chemistry & Biochemistry (2009 - present)  
 Member of Outreaching Committee, Department of Chemistry & Biochemistry (2012 – present)  
 Member of Curriculum Committee, Department of Chemistry & Biochemistry (2009 – 2012)  
 Webmaster of the Department of Chemistry & Biochemistry (2012 – present)  
 Member of Chemistry Tenure-track Laboratory Instructor Search Committee (2017)  
 Chair of the Chemistry Term Laboratory Instructor Search Committees (2016)  
 Member of Chemistry Tenure-track Laboratory Instructor Search Committee (2015)

Member of Chemistry Term Laboratory Instructor Search Committee (2014)  
Member of the Geology Laboratory Instructor Search Committee (2017)  
Member of Biology Lecturer Search Committee, Department of Biology (2013)  
Member of University Homecoming Steering Committee (2011)  
Coordinator of Supplemental Instruction, Faculty of Science (2008 – 2014)  
Coordinator of Science Rendezvous, Faculty of Science (2011 – 2014)  
Co-organizer of Science Rendezvous, Faculty of Science (2014 – present)  
Member of Council Committee on Undergraduate Admissions and Studies (2013 – 2014); co-chair: 2014  
Member of Council Committee of Undergraduate Awards (2014 – 2017); chair: 2016 - 2017  
Chair of Council Committee of Undergraduate Awards (2016– 2017)  
Ex-officio member of Executive of Council (2014 – 2017)  
Chair of President’s Teaching and Learning Scholars adjudication committee (2014 – 2017)  
Chair of Instructional Technology Advisory Group (2014 – 2017)  
Chair of Teaching and Learning Advisory Group (2014 – 2017)  
Chair of the CTL teaching award adjudication committee (2015 – present)  
Faculty of Science representative for Champion College Faculty Forum (2016 – present)  
Adjudicator for the University of Regina Alumni Association Award for Excellence in Teaching (2015 - 2016)  
Member of the Transition from High School to University committee (2014 – 2017)  
Member of Joint Professional Development Transitions committee (2014 – 2017)  
Member of Academic Leadership Group (2014 – 2017)  
Member of Distance and Distributed Learning Committee (2014 – 2017)  
Steering committee member of the University Library strategic plan (2014 – 2016)  
Member of NSERC USRA Selection Committee (2009 and 2013)

**External Services**

Chair of the Teaching and Learning to the Power of Technology 2016 conference organizing committee  
Board of director, COHERE (2014 – 2017)  
Executive member of Sciematics organizing committee (2014 – 2016)  
Chair of the Chemical Institute of Canada South Saskatchewan Local Section (2012 – present)  
Judge of Regina Science Fair (2010 – present)  
Judge of Canada-wide Science Fair (2017)

**Public outreach and presentations:**

1. “Scientific Method and the Conservation of Energy and Mass” for Lifelong Learning Centre at the Centre for Continuing education (May 2016)
2. “National High Altitude Balloon Experiment: Science for Everyone” for Lifelong Learning Centre at the Centre for Continuing education (May 2016)
3. “Journal to the Amazon” for Lifelong Learning Centre at the Centre for Continuing education (November 2015)
4. “My Journal to Iceland and Norway – A Trip for Those who Love Science” for Lifelong Learning Centre at the Centre for Continuing education (June 2015)
5. “Chemistry of Cooking and Food” for Lifelong Learning Centre at the Centre for Continuing education (April 2013)

Scholarly Research

**Publication:**

1. Participation in Peer-led Academic Support Services: One adaptation of a Natural Sciences Peer Learning Model to Enrichment in the Humanities. Stephen Cheng and Susan Johnston. *Journal of Peer Learning*, 2014, 7, 23 -35.

**Conference presentations:**

1. Professional Development Transitions Events for High School Teachers and University Faculty. Stephen Cheng, Reila Bird, Edward Doolittle, Franz Volker Greifenhagen, Joanna Landry, and Juanita Redekopp. 37<sup>th</sup> Annual Society for Teaching and Learning in Higher Education Conference, June 2017.
2. Designing a Contemporary Interdisciplinary Teaching Development Program for Graduate Students. Stephen Cheng, Malin Hansen and Kathryn Ricketts. Educational Developers Caucus 2017 Conference, February 2017.
3. Engaging Youth and Aboriginal Communities with High Altitude Balloon Experiment. David Gerhard and Stephen Cheng. 36<sup>th</sup> Annual Society for Teaching and Learning in Higher Education Conference, June 2016.
4. Creating Learning Communities with High Altitude Balloon Launches Using Open-Source Technologies. David Gerhard and Stephen Cheng. TLt 2016, May 2016.
5. High Altitude Balloon Launch. Stephen Cheng and David Gerhard. 4 H Canada Members Forum, November 2015.
6. Engaging Community Schools in STEM: the High Altitude Balloon Project. David Gerhard and Stephen Cheng. "2<sup>nd</sup> Annual Community-Based Research Showcase, November 2015.
7. The National High Altitude Balloon Experiment: Engaging High School Students to Do Citizen Science. Stephen Cheng and David Gerhard. STEMFEST 2015, September 2015.
8. Incorporate Effective Teaching and Learning Techniques in Large Science Classrooms to Help First Year University Students Transition. Stephen Cheng, 35<sup>th</sup> Annual Society for Teaching and Learning in Higher Education Conference, June 2015.
9. Prezi and PowerPoint Development for an Oral Defense. Kate Cushon and Stephen Cheng. Canadian Doctoral Nursing Network Conference, June 2015.
10. Student-Directed Study Topics for Environmental Science 20. Stephen Cheng, Sciematics 2015, May 2015.
11. Engaging Saskatchewan High School Students with the National High Altitude Balloon Experiment. David Gerhard, Nicole Anderson, Stephen Cheng. Sciematics 2015, May 2015.
12. Space Balloons and Computer Science: Open Source Data Gathering with the National High Altitude Balloon Experiment. David Gerhard and Stephen Cheng. Sciematics 2015, May 2015.
13. A Success Story in the Canadian Prairies - Implementation and Research on Supplemental Instruction at the University of Regina. Stephen Cheng, Susan Johnston and Katherine Arbuthnott. 6th International Conference on Supplemental Instruction, New Orleans, June 2010.
14. Between transition and SI: A Cross-Faculty Adaptation of SI to Support Multiple First Year Classes. Susan Johnston and Stephen Cheng. 6th International Conference on Supplemental Instruction, New Orleans, June 2010.

Dr. Tanya E. S. Dahms

Professor of Biochemistry  
[tanya.dahms@uregina.ca](mailto:tanya.dahms@uregina.ca), (306) 585 -4246

Education and Professional Development

1999 Research Associate, Atomic Force Microscopy, National Research Council Canada (Dr. Linda J. Johnston)  
1998 Post-doctorate, X-ray Crystallography, Purdue University (Dr. Janet L. Smith)  
1996 Doctorate, Time-Resolved Fluorescence and Protein Biophysics, University of Ottawa (Dr. Arthur G. Szabo)  
1990 Bachelor's, Biology and Chemistry, Honours Cooperative, University of Waterloo (Dr. John Honek)

Employment History

2012 – present Professor of Biochemistry, Chemistry and Biochemistry, Science, University of Regina (UofR)  
2017 – 2020 Research Associate Regina Qu'Appelle Regional Health Authority, Regina, SK  
2006 – 2012 Associate Professor of Biochemistry (tenured), Chemistry and Biochemistry, Science, UofR  
2011 – 2011 Environmental Testing Verification (ETV) Consultant, Mainstream Solutions Inc., Regina, SK

Teaching History

**UNDERGRADUATE:** CHEM 102 Introductory Chemistry (2008 (2x), 2016); BIOC 200 Medicinal Plants and Culture (2013 – 2015, 2017)\*; BIOC 220 Introduction to Biochemistry (2009 – 2012, 2014 – 2015); BIOC 320/221 Metabolism (2008, 2010); BIOC 340/821 Introduction to Microscopy (2008 – 2010, 2012 (2x), 2013 – 2015); BIOC 390AA Introduction to Biophysics (2008); BIOC 391 Research Class (2014 (x 2)); BIOC 440 Advanced Microscopy (2012, 2014); BIOC 428 AE Microscopy into Medical Imaging (2015) \* UofR, President's Teaching and Learning Scholar Award (2011-2012) **GRADUATE:** BIOC 800 Literature Review (2012, 2018); BIOC 801 Original Research Proposal (2014, 2015); BIOC 827 Optical and Scanning Probe Microscopy (2013); BIOC 827 AF Scanning Probe Microscopy of Biological Systems (reading class, 2010, 2017); EC&I 890BD Contact Improvisation Dance and Philosophy (2011) **GUEST LECTURES:** FA 300 Mapping Illness (2006) UofR/Interdisciplinary; THEA 437 Contact Improvisation (2007 – 2009) UofR/Theatre; WGST 302 Feminism, Gender and Science (2010)

Student Supervision

Name	Position	Dates of supervision
<b>Postdoctoral</b>		
Nair, Sandhya	Postdoctoral Fellow <sup>a</sup> , Biochemistry	2010
Sultana, Taranum	Research Associate, Biochemistry	2015-present
Bhat, Supriya	Postdoctoral Fellow, Biochemistry	2017
<b>Graduate</b>		
Burns, David	M. Sc. candidate, Biochemistry	2004-2007
Sun, Tianming	M. Sc. candidate, Biophysics	2006-2009
Jun, Dong	Ph. D. candidate <sup>b</sup> , Biophysics	2008-2015
Nair, Sandhya	Ph. D. candidate <sup>a</sup> , Biochemistry	2009-2010
Paul, Biplab	M. Sc. candidate, Biophysics	2009-2012
Eichhorst, Jeff	Ph. D. candidate, Toxicology (UofS, co-supervised)	2009-2012
Tashlikowich, Katrina	M. A. candidate, Interdisciplinary Studies	2011-2012
Bhat, Supriya	M. Sc. candidate, Biophysics <sup>c</sup>	2011-2012
Alkholy, Sarah	Ph. D. candidate, Nutrition (Wayne State University) <sup>d</sup>	2014-2015
Bhat, Supriya	Ph. D. candidate, Biophysics	2013-2016
Zinnat, Shahina	Ph. D. candidate, Biochemistry	2016-
<b>Technician</b>		
Paul, Biplab	Post M. Sc., Biophysics	2013
Bhat, Supriya	Post Ph. D. and maternity leave, Biophysics	2017
<b>Honours</b>		

<b>Clay, Adam</b>	B. Sc. honours candidate, Biochemistry	2009
<b>Madarati, Cheghaf</b>	B. Sc. honours candidate, Biophysics	2011-2012
<b>McGrath, Seamus</b>	B. Sc. honours candidate, Biophysics	2014-2015
<b>Pierce, Alexa</b>	B. Sc. honours candidate, Biochemistry	2015-2016
<b>Summer</b>		
<b>Cuddington, Breanne</b>	B. Sc. co-op candidate, Biochemistry	2008-
<b>McKenzie, Holly</b>	B. Sc./MA candidate, Health Studies <sup>c</sup>	2008-2009
<b>Urban, Ann-Marie</b>	Ph. D. student Education <sup>c</sup>	2008
<b>Abbas, Mariam</b>	B. Sc. candidate, Biochemistry (UofS) NSERC USRA	2009
<b>Herriot, Jon</b>	B. Sc. candidate, Biochemistry NSERC USRA	2010-2012
<b>Signo, Karla</b>	B. Sc. candidate, Biochemistry NSERC USRA	2010-2012
<b>Patterson, Erin</b>	B. Sc. candidate, Biochemistry, volunteer	2011
<b>Beler, Alisha</b>	B. Sc. candidate, Biochemistry, Canadian Cancer Scholar	2011
<b>Madarati, Cheghaf</b>	B. Sc. candidate, Biochemistry, Canadian Cancer Scholar	2011
<b>Graham, Carly</b>	B. Sc. candidate, Biochemistry, Canadian Cancer Scholar	2012
<b>Higgins, Kim</b>	B. Sc. candidate, Biochemistry, Research for BIOC 391	2013
<b>Vantomme, Eric</b>	B. Sc. candidate, Biochemistry NSERC USRA	2013
<b>Idem, Ubong</b>	B. Sc. candidate, Biochemistry NSERC USRA	2014
<b>Zwarych, Spencer</b>	B. Sc. candidate, Biochemistry, Research for BIOC 391	2014
<b>Liu, Claire</b>	B. Sc. candidate, Biochemistry (UofS) NSERC USRA	2014-2015
<b>Kamencic, Belma</b>	B. Sc. candidate, Biology NSERC USRA	2015
<b>Patel, Honey</b>	B. Sc. candidate, Biochemistry, volunteer	2017
<b>Patel, Jahnavi</b>	B. Sc. candidate, Biochemistry, volunteer	2017
<b>High School</b>		
<b>Ali, Samiha</b>	Senior, Biochemistry Science Fair Project	2014

<sup>a</sup>Sandhya had already attained a Ph. D. in India; <sup>b</sup>Andrea left for China (her thesis is written and papers published or submitted); <sup>c</sup>Supriya transferred to a Ph. D. from her M. Sc.; <sup>d</sup>Sarah, a graduate student of Dr. Ferriera, was co-supervised by me and Dr. F. Gendron; <sup>e</sup>I directed Ann-Marie and Holly to conduct research on Sustainable Health initiatives in the province.

#### University Service

**DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY:** Curriculum Committee Member (2014 – present); Equipment and Services Committee Member (2013 – 2016); Seminar Coordinator Fall Semester (2008, 2012); Space Committee Member (2012 – 2015); Nominating (2010 – 2014); Safety Committee Member (2013 – 2015); Graduate Studies Committee Chair (2009 – 2012); Honours Student Research Chair (2010 – 2011); Honours Student Research Vice chair (2009 – 2010); Graduate Student Selection Committee, Member (2008); Library Representative (2008 – 2009) **FACULTY OF SCIENCE:** Criteria Document Committee, Member (2017); Dean Search Committee, Member (2015 – 2016); Nominating Committee, Chair (2016 – 2018); Nominating Committee, Member (2009 – 2015); Faculty of Arts, Faculty of Science Representative (2008 – 2009); Faculty Review Committee, Member (2008) **FACULTY OF GRADUATE STUDIES AND RESEARCH:** NSERC PGSM and PGSD Grant Selection Committee (2008, 2013); Thesis Defense, Chair (2008, 2009, 2010, 2013) **UNIVERSITY OF REGINA:** Council Committee on Budget Chair (2013 – 2015); Ad hoc Committee on Pesticide use on Campus (2013 – 2015); University of Regina Faculty Association Negotiating Team Invited Member (2011 – 2013); Executive of Council Elected Member (2009 – 2012); President’s Committee on Radiation Safety (2008); President’s Research Committee Member Elected by Executive of Council (2008) **EXTERNAL UNIVERSITY-RELATED:** Grant Selection Committee Chair SHRF Biomedical Establishment Grants (2016 – present); Editorial Board Member – Frontiers in Chemistry, Cellular Biochemistry (present); Editorial Board Member – Fungal Biology and Biotechnology (present); Reviewer – Analytical Biochemistry, Biochemistry, Biophysical Journal, Cell Biology, Langmuir, Microbiology, Mycological Research, Journal of Physical Analytical Biochemistry, ACS Nano, BBA Biomembranes, Fungal Biology, Integrative Biology, Journal of Archeological Sciences, Journal of Biotechnology, Microbiology, Mycology, Physical Chemistry Chemical Physics, PLoS Biology, PLoS ONE, Proceedings of the National Academy of Sciences, RSC Advances, Scanning, Soft Matter, Sustainability (2007 – present); Regina Public Interest Group (RPIRG) Advisory Council Member (2013); Prairie Valley Science Fair Judge (2013); Regina Regional Science Fair Prize Contribution – Secured from the Biophysical Society (2013); University of Regina Science Summer Camp Facilitator (2011 – present); Consultant to Dr. Gerald Saul, Media Production and Studies (2008 – present); Regina Regional Science Fair Judge (2008 – present); Who’s Who in Fluorescence – Invited

Member (2008 – present); Grant Selection Committee Member SHRF Biomedical Establishment Grants (2011 – 2014); David Suzuki Foundation, volunteer (2008 – 2013); External Reviewer – NSERC, Brockhouse Award (2011); NSERC Grant Selection (Evaluation Group) Member GSC 32, EG 1501 (2008 – 2011); External Reviewer – National Science Foundation Equipment and MSB (2008); Winston Knoll Science Fair, Judge (2009)

Scholarly Research

**PEER REVIEWED (\* Corresponding Author, HQP in bold, (# citations)):** 1. **Bhat S. V., Sultana T.**, Körnig A., McGrath S., Zinnat S. and Dahms, T. E. S.\* (in review) Correlative atomic force microscopy quantitative imaging-laser scanning confocal microscopy quantifies the impact of stressors on live cells in real-time. *Scientific Reports* 2. **Jun D.**, Minic Z., **Bhat S. V.**, Vanderlinde E. M., Yost C. K., Babu M. and Dahms, T. E. S.\* (accepted) Metabolic Adaptation of a C-Terminal Protease A-Deficient *Rhizobium leguminosarum* in Response to Loss of Nutrient Transport. *Frontiers in Microbiology*. 3. **Bhat S. V., Kamencic B., Zinnat S.,** Körnig A., and Dahms, T. E. S.\* (accepted) Exposure to sub-lethal 2,4-dichlorophenoxyacetic acid arrests cell division and alters cell surface properties in *Escherichia coli*. *Frontiers in Microbiology*. 4. **Zinnat S,** El-Ganiny AM, Minion J, Whiteway M, **Sultana T., Dahms TES.**(accepted). *Cinnamomum zeylanicum* bark essential oil induces cell wall remodelling and spindle defects in *Candida albicans*. *Fungal Biology and Biotechnology*. 5. Alkholy S. O., Gendron F., Dahms T. E. S. and Pontes-Ferreira M.\* (2017) Convergence of Indigenous Science and Western Science Impacts Students' Interest in STEM and Identity as a Scientist. *Ubiquitous Learning: An International Journal* 10, 1-15. 6. Dahms, T. E. S., Bhat, S. V. (2016). Microscopy and "omics" high-content assays to evaluate the impact of environmental contaminants and other xenobiotics. *Microscopy and Analysis* 30(2): 9-15. 7. Zeilinger, S., Gupta, V. K., Dahms, T. E. S., Silva, R. N., Singh, H. B., Upadhyay, R. S., Gomes, E. V., Tsui, C. K.-M. and Nayak, C. (2016). Friends or foes? Emerging insights from fungal interactions with plants. *FEMS Microbiology Reviews* 40, 182-207. (11) 8. **Alkholy, S. O.,** Gendron, F., Dahms, T. E. S., Pontes-Ferreira M. (2015). Assessing student perceptions of indigenous science co-educators, interest in STEM and identity as a scientist: A pilot study. *Ubiquitous Learning*. 7, 41-51. 9. **Bhat, S. V.,** Booth, S. C., Vantomme, E. A. N., Afroj, S., Yost, C. K. and Dahms, T. E. S.\* (2015) Oxidative stress and metabolic perturbations in *Escherichia coli* exposed to sublethal levels of 2,4-dichlorophenoxyacetic acid. *Chemosphere* 135:453-61. (2) 10. **Bhat S. V.,** Booth S. C., McGrath S. G. K. and Dahms T. E. S.\* (2015) *Rhizobium leguminosarum* bv. *viciae* 3841 adapts to 2,4-dichlorophenoxyacetic acid with "auxin-like" morphological changes, cell envelope remodeling and upregulation of central metabolic pathways. *PLoS ONE* 10(4): e0123813. (1) 11. **Gottinger, A. M.\***, **Bhat, S. V.,** McMartin, D. W. and Dahms, T. E. S.\* (2013) Fluorescent Microspheres as Surrogates to Assess (Oo)Cyst Removal Efficacy from a Modified Slow Sand BioFiltration Water Treatment System. *Journal of Water Supply: Research and Technology – AQUA*, 62.3; doi: 10.2166/aqua.2013.104. (2) 12. **Jun, A. D., Signo, K.,** Yost, C. M. and Dahms, T. E. S.\* (2011) AFM of a *ctpA* mutant in *Rhizobium leguminosarum* reveals surface property defects linking *ctpA* function to biofilm formation. *Microbiology* 157, 3049 - 3058. (13) 13. **Paul, B. C.,** El-Ganiny, A., **Abbas, M.,** Kaminskyj, S. and Dahms, T. E. S.\* (2011) The role of galactofuranose in the organization of *Aspergillus nidulans* hyphal wall surfaces. *Eukaryotic Cell* 10, 646-653. (18) 14. Dahms, T. E. S.\*, McMartin, D. W.\* and Petry, R. A.\* (2010) RCE [Regional center of Expertise] Saskatchewan: The Canadian prairies create synergy for urban and rural ESD [education for sustainable development]. *Journal of Education for Sustainable Development* 4, 117-130. (invited) 15. Dahms, T. E. S.\*, McMartin, D. W.\* and Petry, R. A.\* (2008) Saskatchewan's (Canada) regional centre of expertise on ESD. *International Journal of Sustainability in Higher Education* 9, 382-401. (invited) 16. **Wyatt, H. D. M.,** Ashton, N. W., and Dahms, T. E. S.\* (2008) Cell wall architecture of *Physcomitrella patens* is revealed by AFM. *Botany*, 86, 385–397. (6) 17. Kaminskyj, S. G. W. and Dahms, T. E. S.\* (2008) High spatial resolution surface imaging and analysis of fungal cells using SEM and AFM. *Micron* 39, 349-361. (38) (invited review).

**BOOKS (\* Corresponding Author, (# downloads)):** 1. Czymmek, K. J. and Dahms, T. E. S.\* (2015) *Advanced Microscopy in Mycology*. Springer, NY, USA. ISBN 978-3-319-22437-4. (5560) **BOOK CHAPTERS (\* Corresponding Author, HQP in bold, (# downloads))** 1. Czymmek, K. J.\* and Dahms, T. E. S.\* (2015) Future Directions: Advanced Mycological Microscopy. In *Advanced Microscopy in Mycology*. Eds. Czymmek, K. J. and Dahms, T. E. S., Springer, NY, USA, pp 143-162. (667) 2. Dahms, T. E. S.\*, McMartin, D. W.\* , Petry, R. A.\* (2017). Overcoming traditional boundaries in advancing education for sustainable development. Leal W. Handbook of Theory and Practice of Sustainable Development in Higher Education. World Sustainability Series, 111-124. 3. **Paul, B. C., Ma, H., Snook, L. A., Dahms, T. E. S.** (2013). High spatial resolution surface imaging and analysis of fungal cells using AFM and force spectroscopy. *Laboratory Protocols in Fungal Biology*. (1): 151-160. (3830) 4. **Bhat, S. V., Jun, D., Paul, B. C., Dahms, T. E. S.** (2012). Viscoelasticity in biological systems: A special focus on microbes. *Viscoelasticity – From Theory to Biological Applications*. (1): 123-156. (3254) 5. Dahms, T. E. S.\* (2009) Transformation: Body, Mind and Technology. In: #7 Art: Encontro Internacional de Arte e Tecnologia, Venterelli, S. Ed., University of Brasilia Press, Brasilia, Brazil. (invited paper)

## Allan L. L. East

Professor  
 allan.east@uregina.ca, (306) 585 4003

### Education and Professional Development

1989 B.Sc. (1<sup>st</sup> Class Honours) (Chemistry/Mathematics), Brock University (Canada).  
 1994 Ph.D. (Chemistry), Stanford University (USA).

### Employment History

2010: promotion from Associate to Full Professor

### Teaching History

Chem105 (freshman general chemistry), 184-188 students, winter 2013,14  
 Chem250 (sophomore thermodynamics), 19-50 students, winter 2008-09, fall 09-10,13-17  
 Chem251 (sophomore physical chemistry II), 12-19 students, winter 2010,15  
 Chem260 (sophomore molecular structure), 25-50 students, fall 2008  
 Chem360 (junior quantum mechanics), 7-23 students, fall 2009-10,13-17  
 Chem460 (senior quantum mechanics), 4-10 students, winter 2008,09  
 Chem461 (computational chemistry), 5-15 students, winter 2011,12,16  
 Chem867 (postgraduate theoretical chemistry reading course), 6 times, 1 student each time  
 Total: 2+9+2+1+7+2+3 = 26 lecture courses and 6 single-student reading courses.

### Student Supervision

Name	Position	Dates of supervision
Adam Clay	BSc researcher	2008
Johnny Tran	BSc researcher	2010
Colin Kuntz	BSc researcher	2010,2011
	Chem401 Honours researcher	2012
	MSc researcher	2015-
Dan Sandbeck	BSc researcher	2011,2013
	Chem401 Honours researcher	2012
Kyle Gemmell	Chem401 Honours researcher	2013
Chatin Bains	BSc researcher	2013
Ubong Idem	BSc researcher	2013
Williams Usama	BSc researcher	2014
Christine Luu	BSc researcher	2014
Daniel Markewich	BSc researcher	2015
Lucas Hoffert	BSc researcher	2016
Shamneet Dhillon	BSc researcher	2017
Farhad Khalili	M.Eng (co-supervised)	2008
Abrha Molla Wagaye	MSc researcher	2008-2011
Arumugam Jayaraman	MSc researcher	2009-2011
Aneesh Chacko	MSc researcher	2009-2012
Kazi Sumon	PhD (co-supervised)	2008-2013
Nikhil Aravindakshan	PhD researcher	2014-

Ruchit Patel	MSc researcher	2016 winter only
--------------	----------------	------------------

### University Service

University service: committees at the University (5), Faculty (4), and Department (9) level  
 External community service:

- Conference chairman and organizer, 27<sup>th</sup> Canadian Symposium on Theoretical and Computational Chemistry, held July 10-15, 2016 in Regina
- Refereed 58 papers for journals: 27 for Comp Theo Chem/THEOCHEM (Elsevier), 6 for J Phys Chem, 3 for J Chem Eng Data, 3 for Can J Chem,...
- External referee for 3 NSERC Discovery and 2 Professor promotion applications
- High school science fair judge, Regina Regionals ('09,'12,'13,'15) and Nationals ('17)
- 50-minute research seminars: 10 at other universities, 5 here at U of R

### Scholarly Research

1. **“Photochemistry studied with *ab initio* orbital-correlation and state-correlation plots: Classic cyclobutene ring opening, and the reaction of N<sub>2</sub> with photoexcited O<sub>2</sub>,”** H. Shi, D. C. Roettger, and A. L. L. East, *J. Comp. Chem.* **29** (2008), pp. 883-891.
2. “Computational study of tungsten(II)-catalyzed rearrangements of norbornadiene,” A. L. L. East, G. M. Berner, A. D. Morcom, and L. Mihichuk, *J. Chem. Theory Comput.* **4** (2008), pp. 1274-1282.
3. “Nitrous oxide dimer: An *ab initio* coupled-cluster study of isomers, interconversions, and infrared fundamental bands, and experimental observation of a new fundamental for the polar isomer,” G. M. Berner, A. L. L. East, M. Afshari, M. Dehghany, N. Moazzen-Ahmadi, and A. R. W. McKellar, *J. Chem. Phys.* **130** (2009), 164305 (8p).
4. “On the structure and dynamics of secondary n-alkyl cations,” A. L. L. East, T. Bucko, and J. Hafner, *J. Chem. Phys.* **131** (2009), 104314 (10p).
5. “pK<sub>a</sub> values of some piperazines at (298, 303, 313, and 323) K,” F. Khalili, A. Henni, and A. L. L. East, *J. Chem. Eng. Data* **54** (2009), pp. 2914-2917.
6. “Catalyzed beta scission of a carbenium ion III - Scission observed in *ab initio* molecular dynamics simulations,” G. M. Berner and A. L. L. East, *Can. J. Chem.* **87** (2009), pp. 1512-1520.
7. “Entropy contributions in pK<sub>a</sub> computation: Application to alkanolamines and piperazines,” F. Khalili, A. Henni, and A. L. L. East, *J. Mol. Struct. THEOCHEM* **916** (2009) pp. 1-9.
8. “Si-H bond activation by electrophilic phosphinidene complexes,” K. Vaheesar, T. M. Bolton, A. L. L. East, and B. T. Sterenberg, *Organometallics* **29** (2010), pp. 484-490.
9. “Supra-supra, supra-antara, and stepwise-diradical pathways for an observed 16-electron double-[4+4] cycloaddition within metal-templated dialkyne dimers (PtX<sub>2</sub>)<sub>2</sub>(μ-R<sub>2</sub>PCCCCPR<sub>2</sub>)<sub>2</sub>,” A. Chacko, B. T. Sterenberg, and A. L. L. East, *J. Phys. Chem. A* **115** (2011), pp. 4951-4958.
10. “Tungsten(II)-catalyzed rearrangements of norbornadiene: Effects of alternative complexation stages,” A. Jayaraman, G. M. Berner, L. M. Mihichuk, and A. L. L. East, *J Mol. Catal. A: Chemical* **351** (2011) pp. 143-153.
11. “The mechanism of permanganate oxidation of sulfides and sulfoxides,” A. Jayaraman and A. L. L. East, *J. Org. Chem.* **77** (2012), pp. 351-356.

12. "The origin of the conductivity maximum in molten salts. I. Bismuth chloride," A. T. Clay, C. M. Kuntz, K. E. Johnson, and A. L. L. East, *J. Chem. Phys.* **136** (2012), 124504 (11p).
13. "Kinetics and Dissociation Constants ( $pK_a$ ) of Polyamines of Importance in Post-Combustion Carbon Dioxide (CO<sub>2</sub>) Capture Studies," F. Khalili, A. V. Rayer, A. Henni, A. L. L. East and P. Tontiwachwuthikul, in *Recent Advances in Post-Combustion CO<sub>2</sub> Capture Chemistry*, M. I. Attalla ed., ACS Symposium Series; American Chemical Society (Washington DC), 2012.
14. "An Arrhenius argument to explain electrical conductivity maxima versus temperature," C. M. Kuntz and A. L. L. East, *Electrochem. Soc. Trans.* **50**, no. 11 (2012), pp. 71-78.
15. "Predicting pKa of amines for CO<sub>2</sub> capture: computer versus pencil-and-paper," K. Z. Sumon, A. Henni, and A. L. L. East, *Ind. Eng. Chem. Res.* **51** (2012) pp. 11924-11930.
16. "Bite Angle Effects of dppm vs dppe in seven-coordinate complexes: a DFT case study," A. Chacko, U. R. Idem, C. H. Bains, L. M. Mihichuk, and A. L. L. East, *Organometallics* **32** (2013), pp. 5374-5383.
17. "Molecular Dynamics Simulations of Proposed Intermediates in the CO<sub>2</sub> + Aqueous Amine Reaction," K. Z. Sumon, A. Henni, and A. L. L. East, *J. Phys. Chem. Lett.* **5** (2014), pp. 1151-1156.
18. "Challenges in Predicting  $\Delta_{\text{rxn}}G$  in Solution: The Mechanism of Ether-Catalyzed Hydroboration of Alkenes," D. J. S. Sandbeck, C. M. Kuntz, C. Luu, R. A. Mondor, J. G. Ottaviano, A. V. Rayer, K. Z. Sumon, and A. L. L. East, *J. Phys. Chem. A* **118** (2014), pp. 11768-11779.
19. "Semicontinuum Solvation Modeling Improves Predictions of Carbamate Stability in the CO<sub>2</sub> + Aqueous Amine Reaction," K. Z. Sumon, C. H. Bains, D. J. Markewich, A. Henni, and A. L. L. East, *J. Phys. Chem. B* **119** (2015), pp. 12256-12264.
20. "The Carbocation Rearrangement Mechanism, Clarified," D. J. S. Sandbeck, D. J. Markewich, and A. L. L. East, *J. Org. Chem.* **81** (2016), pp. 1410-1415.
21. "Conductivity Maxima vs. Temperature: Grotthuss Conductivity in Aprotic Molten Salts," N. P. Aravindakshan, C. M. Kuntz, K. E. Gemmell, K. E. Johnson, and A. L. L. East, *Electrochem. Soc. Trans.* **75**, no. 15 (2016), pp. 575-583.
22. "The Origin of the Conductivity Maximum in Molten Salts. II. SnCl<sub>2</sub> and HgBr<sub>2</sub>," N. P. Aravindakshan, C. M. Kuntz, K. E. Gemmell, K. E. Johnson, and A. L. L. East, *J. Chem. Phys.* **145** (2016), 094504 (12p).
23. "What Causes the Nonclassical Structure of 2-Norbornyl Ion?," R. A. Patel and A. L. L. East, *Can. J. Chem.* **94** (2016), pp. 1044-1048.

## Dennis William Fitzpatrick

Professor of Biochemistry  
[Dennis.Fitzpatrick@uregina.ca](mailto:Dennis.Fitzpatrick@uregina.ca), 306 337-3332

### Education and Professional Development

- |   |      |
|---|------|
| • Ph.D. Nutritional Biochemistry, Rutgers University, New Brunswick, New Jersey | 1981 |
| • M.Sc. Nutritional Sciences, University of Guelph, Guelph, Ontario             | 1977 |
| • B.Sc. Hon Biological Sciences, University of Guelph, Guelph, Ontario          | 1975 |
| • B.A. Gen Liberal Arts, Queen's University, Kingston, Ontario                  | 1972 |

### Employment History

- |   |                |
|---|----------------|
| • Professor of Biochemistry, Department of Chemistry and Biochemistry, University of Regina                                 | 2013 - current |
| • Vice-President Research and Professor of Biochemistry, Department of Chemistry and Biochemistry, University of Regina     | 2011 – 2013    |
| • Vice-President Research and Professor of Biochemistry, Department of Chemistry and Biochemistry, University of Lethbridge | 2004 – 2009    |

### Teaching History

- |  |   |
|--|---|
| 2013 <ul style="list-style-type: none"> <li>• Biomolecules 220</li> </ul>  | 2014 <ul style="list-style-type: none"> <li>• Chemistry 100</li> <li>• Biochemical Toxicology 390</li> <li>• Graduate Seminar</li> </ul>                              |
| 2015 <ul style="list-style-type: none"> <li>• Chemistry 100</li> <li>• Chemistry 105</li> <li>• Two course buyout</li> </ul>   | 2016 <ul style="list-style-type: none"> <li>• Chemistry 105</li> <li>• Biomolecules 220</li> <li>• Biochemical Toxicology 428</li> <li>• One course buyout</li> </ul> |
| 2017 <ul style="list-style-type: none"> <li>• Biomolecules 220</li> <li>• Biochemical Toxicology 428</li> <li>• Biochemistry 827</li> <li>• Two course buyout</li> </ul> |   |

### Student Supervision

2014 <ul style="list-style-type: none"> <li>• Mohamed Anas, Doctoral Candidate Biology (ongoing)</li> </ul>	2015 <ul style="list-style-type: none"> <li>• Seamus McGrath, Biochemistry, Honors Thesis Committee</li> <li>• Devin Jones, Biochemistry, Honors Thesis Committee</li> </ul>
2016 <ul style="list-style-type: none"> <li>• Molly Wade-Cummings, Biochemistry, Honors Thesis Committee</li> <li>• Fazle Rabbi, Chemistry, Masters Thesis Committee</li> </ul>	2017 <ul style="list-style-type: none"> <li>• Ryan King, Masters Candidate (ongoing)</li> <li>• Qing Zhang, Doctoral Candidate (ongoing)</li> <li>• Shahreen Amin, Masters Candidate (ongoing)</li> </ul>

University Service

- President, University of Regina Faculty Association 2015 - 2018
  - Member, Budget Committee
  - Member, Equity Committee
  - Member, Grievance Committee
  - Member, Sessional Advocacy Committee
  - Member URFA Executive
  - Member URFA Council
  - Delegate, Canadian Association of University Teachers
  - Delegate, Western Canadian Association of University Teachers
  - Delegate, Canadian Labor Council
  - Delegate, Saskatchewan Labor Council
- Chief Contract Negotiator, University of Regina Faculty Association 2014 - 2015
- Member, Faculty of Science Review Committee 2016 - 2018
- Member, Faculty of Science Student Appeal Committee 2013 - 2017
- Member, Faculty of Science Council 2013 - 2017
- Member, Department of Chemistry and Biochemistry Curriculum Committee 2013 - 2017
- Member, Executive Council 2011 - 2013
- Member, Dean's Council 2011 - 2013
- Member, Research Committee 2011 - 2013
- Member, Animal Welfare Committee 2011 - 2013
- Member, Budget Advisory Committee 2011 - 2013
- Member, Space Allocation Committee 2011 - 2013
- Member, Biosafety Committee 2011 - 2013
- Member, Radiation Safety Committee 2011 - 2013

**Service: National and International Boards**

- Member, TRIUMF, Vancouver British Columbia. Vancouver, BC 2012 - 2013
- Member, Canadian Institute for Military and Veteran Health Research, Kingston, ON 2012 - 2013
- Member, HarvestPlus, International Food Policy Research Institute, Washington D.C. 2010 - 2012

**Service: Regional Boards**

- Board Chair and Member, Saskatchewan Research Council, Saskatoon, SK 2011 - current
- Board Chair and Member, IPAC CO2, Regina, SK 2011 - 2013
- Member, Petroleum Technology Research Centre, Regina, SK 2011 - 2013
- Member, International Minerals Innovation Institute. Saskatoon, SK. 2011 - 2013

Scholarly Research

### Capacity Building Initiatives: Centers and Programs – University of Regina

#### Canadian Centre for Public Safety and First Responders

- The center aspires to advance education, training, knowledge and innovation focused on public safety and policing leadership. The objective is to inform and prepare individuals engaged in the provision of policing and public safety services in an effort to foster safer communities. The center is poised to lead innovative research in close association with its partners, aiming to commercialize novel technologies.

#### Biannual Water – Climate Change Policy Conference

- Conference goals: 1) Translate research into language that citizens and decision-makers can act upon; 2) Provide appropriate adaptation practices and technologies examples; and 3) Identify economic incentives and legal frameworks that facilitate adaptation. The audience was international, including key scientists and policy / decision makers from Canada, China, Japan and the United States. The University of Regina, University of Texas at Austin and North China Electric Power University organized the program.

#### China-Canada Institute for Energy, Environment and Sustainability Research China-Canada IEESR

- A University of Regina and North China Electric Power University joint research program, with faculty and student exchanges in the fields of energy, environment, climate change and social adaptation, and pollution reduction for power industries.

#### Clean Energy and Technology Institute CETI

- CETI was created to showcase Faculty of Engineering and Applied Sciences research activities. It provides an organizational framework for International Test Centre for CO<sub>2</sub> Capture activities.

#### Shen Kuo Program

- Developed three elements to Shen Kuo. 1) Canadian graduate students presented their research in Beijing. 2) In partnership with the University of Texas Austin and Xiamen University of Technology English language science courses to be offered Xiamen. 3) Engineering student exchange was developed with the China University of Petroleum Beijing and South West Petroleum University.

#### University of Regina Press

- The Canadian Plains Research Centre Press was refocused, a contemporary business plan developed, a new editor recruited and a vibrant new University Press launched. [ <http://www.uofrpress.ca> ]

### Capacity Building Initiatives: Chairs – University of Regina

- |   |          |             |
|---|----------|-------------|
| • SaskPower Research Chair in Clean Energy in the Faculty of Engineering. Saskatchewan Power Corporation  | \$ 3.5 M | 2012        |
| • CISCO Systems Research Chair in E-Governance in Big Data and Open Government, Johnson-Shoyama Graduate School of Public Policy. CISCO Corporation | \$ 2 M   | 2012 - 2022 |

### Capacity Building Initiatives: Institution Grants – University of Lethbridge

- |  |           |             |
|--|-----------|-------------|
| • Alberta Heritage Foundation for Medical Research AHFMR Polaris Award. Grant to recruit an internationally-renowned neuroscientist and other faculty                  | \$20 M    | 2007 - 2017 |
| • Water Hub. Western Economic Diversification and the United Nations GEMS Program  | \$ 2.25 M | 2010        |
| • Southern Alberta Group for Epigenetic Studies - Epigenetic Regulation of Cell Memory and Stress Response. Canada Foundation for Innovation and Government of Alberta | \$ 8.2 M  | 2009        |
| • Water and Environmental Science Building. Government of Alberta  | \$ 26 M   | 2008        |
| • Equipping the Water and Environmental Sciences Building. Western Economic Diversification  | \$ 3 M    | 2008        |

## Lynn Mihichuk

Associate Professor

[lynn.mihichuk@uregina.ca](mailto:lynn.mihichuk@uregina.ca), (306) 585-4793

### Education and Professional Development

- B.Sc. 1<sup>st</sup> Class Honours Chemistry, University of Waterloo, 1970
- Ph.D. in Chemistry, University of British Columbia, 1975, Thesis work under WR Cullen
- Postdoctoral position, University of Sussex, 1974-1976, (NRC Fellow) with Professors MF Lappert and AW Johnson
- Teaching Postdoctoral position, University of British Columbia, 1976-1978, with WR Cullen

### Employment History

- University of Saskatchewan, (1978-1980) Assistant Professor of Chemistry
- University of Regina, (1980-1985) Assistant Professor of Chemistry, Tenured July 1, 1984
- University of Regina, (1985-present) Associate Professor of Chemistry
- University of Regina, Department Head, July 2006-June 2013
- University of Veszprém, Veszprém, Hungary, (2001-2002) Sabbatical Leave
- University of Regina, July 1, 2013 – December 31, 2013, Administrative Leave

### Teaching History

- Chemistry 230 Inorganic Chemistry I
- Chemistry 310 Analytical Chemistry II
- Chemistry 330 Inorganic Chemistry II
- Chemistry 391 Research Experience
- Chemistry 431/491 Magnetic Resonance Spectroscopy in Inorganic Chemistry
- Chemistry 837AA Graduate Class: Magnetic Resonance Spectroscopy in Inorganic Chemistry

### Student Supervision

Name	Position	Dates of supervision
<b>Tyler Fell</b>	Undergraduate Research Experience (Chem 391)	Jan. 1 - Apr. 30, 2015
<b>Jianxin Cai</b>	Research Associate	June 1 - August 31, 2014
<b>Tyler Fell</b>	Research Associate (part-time)	2015-Present

### University Service

Coordinator for the Western Universities Exchange Speakers Program (Alberta, Saskatchewan, Manitoba)

Program Assistant for University Employee Assistant Program

Faculty of Science Faculty Review Committee and Laboratory Instructors Review Committee  
 Faculty of Science Admissions and Studies Committee

Faculty of Science Student Appeals Committee

Faculty of Science Nominating Committee

Faculty of Science and University Scholarship Committee

Faculty of Science Representative to the Faculty of Social Work

University Executive of Council

Advisory Committee on the President's NSERC Fund

Faculty of Graduate Studies and Research Ph.D. and Accreditation Committee

Departmental Committees: Freshman, Curriculum, Graduate Students, Nominating, Future Directions, Equipment and Services

Departmental Timetable Coordinator and Cooperative Education Chemistry Coordinator

Head, Department of Chemistry and Biochemistry

### Scholarly Research

#### **Publications**

- Hydrides in Liquid Chloroaluminates, D.F. Wassell, K.E. Johnson and L.M. Mihichuk. *J. Phys. Chem. B* **111**, 13578 (2007).

2. Computational Study of Tungsten(II)-Catalyzed Rearrangements of Norbornadiene, A.L.L. East, G.M. Berner, A.D. Morcom and L. Mihichuk. *J. Chem. Theo. and Comp.* **4**, 1274 (2008).
3. Bronsted acidity and the Medium: Fundamentals with a Focus on Ionic Liquids, K.E. Johnson, G.W. Driver and L.M. Mihichuk. *Chem. Phys. Chem.* **12**, 1622 (2011).
4. Tungsten(II)-catalyzed rearrangements of norbornadiene: Effects of alternative complexation stages, A. Jayaraman, G.M. Berner, L.M. Mihichuk and A.L.L. East. *J. Mol. Cat. A: Chem.* **351**, 143 (2011).
5. Bite Angle Effects of dppm vs dppe in seven-coordinate complexes: a DFT case study, A. Chacko, U.R. Idem, C.H. Bains, L.M. Mihichuk and A.L.L. East. *Organomet.* **32**, 5374 (2013).

### **Papers Presented at Conferences**

Acidity in Ionic Liquids. K.E. Johnson, G.W. Driver and L.M. Mihichuk. Paper accepted (December, 2010) for presentation at the Fray International Symposium (November 27 – December 1, 2011) in Cancun, Mexico.

Mechanistic Studies of Ring Opening Metathesis Polymerization Reactions Involving “*in situ*” Generation of Carbenes. A. Jayaraman, G.M. Berner, A.L.L. East, L. Mihichuk. Poster presentation at the 21<sup>st</sup> Canadian Symposium on Catalysis (May 9-12, 2010) in Banff, Alberta.

## Renata Raina-Fulton

Professor and Head  
[renata.raina@uregina.ca](mailto:renata.raina@uregina.ca), (306) 585 4012,

### Education and Professional Development

Postdoctoral Fellowship, University of Alberta, Analytical Chemistry, 1991-1992, Supervisor: Dr. F. F. Cantwell; Ph. D University of Saskatchewan, Analytical Chemistry 1991, Supervisor Dr. R. Cassidy; B Sc. Honours Chemistry, Supervisor Dr. O.E. Hileman, McMaster University, 1988.

### Employment History

University of Regina, Department of Chemistry & Biochemistry positions: Head, Department of Chemistry & Biochemistry, July 2013-present; Professor 2014-present, Associate Professor 2002-2014; Director Trace Analysis Facility, 2005.

### Teaching History

CHEM210 (Analytical Chemistry I), CHEM/BIOC312 (Analytical Chemistry III), CHEM491-AG/817AA (previously CHEM411) Advanced Techniques in Analytical Chemistry: Mass Spectrometry in Chromatography; CHEM 817AB and CHEM491AB Inductively Coupled Plasma-Mass Spectrometry; CHEM105 (General Chemistry II) and previously CHEM102; CHEM391 Research Experience; As department Head chair and review member of all CHEM/BIOC800(Literature Review)/801 (Research Proposal) committees as well as all progress report meetings for M Sc. and Ph. D students.

### Student Supervision

Name	Position	Dates of supervision
Aisha Mohammad	M Sc. Candidate	Winter 2017
Asal Behdarvandan	M Sc. candidate	Fall 2016-present
Ghada Aborkhees	M Sc. candidate	Summer 2015-present
Liu Yang	M Sc. candidate	Complete 2016
Noof Edan Al-Zahrani	M. Sc. candidate	Completed 2013
Nicole Dunn (Fergus)	M. Sc. candidate	Completed 2012
Erica Smith	M. Sc. candidate	Completed 2012
Michelle Etter	M Sc. candidate	Completed 2010
Patricia L. Hall	Ph D. candidate	Completed 2010
Lina Sun	M Sc. candidate	Completed 2009
Ian Cowan	undergraduate	Summer 2014
Naomi Kwong	undergraduate	Fall 2013
Mishal Nawaz	undergraduate	Summer 2013
Sean Gibbons	undergraduate	Summer 2013
Bryanna Sigurdson	undergraduate	2008-2009
Erika Smith	undergraduate	2008
Adrian Clark	undergraduate	2008-2009
Kevin Stark	undergraduate	Summer 2007, 2008, 2009
Katherine Buehler	Research assistant; technician TAF	2006-2207; 2007-2009

### University Service

Head, Department of Chemistry & Biochemistry 2013-present; department committees (member):space committee 2005-2013; introductory chemistry committee 2005-2012; graduate student review committee 2006-2007; biochemistry search member 2002-2003; department academic advising 2002-2012. University of Regina committees (member):Academic leadership Group (2013 –present); Science Student Appeals Committee 2013; Search Committee for Associate VP (Academic & Research) 2013; Graduate Student & Research Representative, Academic Program Review Committee, 2011-2012; Science Faculty Review Committee (2009); Science Representative to Faculty of Education 2008. External community service: SETAC (Society of Environmental toxicology & Chemistry), Committee Member of Science Committee 2007-present; Peer Review Member of the Northern Contaminants program, Indian and Northern Affairs Canada, yearly research proposal review (2010-present), blueprint review Sept 2011 and scientific reviewer in 2013 for Indian and Northern Affairs Canada draft CACAR (Canadian Arctic Contaminants Assessment Report) III for POPs assessment report, 2002; Director membership (elected), CPANS-A&WMA (Canadian Prairie and Northern Section of Air and Waste management association), 2007-2015; Invited Peer Review Panel Member for Canada/US Great Lakes Integrated Atmospheric Deposition Network (IADN), Tampa Bay, Florida, Nov 2008;City of Regina , Integrated Pest Management Advisory Committee, member 2007-2008; Water Quality Panel member-Environmental Advisory Committee, City of Regina, May 30, 2013, PNW (Pacific Northwest)-SETAC Contaminants Workgroup member 2011-2014. Session organizer of SETAC 37<sup>th</sup>, 34<sup>th</sup>, and 33<sup>rd</sup> annual meetings in 2016, 2013, and 2012; organizing team member for SEIMA/CPANS Air Quality in Saskatchewan Workshop 2014 and organized and chair of CPANS-A&WMA workshop Winnipeg, 2007; Co-organizer and co-chair session at 95<sup>th</sup> and 88<sup>th</sup> CSC Conference in 2012 and 2005.

### Scholarly Research

#### 7. JOURNAL PUBLICATIONS:

**1. R. Raina-Fulton**, Ghada Aborkhees, and Asal Behdarvandan (2017) Analysis of herbicide and/or pesticide residues in dietary botanical supplements. *Encyclopedia of Analytical Chemistry*, A9603, 1-126, accepted Nov 2017; **2. R. Raina-Fulton** and Behdarvandan, A. (2016). Liquid Chromatography-mass spectrometry for the determination of neonicotinoid insecticides and their metabolites in biological, environmental and food commodity matrices, *Trends in Chromatography*, 10, 51-79. Research Trends (P) Ltd., Trivandrum, India, ISSN: 0972-8635; **3. R. Raina-Fulton** and L. Yang (2016) Analysis of Orphan and Difficult Herbicide and/or Pesticides. *Encyclopedia of Analytical Chemistry*, A9603, 1-33. DOI: 10.1002/9780470027318.a9603; **4. R. Raina-Fulton**. (2014) Determination of neonicotinoid insecticides and strobilurin fungicides in particle phase atmospheric samples by liquid chromatography-tandem mass spectrometry. *Journal of Agriculture and Food Chemistry*, under review November 19, 2014; **5. R. Raina-Fulton**. (2015) Determination of Neonicotinoid Insecticides and Strobilurin Fungicides in Particle Phase Atmospheric Samples by Liquid Chromatography-Tandem Mass Spectrometry. *J. Agric. and Food Chem.*63(21): 5152-5162; **6. R. Raina-Fulton**. (2015). New Trends in Pesticide Residue Analysis in Cereals, Nutraceuticals, Baby Foods, and Related Processed Consumer Products. *J. AOAC Int.*98(5): 1163-1170. **7. S. Sura, M. J. Waiser, V. Tumber, R. Raina-Fulton, A. J. Cessna** (2015) Effects of a herbicide mixture on primary and bacterial productivity in four prairie wetlands with varying salinities: An enclosure approach. *Science of the Total Environment* 512–513, 526–539; **8. R. Raina-Fulton**. (2014) A review for the Analysis of Orphan and Difficult Pesticides: Glyphosate, Glufosinate, Quaternary Ammonium and Phenoxy Acid Herbicides; Dithiocarbamate and Phthalamide Fungicides. Review, *J. AOAC Int.*, 97 (4), 965-977; **9. R. Raina**, E. Smith. (2012) Detection of Azole Fungicides in Atmospheric Samples Collected in the Canadian Prairies. *J. AOAC Int.*, 95 (5) 1350-1356; **10. D. Degenhardt, D. Humpries, A. J. Cessna, P. Messing, P. H. Badiou, R. Raina, A. Farenhorst, D. Pennock**. (2012) Dissipation of glyphosphate and aminomethylphosphonic acid in water and sediment of two Canadian prairie wetlands, *J. Environmental Science and Health, Part B*, 47 (7) 631-639; **11. D. Degenhardt, A. Cessna, R. Raina, A. Farenhorst, D. Pennock**. (2011) Dissipation of herbicides in water and sediment of two Canadian prairie wetlands. *Journal of Environmental Toxicology and Chemistry*, 30 (9), 1982-1989; **12. R. Raina**, M.L Etter, K. Buehler, K. Starks, Y. Yowin. (2011) Phenoxyacid herbicides in stormwater retention ponds: urban inputs. *American Journal of Analytical*

*Chemistry*, 2, 962-970; **13. R. Raina**, P. Hall, L. Sun. (2010) Occurrence and Relationship of Organophosphorus Insecticides and their Degradation Products in the Atmosphere in Western Canada Agricultural Regions, *Environmental Science and Technology*, 44, 8541-8546; **14. R. Raina**, P. Hall. (2010) Field Evaluation of Solid Sorbents for Ambient Air Sampling of Pesticides, *Air, Soil, and Water Research*, 3, 57-66; **15. R. Raina**, M.L. Etter. (2010) Liquid chromatography with post-column reagent addition of ammonia in methanol coupled to negative ion electrospray ionization tandem mass spectrometry for determination of phenoxyacid herbicides and their degradation products in surface water, *Analytical Chemistry Insights*, 5, 1-15; **16. D. Degenhardt, A. Cessna, R. Raina, D. Pennock, A. Farenhorst.** (2010) Trace level determination of selected sulfonylurea herbicides in wetland sediment by liquid chromatography-positive ion electrospray tandem mass spectrometry, *Journal of Environmental Science and Health, Part B: Pesticides, Food Contaminants, and Agricultural Waste*, 45(1), 11-24; **17. R. Raina**, W. Belzer, K. Jones. (2009) Atmosphere Concentrations of captan and folpet in the Lower Fraser Valley agricultural region of Canada, *Journal of Air, Soil, Water Research* 2, 41-49; **18. C. Thrift, K. Wilkening, H. Myers, R. Raina.** (2009) The Influence of Science on Canada's Foreign Policy on Persistent Organic Pollutants (1985-2001). *Journal of Environmental Science & Policy*, 12, 981-993; **19. N. Mahinpey, P. Murugan, T. Mani, R. Raina.** (2009) Analysis of Bio-Oil, Biogas, and Biochar from Pressurized Pyrolysis of Wheat Straw Using a Tubular Reactor, *Energy & Fuels*, 23, 2736-2742; **20. R. Raina**, P.Hall. (2008) Comparison of Gas Chromatography-Mass Spectrometry with Electron Ionization and Negative-Ion Chemical Ionization for Analyses of Pesticides at Trace Levels in Atmospheric Samples, *Analytical Chemistry Insights*, 3, 111-125; **21. R. Raina**, L. Sun. (2008) Trace level determination of selected organophosphorus pesticides and their degradates in environmental air samples by liquid chromatography-positive ion electrospray tandem mass spectrometry, *Journal of Environmental Science and Health, Part B: Pesticides, Food Contaminants, and Agricultural Waste*, 43, 323-332; **22. R. Bailey (Raina-Fulton)** and W. Belzer. (2007) Large Volume Cold On-Column Injection for Gas Chromatography-Negative Chemical Ionization-Mass Spectrometry Analysis of Selected Pesticides in Air Samples" *Journal of Agriculture and Food Chemistry*, 55(4), 1150-1155.

#### Book Chapters

**1. R. Raina-Fulton**, N. Dunn, Z. Xie (2017), Chapter 4: Pesticides and Their Degradation Products Including Metabolites: Chromatography-Mass Spectrometry Methods, ed. Aliofkhazraei, M., Intech, Rijeka, Croatia, DOI: 10.5772/65165; **2. R. Raina-Fulton**, Chapter 2, Neonicotinoid Insecticides: Environmental Occurrence in Soil, Water and Atmospheric Particles, Avid Sciences, pp 2-38, July 2016, available at <http://www.avidscience.com/wp-content/uploads/2016/08/PST-16-02.pdf>, in Pesticides ISBN: 978-93-86337-19-1; **3. R. Raina-Fulton**, L. Yang, N. Alzahrani, in Chlorpyrifos: Toxicological Properties, Uses and Effects on Human Health and the Environment. Book Chapter: Chlorpyrifos: Environmental Occurrence in the Atmosphere and Water, January 2015, pp 100-115. Nova Science Publishers.; **4. R. Raina-Fulton**, Improving Sensitivity and Selectivity in Pesticide Analysis with GC-MS and GC-MS-MS. Bush L, Advanstar Pharmaceutical. 2015, Advances in GC-MS Analysis of Pesticides (e-book): 4-19, publisher LCGC; **5. R. Raina-Fulton**, P. Hall, N. Alzahrani, Chapter 10, pp 201-230, Perspective on Changes in Atmospheric Concentrations of Lindane, and the Pre-Emergent Herbicides (Trifluralin, Ethalfluralin, Triallate) in the Canadian Prairies, American Chemical Society Symposium Series 1149, Occurrence, Fate and Impacts of Atmospheric Pollutants, web published November 8, 2013, ISBN13: 978081228900, eISBN: 9780841228917, DOI: 10.10211, bk-2013-1149, editors L. L. McConnell, J. Dachs, C. J. Hapeman. <http://pubs.acs.org/doi/pdf/10.1021/bk-2013-1149.ch010> (ACS refereed book chapter); **6. R. Raina**, Chapter 5, Chemical Analysis of Pesticides using GC/MS, GC/MS/MS, and LC/MS/MS in Pesticides Strategies for Pesticide Analysis, edited by M. Stoytcheva, INTECH, ISBN 978-953-307-460-3, Jan 2011, [www.intechopen.com](http://www.intechopen.com) (over 14,000 downloads).

## Robert Scott Murphy

Professor

[scott.murphy@uregina.ca](mailto:scott.murphy@uregina.ca), (306)

585-4247

### Education and Professional Development

1995-2000, PhD in Physical Organic Chemistry, Department of Chemistry, University of Victoria

1991-1995, BSc in Chemistry, Department of Chemistry, University of Prince Edward Island

### Employment History

July 2017-present, Professor, Department of Chemistry and Biochemistry, University of Regina; May 2015-present, Materials Group Leader, Max Planck Institute for the Structure and Dynamics of Matter (MPSD), Atomically Resolved Dynamics Department, Hamburg, Germany; July-December 2017, Visiting Professor, MPSD, Atomically Resolved Dynamics Department, Hamburg, Germany; July 2008-June 2017, Associate Professor, Department of Chemistry and Biochemistry, University of Regina; January-August 2014, Visiting Associate Professor, MPSD, Atomically Resolved Dynamics Department, Hamburg, Germany; January-August 2010, Visiting Associate Professor, Department of Chemistry, University of Calgary; July 2002-June 2008, Assistant Professor, Department of Chemistry and Biochemistry, University of Regina; February 2000-June 2002, Postdoctoral Fellow, Department of Chemistry, University of Toronto.

### Teaching History

CHEM 140-Organic Chemistry I; CHEM 251-Physical Chemistry II; CHEM 391-Research Experience; CHEM 444-Photochemistry; CHEM 445-Supramolecular Chemistry; CHEM 492AB-Advanced Topics in Supramolecular Organic Photochemistry; CHEM 847AB-Photochemistry; CHEM 847AE-Supramolecular Photochemistry and Photophysics; CHEM 847AF-Supramolecular Chemistry.

### Student Supervision

Name	Position	Dates of supervision
<b>Kelti Smith</b>	Undergraduate	2017-present; 2016; 2015
<b>Hillary Mehlhorn</b>	Undergraduate	2017
<b>Jordan Rothwell</b>	MSc	2017-present
<b>Tyrell Wees</b>	Undergraduate	2016-2017
<b>Sean Myers</b>	Undergraduate	2016-2017
<b>Hanlin Hu</b>	PhD (co-supervised)	2016-2017
<b>Sylvia Okonofua</b>	Undergraduate	2016
<b>Zach Horvath</b>	Undergraduate	2016
<b>Jianxin Cai</b>	Research Associate MSc	2015-16; 2013-14; 2012-13; 2011-12 2008-2011
<b>Andreas Rossos</b>	PDF (co-supervised)	2014-present
<b>Maria Katsiaflaka</b>	PhD (co-supervised)	2014-present

<b>Jemeli Sang</b>	MSc	2013-2017
<b>Yamuna Kandasamy</b>	PhD	2010-2016
<b>Ashley Williams</b>	Undergraduate	2015
<b>Alisha Beler</b>	Research Associate Undergraduate	2012-2013 2012
<b>Roya Nabi</b>	Undergraduate	2012
<b>John G. Ottaviano</b>	Research Associate Undergraduate	2012-2013 2011-2012
<b>Patrick D. Andrews</b>	Undergraduate	2011-2012
<b>Madiha Masawer</b>	Research Associate	2011
<b>Amani Farhat</b>	Undergraduate	2009
<b>Jarod Moore</b>	Undergraduate	2009-2010
<b>Ryan Scott</b>	Undergraduate	2008
<b>Tara Hicks</b>	Undergraduate	2008
<b>Lindsay Selzler</b>	Research Associate	2007-2008
<b>Tobechi Okwuonu</b>	MSc	2006-2007

### University Service

**External community:** 2012-present, Treasurer and Founding Director of the Association of the Chemical Profession of Saskatchewan (ACPS); 2012-present, Treasurer of the Chemical Institute of Canada (CIC) South Saskatchewan Local Section; 2016-2017, Member of the Saskatchewan Science Centre Audit and Finance Committee; 2016-2017, Member of the Saskatchewan Science Centre Board of Directors; 2016, External Examiner, Ph.D. thesis, Ms. Danielle Wilson, Simon Fraser University; 2014, Reviewer of an Israel Ministry of Science, Technology and Space proposal; 2013-2015, Member of the American Society for Photobiology (ASP) Education and Outreach Committee; 2012, National Science Foundation (NSF) Reviewer; 2011-2015, Member of the ASP Associate Members and Mentoring Committee; 2010-11, Principal Organizer and Host of the XVI Reactive Intermediates Student Exchange (RISE) Conference, University of Regina; 2010, Co-chair of the Modern Physical Organic Chemistry symposium (OR6) at the 93rd Conference of the Canadian Society for Chemistry, Toronto, ON;

2010, External Examiner, M.Sc. thesis, Mrs. Stephanie Vennhuis-MacNeil, University of Prince Edward Island; 2008-2011, SHRF Biomedical Personnel Awards Review Committee; 2007, Chair of the Polymolecular and Supramolecular Photochromism symposium at the International Symposium on Photochromism, Vancouver, BC; 2004-2012, NSERC Reviewer for four proposals in the Discovery Grant program; 2003-2008, District Coordinator for the CIC Canadian Chemistry Contest; 2007-2016, Presentations at 16 Public Outreach Events.

**University:** 2015-2017, Vice-Chair of the Council Committee on Budget; 2015-2017, Faculty of Science representative to the Executive of Council; 2016, Member of the Reappointment Committee for the Director of the CCE; 2015, Member of a Faculty Search Committee for the hiring of a Laboratory Instructor in Chemistry and Biochemistry; 2012, Member of a Faculty Search Committee for the hiring of a Lecturer in Chemistry; 2011, Member of the Faculty of Science Safety Committee; 2011, Member of a Decanal Search Committee for the hiring of Dean, Faculty of Science; 2010-2011, Member of a Faculty Search Committee for the hiring of an Assistant Professor in

Biochemistry; 2009-2012, Member of the Faculty of Graduate Studies and Research Scholarship and Awards Committee; 2008-2012, Faculty of Science representative to the Executive of Council; 2008-2009, Member of the Faculty of Science Academic Review Committee; 2008, Member of a Faculty Search Committee for the hiring of a Lecturer in Chemistry; 2007, Chair of the NSERC Undergraduate Student Research Award Selection Committee; 2007-2012, Faculty of Graduate Studies and Research representative as Chair or External Examiner of 7 Student Examination Committees; 2007-2017, Member of 16 Student Thesis Committees.

### Scholarly Research

## 8. REFERRED PUBLICATIONS

1. Siddiqui, K.M.; Corthey, G.; Hayes, S.A.; Rossos, A.; Badali, D.S.; Xian, R.; Murphy, R.S.; Whitaker, B.J.; Miller, R.J.D. (2016) Synchronized Photoreversion of Spirooxazine Ring Opening in Thin Crystals to Uncover Ultrafast Dynamics. *CrystEngComm*, 18, 7212-7216.
2. Tempelaar, R.; Halpin, A.; Johnson, P.J.M.; Cai, J.; Murphy, R.S.; Knoester, J.; Miller, R.J.D.; Jansen, T.L.C. (2016) Laser-limited Signatures of Quantum Coherence. *Journal of Physical Chemistry A*, 120, 3042-3048.
3. Kandasamy, Y.; Cai, J.; Ottaviano, J.G.; Smith, K.A.; Williams, A.N.; Moore, J.; Louis, K.M.; Selzler, L.; Beler, A.; Okwuonu, T.; Murphy, R.S. (2016) Photocontrol of Ion Permeation in Lipid Vesicles with (Bola)amphiphilic Spirooxazines. *Organic & Biomolecular Chemistry*, 14, 296-308.
4. Kandasamy, Y.; Cai, J.; Beler, A.; Sang, M.-S.J.; Andrews, P.D.; Murphy, R.S. (2015) Photocontrol of Ion Permeation in Lipid Vesicles with Amphiphilic Dithienylethenes. *Organic & Biomolecular Chemistry*, 13, 2652-2663.
5. Halpin, A.; Johnson, P.J.M.; Tempelaar, R.; Murphy, R.S.; Knoester, J.; Jansen, T.L.C.; Miller, R.J.D. (2014) Two-dimensional Spectroscopy of a Molecular Dimer Unveils the Effects of Vibronic Coupling on Exciton Coherences. *Nature Chemistry*, 6, 196-201.
6. Ottaviano, J.G.; Cai, J.; Murphy, R.S. (2014) Assessing the Decontamination Efficiency of a Three- Component Flocculating System in the Treatment of Oilfield-Produced Water. *Water Research*, 52, 122- 130.
7. Halpin, A.; Johnson, P.J.M.; Murphy, R.S.; Prokhorenko, V.I.; Miller, R.J.D. (2013) Two-dimensional Electronic Spectroscopy of a Model Dimer System. *European Physical Journal Web of Conferences*, 41, 05032 (pp 1-3).
8. Cai, J.; Farhat, A.; Tsitovitch, P.B.; Bodani, V.; Toogood, R.D.; Murphy, R.S. (2010) Synthesis and Photochromism of 1,2-Bis(5-aryl-2-phenylethynylthien-3-yl)hexafluorocyclopentene Derivatives. *Journal of Photochemistry and Photobiology A: Chemistry*, 212, 176-182.
9. Bai, Y.; Louis, K.M.; Murphy, R.S. (2007) Photochromism of 1,2-Bis(2-methyl-5-phenylthien-3-yl)perfluoro-cyclopentene in Liposomes. *Journal of Photochemistry and Photobiology A: Chemistry*, 192, 130-141.
10. Louis, K.M.; Kahan, T.; Morley, D.; Peti, N.; Murphy, R.S. (2007) Photochromism of Spirooxazines with Elements of Lipid Complementarity in Solution and Liposomes. *Journal of Photochemistry and Photobiology A: Chemistry*, 189, 224-231.

## 9. BOOK

11. Murphy, R.S. (2009) *The Dynamics of Guest Complexation with Cyclodextrins: A Photophysical Study*; VDM Publishing House: Germany; 134 pp.

## Erika Smith

Lab Instructor II

[Erika.Smith@uregina.ca](mailto:Erika.Smith@uregina.ca), (306) 585-4277,

### Education and Professional Development

<b>Masters of Science – Analytical Environmental Chemistry</b> University of Regina, Regina, SK	2012
<b>Bachelor of Science – Chemistry</b> University of Regina, Regina, SK	2008
<b>Grade 12 Diploma</b> Martin Collegiate Institute, Regina, SK	1998
<b>Professional Development &amp; Continuing Education</b>	
• W.E. Harris Chemistry Teaching Workshop, <i>Teaching Analytical Chemistry</i>	2016
• W.E. Harris Chemistry Teaching Workshop, <i>Enhancing the Undergraduate Experience: To the Curriculum and Beyond!</i>	2014
• W.E. Harris Chemistry Teaching Workshop, <i>Concepts and Misconceptions in Chemistry</i>	2012

### Employment History

Appointment to Tenure Track Lab Instructor I	July 18, 2011
Merit	July 01, 2014
Tenure Granted	July 01, 2015
Promotion to Lab Instructor II	July 01, 2015

### Teaching History

<u>Semester</u>	<u>Course</u>	<u>Role</u>	<u>Number of Sections</u>
201730	CHEM210	Laboratory Instructor	3
	CHEM250	Laboratory Instructor	3

### Teaching History continued

<u>Semester</u>	<u>Course</u>	<u>Role</u>	<u>Number of Sections</u>
201710	CHEM215	Laboratory Instructor	2
	CHEM251	Laboratory Instructor	1
	CHEM312/BIOC312	Laboratory Instructor	2
201630	CHEM210	Laboratory Instructor	3

	CHEM250	Laboratory Instructor	3
201620	CHEM104	Lecturer	1
	CHEM104	Laboratory Instructor	1
201610	CHEM215	Laboratory Instructor	2
	CHEM251	Laboratory Instructor	1
	CHEM312/BIOC312	Laboratory Instructor	2
201530	CHEM210	Laboratory Instructor	3
	CHEM250	Laboratory Instructor	3
201510	CHEM215	Laboratory Instructor	2
	CHEM251	Laboratory Instructor	1
	CHEM312/BIOC312	Laboratory Instructor	2
201430	CHEM210	Laboratory Instructor	3
	CHEM250	Laboratory Instructor	3
201410	CHEM215	Laboratory Instructor	2
	CHEM251	Laboratory Instructor	1
	CHEM312/BIOC312	Laboratory Instructor	2
201330	CHEM210	Laboratory Instructor	3
	CHEM250	Laboratory Instructor	2
	CHEM250	Supervised Teaching Assistant	1
201310	CHEM215	Laboratory Instructor	3
	CHEM251	Supervised Teaching Assistant	1
	CHEM312/BIOC312	Laboratory Instructor	2

**Teaching History continued**

<u>Semester</u>	<u>Course</u>	<u>Role</u>	<u>Number of Sections</u>
201230	CHEM210	Laboratory Instructor	3
	CHEM250	Laboratory Instructor	2
	CHEM250	Supervised Teaching Assistant	1
201210	CHEM215	Laboratory Instructor	3
	CHEM251	Supervised Teaching Assistant	1
	CHEM312/BIOC312	Laboratory Instructor	2
	CHEM805	Laboratory Instructor	1

201130	CHEM210	Laboratory Instructor	4
	CHEM250	Laboratory Instructor	1
	CHEM250	Supervised Teaching Assistant	2

### Student Supervision

I have supervised one teaching assistant per semester since 201130. For 2011 – 2013 the TAs were responsible for lab demonstration as well as report marking. For 2014 – 2017 the TA was responsible for lab preparation (chemical and equipment) and report marking.

### University Service

Physics Term Lab Instructor Hiring Committee	April 2017 – June 2017
Chemistry Term Lab Instructor Hiring Committee	May 2016 – Aug 2016
Department Space Committee	Sept 2015 – present
Department Science Outreach Committee	June 2012 – July 2016
Department Safety Committee	June 2013 – July 2015
Lab Instructor Review Committee	Sept 2012 – Aug 2015
Chemistry Lecturer Hiring Committee	Nov 2012

### Scholarly Research

- M.Sc. thesis research titled, “Determination of Azole Fungicides in Atmospheric Samples Collected in the Canadian Prairies by LC/MS/MS” defended Dec 2011
- R. Raina, **E. Smith. (2012)** Detection of Azole Fungicides in Atmospheric Samples Collected in the Canadian Prairies. *J. AOAC Int.*, 95 (5) 1350-1356;

## Brian T. Sterenberg

Associate Professor  
 brian.sterenberg@uregina.ca, (306) 585-4106.

### Education and Professional Development

- 1991-1997 University of Alberta, Edmonton, Alberta, Canada. Ph. D. (Chemistry), supervisor Professor Martin Cowie. Degree awarded 1997. Thesis Title: "The Organometallic Chemistry of Heterobimetallic Complexes Involving Group 8 and Group 9 Metals."
- 1987-1991 University of Alberta, Edmonton, Alberta, Canada. B. Sc. Honours with Distinction (Chemistry). Degree awarded 1991.

### Employment History

- 2016 (Jan-June) Acting Head, Department of Chemistry & Biochemistry
- 2008- Associate Professor, Department of Chemistry & Biochemistry, University of Regina

### Teaching History

- CHEM 102 Introductory Chemistry (2007, 2008)
- CHEM 104 Introductory Chemistry (2009, 2010, 2014, 2016)
- CHEM 140 Organic Chemistry I (2017)
- CHEM 215 Analytical Chemistry II (2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017)
- CHEM 230 Inorganic Chemistry I (2007, 2008, 2009, 2010, 2011, 2012, 2014)
- CHEM 430/837AC Advanced Main Group Chemistry (2008, 2015, 2016)
- CHEM 433/837AB Advanced Organometallic Chemistry (2007, 2009, 2010, 2012, 2013, 2015)

### Student Supervision

Name	Position	Dates of supervision
Hillary Mehlhorn	Undergraduate project	2017
Hamdi Bumraiwha	PhD Candidate	2016-
Ryan King	MSc Candidate	2015-
Shrikant Nilewar	PhD Candidate	2015-
Chris Zerr	Honour's thesis	2015-2016
Tyler Jacob	Undergraduate project	2014
Jeff Bisskey	Undergraduate project	2014

Arumugam Jayaraman	PhD	2011-2016
Colin Kuntz	Undergraduate project	2011
Rakesh Rajagopalan	PhD	2009-2014
Kandasamy Vaheesar	PhD	2009-2013
Chris Berger	Honour's thesis	2008-2009
Jordan Tsui	Honour's thesis	2007-2009

### University Service

Chemistry/Biochemistry Curriculum Committee, Chair (2014- )  
 Chemistry/Biochemistry Grad Coordinator (2012- )  
 Faculty of Graduate Studies and Research PhD Committee Member (2012- )  
 Faculty of Science Admissions and Studies Committee Member (2008- )  
 Faculty of Science Safety Committee Member (2007- )  
 Chemistry/Biochemistry Introductory Chemistry Committee Member (2007- )  
 Faculty of Graduate Studies and Research NSERC PGSD Selection Committee Member (2016)  
 Council Committee on the Academic Mission Member (2013-2015)  
 CCAM Sub-committee on Academic Reviews Chair (2013-2015)  
 Chemistry/Biochemistry Honours Coordinator (2012-2013, 2007-2008)  
 Executive of Council Member (2010-2012, 2007-2009)  
 Chemistry/Biochemistry Space Committee Member (2008-2011)  
 Chemistry/Biochemistry Equipment & Services Committee Member (2008-2011)  
 Faculty of Science Representative to the Faculty of Arts (2007-2008)  
 Regional Science Fair Judge (2007-2017)  
 National Science Fair Judge (2017)  
 Science Rendezvous Demonstrator (2015, 2016)

### Scholarly Research

Refereed publications:

16. Arumugam Jayaraman, Shrikant Nilewar, Tyler V. Jacob, and Brian T. Sterenberg, "Sequential Electrophilic Substitution Reactions of Tungsten-Coordinated Phosphenium Ions and Phosphine Triflates." *ACS Omega* **2017**, 2, 7849–7861.
15. Shelby Hubick, Arumugam Jayaraman, Alexander McKeen, Shelby Reid, Jane Alcorn, John Stavrinides, Brian T Sterenberg, A potent synthetic inorganic antibiotic with activity against drug-resistant pathogens. *Scientific Reports* **2017**, 17, 41999.
14. Arumugam Jayaraman and Brian T. Sterenberg, Phosphorus–Carbon Bond Forming Reactions of Diphenylphosphenium and Diphenylphosphine Triflate Complexes of Tungsten. *Organometallics* **2016**, 35 (14), 2367-2377.
13. Arumugam Jayaraman, Tyler V. Jacob, Jeff Bisskey, Brian T. Sterenberg, "Sequential electrophilic P–C bond formation in metal-coordinated chlorophosphines." *Dalton Transactions*, **2015**, 44, 8788-8791.
12. Brian T. Sterenberg, Christian T. Wrigley and Richard J. Puddephatt, "Binuclear Platinum-Iridium Complexes: Synthesis, Reactivity and Luminescence." *Dalton Transactions*, **2015**, 44, 5555-5568.

11. Christina Jepson, Katja Karppinen, Rhys M Daku, Brian T Sterenberg, Dae-Yeon Suh "Hypericum perforatum hydroxyalkylpyrone synthase involved in sporopollenin biosynthesis—phylogeny, site-directed mutagenesis, and expression in nonanther tissues" *FEBS Journal*, **2014**, 281, 3855-3868.
10. Rakesh A. Rajagopalan, Arumugam Jayaraman and Brian T. Sterenberg "Reactivity of a dichlorophosphido complex. Nucleophilic substitution reactions at metal coordinated phosphorus." *Journal of Organometallic Chemistry*, **2014**, 761, 84-92.
9. Arumugam Jayaraman, Brian T. Sterenberg "Electrophilic Aromatic Substitution Reactions of a Tungsten-Coordinated Phosphirenyl Triflate" *Organometallics*, **2014**, 33, 522–530.
8. Kandasamy Vaheesar, Colin M. Kuntz, Brian T. Sterenberg "Formation of phosphorus heterocycles using a cationic electrophilic phosphinidene complex", *Journal of Organometallic Chemistry*, **2013**, 745, 347-355.
7. Arumugam Jayaraman and Brian T. Sterenberg, "Facile Phosphorus–Carbon Bond Formation using a Tungsten-Coordinated Phosphirenyl Cation." *Organometallics*, **2013**, 32, 745-747.
6. Sun Young Kim, Che C. Colpitts, Gertrud Wiedemann, Christina Jepson, Mehrieh Rahimi, Jordan R. Rothwell, Adam D. McInnes, Mitsuyasu Hasebe, Ralf Reski, Brian T. Sterenberg, and Dae-Yeon Suh, "Phycomitrella PpORS, Basal to Plant Type III Polyketide Synthases in Phylogenetic Trees, Is a Very Long Chain 2'-Oxoalkylresorcinol Synthase." *The Journal of Biological Chemistry*, **2013**, 288, 2767-2777.
5. Rakesh A. Rajagopalan and Brian T. Sterenberg, "Formation and Reactivity of a Transient Cationic Alkyl Phosphinidene Complex." *Organometallics*, **2011**, 30, 2933.
4. Aneesh Chacko, Brian T. Sterenberg, and Allan L. L. East, "Supra–Supra, Supra–Antara, and Stepwise-Diradical Pathways for an Observed 16-Electron Double-[4 + 4] Cycloaddition within Metal-Templated Dialkyne Dimers (PtX<sub>2</sub>)<sub>2</sub>(μ-R<sub>2</sub>PCCCCPR<sub>2</sub>)<sub>2</sub>." *The Journal of Physical Chemistry A*, **2011**, 115, 4951.
3. Kandasamy Vaheesar, Timothy M. Bolton, Allan L. L. East, and Brian T. Sterenberg, "Si–H Bond Activation by Electrophilic Phosphinidene Complexes." *Organometallics*, **2010**, 29, 484.
2. Jordan A. Tsui and Brian T. Sterenberg, "A Metal-Templated 4+2 Cycloaddition Reaction of an Alkyne and a Diyne to Form a 1,2-aryne." *Organometallics*, **2009**, 28, 4906-4908.
1. Jordan A. Tsui, Timothy M. Bolton, and Brian T. Sterenberg, "Tungsten Coordination Chemistry of 1,4-bisdiphenylphosphinobutadiyne. Synthesis of Coordination Macrocycles and Factors Controlling Diyne Cycloaddition." *Canadian Journal of Chemistry*, **2009**, 87, 197–204.

Patent: A potential synthetic inorganic antibacterial with activity against drug-resistant pathogens. United States. US 62/524,694. 2017/06/08. Canada. 2,972,079. 2017/06/28. Patent Status: Pending. Inventors: A. Jayaraman, B.T. Sterenberg, J. Stavrinides

## Dae-Yeon Suh

Professor

[suhdaey@uregina.ca](mailto:suhdaey@uregina.ca), (306) 585 4239

### Education and Professional Development

1991. 5. PhD in Chemistry, Purdue University, West Lafayette, Indiana, USA  
 1985. 2. BSc in Biochemistry, Yonsei University, Seoul, Republic of Korea

### Employment History

2015. 7. – Professor  
 2008. 7. – 2015. 6. Associate Professor  
 2002. 7. – 2008. 6. Assistant Professor, Department of Chemistry and Biochemistry, University of Regina

### Teaching History

#### Undergraduate courses:

BIOC 430 (Chemical Biology): 2007–08, 2010, 2012, 2014–17  
 BIOC 330 (Enzymes): 2007–08, 2010–11, 2013–17  
 BIOC 221 (Metabolism): 2011, 2013–7  
 BIOC 220 (Bioorganic Chemistry): 2007–08  
 CHEM 140 (Organic Chemistry I): 2009–10, 2013 (50%)

#### Graduate courses:

BIOC 827AG (Chemical Biology): 2004–2007, 2010, 2012, 2015–16  
 BIOC 827AH (Natural Products Biosynthesis): 2004, 2013

### Student Supervision

Hon, Honours; UN, NSERC USRA; U, undergraduate; PDF, post-doc; RA, Research Assoc.

Name	Position	Dates of supervision
<b>Elizabeth Barker</b>	RA, U of R	2017. 1. –
<b>Sun Young Kim</b>	RA, Senior Research Assoc, Chem/Biochem, U of R	2003. 7. – 2016. 10.
<b>Fazle Rabbi</b>	PhD student, U of R	2014. 5. –
<b>Farhana Akther</b>	MSc student, U of R	2016. 9. –
<b>Misbah Aslam</b>	MSc student, U of R	2016. 1. –
<b>Li Li</b>	MSc, Research Tech, Crop Development Center, USask	2012. 9. – 2015. 12.
<b>Rhys Daku</b>	MSc, Lab Technologist, Sask. Disease Control Lab	2009. 9. – 2014. 9.
<b>Sarah Posehn</b>	MSc, Chemical & Laboratory Safety Advisor, UofR	2009. 9. – 2012. 8.
<b>Che Colpits</b>	MSc, PDF, University College London	2007. 9. – 2009. 8.
<b>Wallace Rourke</b>	Hon, Pharmacy, USask.	2015. 9. – 2016. 4.
<b>Devon Jones</b>	Hon, Lab Tech, Medical Lab, Warman, SK	2014. 9. – 2015. 4.
<b>Christina Jepson</b>	Hon, Senior Developer, QReserve, Hamilton, ON	2012. 1. – 2012. 8.
<b>Jordan Rothwell</b>	Hon, MSc student, Chem/Biochem, UofR	2011. 9. – 2012. 4.
<b>Jakeb Reis</b>	Hon, PhD Student, Chemistry, U of Tronto	2010. 9. – 2011. 4.
<b>Nicole Matties</b>	Hon	2009. 9. – 2010. 4.
<b>Reyad Arwini</b>	UN, U of R undergraduate	2017. 5. – 2017. 8.
<b>Rachel Willis</b>	UN, Lab Technologist, Sask. Disease Control Lab	2016. 5. – 2016. 8.
<b>Youngseo Lee</b>	UN, Medicine, USask	2015. 5. – 2016. 8.
<b>Christina Jepson</b>	UN, Senior Developer, QReserve, Hamilton, ON	2013. 5. – 2013. 8.

		2009. 5. – 2009. 8.
<b>Mehrieh Rahimi</b>	UN, Medical doctor	2012. 5. – 2012. 8.
<b>Adam McInnes</b>	UN, Medical doctor, MSc student, Chem Eng, USask	2011. 5. – 2011. 8.
<b>Barry Bushell</b>	UN, Medical doctor	2011. 5. – 2011. 8.
<b>Che Colpitts</b>	UN, PDF, University College London	2007. 5. – 2007. 8.
<b>Christopher Lohans</b>	UN, PDF, University of Oxford	2009. 5. – 2009. 8. 2008. 5. – 2008. 8. 2007. 5. – 2007. 8.
<b>Jerrod Smith</b>	UN, Assistant Professor, Math & Stat, U of Maine, USA	2009. 5. – 2009. 8.
<b>Fatima Abbas</b>	UN, Actuary	2008. 5. – 2008. 8. 2007. 5. – 2007. 8.
<b>Thomas Nguyen</b>	UN, Optometrist, Regina	2008. 5. – 2008. 8.
<b>Christopher Askew</b>	UN, Forensic Scientist, RCMP	2007. 5. – 2007. 8.
<b>Ahmad Abedi</b>	U, Undergraduate, U of R	2017. 1. – 2017. 4.
<b>Yuanjian Wang</b>	U, Undergraduate, U of R	2017. 1. – 2017. 4.
<b>Heather Hicton</b>	U, Undergraduate, U of R	2016. 5. – 2016. 8.
<b>Christine Luu</b>	U, Medicine, USask	2013. 5. – 2013. 8.
<b>Leon Bray</b>	U,	2008.1 – 2008. 5.
<b>Mike Larwood</b>	U, Financial Services Manager, Wheaton Chevrolet	2007.9 – 2007. 12.
<b>Matthew Endsins</b>	U, Program Manager in Ambient Air Quality, AGAT Labs	2007.9 – 2007. 12.

### University Service

University: President's Advisory Committee on Radiation Safety (2010–); Faculty Review Committees (2)  
 Faculty Search Committees (4); President's Research Seed Grant Adjudication Committee (2015)  
 NSERC/CIHR Selection Committees (9, 2008–10, 2012–14, 2016);  
 Thesis external examiner (6 MSc, Biology); Thesis supervisory committees (12 PhD, 8 MSc)  
External Community:  
 Saskatchewan Health Research Foundation Biomedical Personnel Grant Review Committee (2012–14)  
 NSERC grant reviewer (4, 2010, 12, 13)  
 Journal article reviewer (43 manuscripts); 3 PhD theses (USask, KLU, India)

### Scholarly Research

#### Refereed journal articles

- (1) Li L, Aslam M, Rabbi F, Vanderwel MC, Ashton NW, Suh D-Y (2017) *Planta*, Accepted
- (2) Daku RM, Rabbi F, Buttigieg J, Coulson IM, Horne D, Martens G, Ashton NW, Suh D-Y (2016) *PLOS ONE* 11, e0146817
- (3) Jepson C, Karppinen K, Daku RM, Sterenberg BT, Suh D-Y (2014) *FEBS J* 281, 3855–3868
- (4) Kim SY, Colpitts CC, Wiedemann G, Jepson C, Rahimi M, Rothwell JR, McInnes AD, Tanahashi T, Hasebe M, Reski R, Sterenberg BT, Suh D-Y (2013) *J Biol Chem* 288, 2767–2777
- (5) Posehn SE, Kim SY, Wee AGH, Suh D-Y (2012) *ChemBioChem* 13, 2212–2217
- (6) Colpitts CC, Kim SS, Posehn SE, Jepson C, Kim SY, Wiedemann G, Reski R, Wee AGH, Douglas CJ, Suh D-Y (2011) *New Phytol* 192, 855–868

- (7) Kim SS, Grienberger E, Lallemand B, Colpitts CC, Kim SY, Geoffroy P, Heintz D, Krahn D, Kaiser M, Kombrink E, Heitz T, Suh D-Y, Legrand M, Douglas CJ (2010) *Plant Cell* 22, 4045–4066
- (8) Koduri PKH, Gordon GS, Barker EI, Colpitts CC, Ashton NW, Suh D-Y (2010) *Plant Mol. Biol.* 72, 247–263
- (9) Jiang C, Kim SY, Suh D-Y (2008) *Mol Phylogenet Evol* 49, 691–701
- (10) Fukuma K, Neuls ED, Ryberg JM, Suh D-Y, Sankawa U (2007) *J Biochem* 142, 731–739
- Conference presentations
- (1) Rabbi F, Ashton NW, Suh D-Y. CSPB/CSHS 2017, Vancouver, July 4, 2017.
- (2) Li L, Rabbi F, Aslam M, Ashton NW, Suh D-Y. Plant Biotech 2016, Kingston, June 20, 2016.
- (3) Li L. 8th Chemistry and Biochemistry Graduate Research Conference, Concordia University, Montreal, November 20, 2015.
- (4) Colpitts CC, Daku RM, Kim SS, Posehn SE, Jepson C, Kim SY, Wee AGH, Douglas CJ, Suh D-Y. Plant Canada 2011, Halifax, July 17, 2011.
- (5) Posehn SE, Wee AGH, Suh D-Y. 93rd Canadian Chemistry Conference, Toronto, May 31, 2010.
- (6) Kim SS, de Azevedo Souza C, Koch S, Kienow L, Schneider K, Colpitts C, Suh D-Y, Kombrink E, Douglas CJ. The 20th International Conference on Arabidopsis Research (ICAR), Edinburgh, UK, June 30, 2009.
- (7) Douglas CJ, Kim SS, de Azevedo Souza C, Kombrink E, Koch S, Kienow L, Schneider K, Colpitts C, Suh D-Y, Quilichini T, Friedmann M. Plant Biology 2009, Hawaii, July 18–22, 2009.
- (8) Colpitts C, Kim SS, Douglas C, Suh D-Y. 92nd Canadian Chemistry Conference, Hamilton, May 30, 2009.
- (9) Koduri PKH, Gordon G, Barker E, Ashton N, Suh D-Y. The XVI Congress of the Federation of European Societies of Plant Biology (FESPB 2008), Tampere, Finland, August 17–22, 2008.
- (10) Koduri PKH, Suh D-Y, Barker E, Ashton N. 50th Canadian Society of Plant Physiologists Annual Meeting, Ottawa, June 16, 2008.
- (11) Colpitts C, Lohans C, Askew C, Yost C, Suh D-Y. 91th Canadian Chemistry Conference, Edmonton, May 26, 2008 (oral presentation).
- (12) Yost CK, Lohans CT, Colpitts CC, Suh D-Y. 20th North American Symbiotic Nitrogen Fixation Conference, Marquette University, Milwaukee, Wisconsin, July 10, 2007.
- (13) Gordon G, Suh D-Y. 90th Canadian Chemistry Conference, Winnipeg, May 26, 2007.
- (14) Jiang C, Suh D-Y. 90th Canadian Chemistry Conference, Winnipeg, May 26, 2007
- GenBank sequence depositions
- (1) Gene accession no. JN578758. Daku RM, Bushell BR, Kim SY, Weger HG, Suh D-Y. Type III polyketide synthase from *Coccomyxa* sp. C-169. September 2011.
- (2) Gene accession no. FJ443125. Colpitts CC, Pham Y, Kim SY, Suh D-Y. A p-coumaroyl-triacetic acid synthase from *Equisetum hyemale*. December 2009.
- (3) Gene accession no. EF593132. Gordon G, Tanahashi T, Hasebe M, Suh D-Y. Alkylresorcinol synthase from *Physcomitrella patens*. August, 2007. Updated on August, 2014.

## Mark Tymchak

Laboratory Instructor  
[tymchakm@uregina.ca](mailto:tymchakm@uregina.ca), (306) 585-4462,

### Education and Professional Development

<i>Graduate studies in Biochemistry</i>	1997-
2002 University of Regina Saskatchewan	Regina,
<i>Bachelor of Education (Distinction)</i>	1995 – 1997
University of Regina	Regina, Saskatchewan
<i>Bachelor of Science (Honours) in Biochemistry</i>	1991 – 1995
University of Saskatchewan	Saskatoon, Saskatchewan
<i>XRF Training</i>	2015
Transitions Technologies	Regina, Saskatchewan
<i>Hazwoper 29 cfr 1910.120 (e) &amp; (q)(40HR Worker Program)</i>	2008
HAZCO Environmental Services	Regina, Saskatchewan
<i>Chemical and laboratory Safety Training</i>	
2008 University of Regina Health & Safety HR Saskatchewan	Regina,

### Employment History

<b>Chemistry Laboratory Instructor III</b>	July
2010 - Present Faculty of Science, University of Regina Regina, Saskatchewan	
<b>Sessional Lecturer/Lab instructor (Chemistry 105)</b>	May 2014-
June 2014	May
2012- June 2012	
May 2011- June 2011 Faculty of Science, University of Regina Regina, Saskatchewan	
<b>Chemistry Laboratory Instructor II</b>	August
2006 - July 2010 Faculty of Science, University of Regina Regina, Saskatchewan	
<b>Sessional Lecturer (Biochemistry 321)</b>	September
2009 - December 2009 Faculty of Science, University of Regina Regina, Saskatchewan	
<b>Sessional Lecturer (Biochemistry 320)</b>	January
2009 - April 2009 Faculty of Science, University of Regina Regina, Saskatchewan	



Summer Lab Instruction for Grade 12 Lab experience  
Numerous Search Committees (Internal and External), Curriculum Committee, Laboratory Review Committees and Safety Group.  
Board of Directors, Living Hope Alliance Church  
Worship Coordinator, Living Hope Alliance Church

### Manuals

Laboratory Manuals for:  
Chemistry 102&103, Chemistry 104, Chemistry 105, Chemistry 230, Biochemistry 220,  
Biochemistry 321

## Andrew G. H. Wee

Professor

[andrew.wee@uregina.ca](mailto:andrew.wee@uregina.ca), (306) 585 4767

### Education and Professional Development

Ph.D. in Organic Chemistry, University of London, England

B.Sc (Honours, First Class), University of London, England

### Employment History

Professor Department of Chemistry and Biochemistry, University of Regina July 2000 – present

### Teaching History

Chemistry 140 (Organic Chemistry I)  
 Chemistry 241 (Organic Chemistry II)  
 Chemistry 340 (Organic Chemistry III)  
 Chemistry 390AA (Selected Topics)  
 Chemistry 441 (Modern Organic synthesis)  
 Chemistry 051-054 (Co-Op Work term)  
 Chemistry/Biochemistry 401 and 402 (Honours research)  
 Chemistry 805 (Analytical Instrumentation)  
 Chemistry 841 (Advanced Organic Chemistry)  
 Chemistry 901 (Research)

### Student Supervision

Name	Position	Dates of supervision
<b>K. Annadi</b>	Ph.D	January 2009 – July 2015
<b>B. Zhang</b>	Ph.D	September 2004 – August 2010
<b>S. Posehn</b>	M.Sc	September 2010 – August 2012
<b>H. M. Bayirinoba</b>	M.Sc	September 2005 – December 2008
<b>K. Johnson</b>	B.Sc Honours Research	September 2014 – April 2015
<b>J. Hughes</b>	B.Sc Honours Research	September 2011 – April 2012
<b>D. Hurrell</b>	B. Sc Honours Research	September 2009 – April 2010
<b>Y.-J. Park</b>	B. Sc Honours Research	September 2006 – April 2007
<b>J. Hughes</b>	NSERC USRA	May – August 2012
<b>J. Hughes</b>	NSERC USRA	May – August 2011
<b>J. Hughes</b>	NSERC USRA	May – August 2010
<b>D. Hurrell</b>	Undergrad Research Assistant	May – August 2009
<b>J. Moore</b>	Undergra Research Assistant	May – August 2008

### University Service

Served in Departmental, Faculty of Science and University Committees. Representative Activities are presented.

#### Department

Safety Officer; Curriculum Committee; Nominating Committee; Academic 5-year Plan committee; Graduate Studies Admissions Committee; Equipment and Services; Faculty Search Committee, Space Committee; Co-Op Coordinator, Chem and Biochem 401/402; Student Counselling.

#### Faculty of Science

Student Appeals Committee; Admission and Studies Committee; Curriculum Committee. Laboratory Instructors Review Committee; Faculty Review Committee; Safety Committee. NSERC USRA Selection Committee; Faculty of Science Representative to Faculty of Arts.

#### University

Executive of Council; Space Allocation Committee; Campus Promotion Committee; Planning and Priorities Committee; Council Committee on Research; Advisory Group on Planning, Evaluation and Allocation Committee; Council Committee on Student Appeals; FGSR NSERC PGS Selection Committee; FGSR Scholarship Committee.

### Scholarly Research

#### Refereed publications (2007-present)

1. Annadi, K.; Wee, A.G.H. An alkylidene carbene C–H activation approach toward the enantioselective syntheses of spirolactams: Application to the synthesis of (–)-adalinine. *J. Org. Chem.* **2016**, *81*, 1021-1038.
2. Annadi, K.; Wee, A.G.H. Stereoselective syntheses of (+)-2-*epi*-deoxoprosopinine, (-)-deoxoprosophylline, (+)-*cis*-195A and 2,5-di-*epi-cis*-195A from a common chiral nonracemic building block. *J. Org. Chem.* **2015**, *80*, 5236-5251.
3. Annadi, K.; Wee, A.G.H. Ceric ammonium nitrate oxidation of *N*-(*p*-methoxybenzyl) lactams: competing formation of *N*-(hydroxymethyl) *d*-lactams, *ARKIVOC* **2014** (vi), 108-126.
4. Zhang, B.; Wee, A. G. H. Conformational, steric and electronic effects on site- and chemoselectivity of the metal catalyzed reaction of *N*-bis(trimethylsilyl)methyl, *N*-(2-indolyl)methyl  $\alpha$ -diazoamides. *Org. Biomol. Chem.* **2012**, *10*, 4597-4608.
5. Sarah E. Posehn, S. E.; Kim, S. Y.; Wee, A. G. H.; Suh, D.-Y. Mapping the Mechanism of the Resorcinol Ring Formation Catalyzed by ArsB, a Type III Polyketide Synthase from *Azotobacter vinelandii*. *ChemBiochem*, **2012**, *13*, 2212-2217.
6. Colpitts, C. C.; Kim, S. S.; Posehn, S. E.; Jepson, C.; Kim, S. Y.; Wiedemann, G.; Reski, R.; Wee, A.G.H.; Douglas, C.J.; Suh, D.-Y. PpASCL, a moss ortholog of anther-specific chalcone synthase-like enzymes, is a hydroxyalkylpyrone synthase involved in an evolutionarily conserved sporopollenin biosynthesis pathway. *New Phytologist* **2011**, *192*, 855
7. Zhang, B.; Wee, A.G.H. Di- and trisubstituted  $\gamma$ -lactams via Rh(II)-carbenoid reaction of *N*-*C* $\alpha$ -branched, *N*-bis(trimethylsilyl)methyl  $\alpha$ -diazoamides. Synthesis of ( $\pm$ )- $\alpha$ -allokainic acid. *Organic Lett.* **2010**, *12*, 5386-5389.

8. Maneeintr, K.; Idem, R.O.; Tontiwachwuthikul, P.; Wee, A.G.H. Comparative Mass Transfer Performance Studies of CO<sub>2</sub> Absorption into Aqueous Solutions of DEAB and MEA. *Ind. Eng. Chem. Res.* **2010**, *49*, 2857–2863
9. Wee, A.G.H.; Fan, G.J.; Bayirinoba, H.M. Non racemic bicyclic lactam lactones via regio- and *cis*-diastereocontrolled C-H insertion. Asymmetric synthesis of (8*S*,8*aS*)-octahydroindolizidin-1-ol and (1*S*,8*aS*)-octahydroindolizidin-1-ol. *J. Org. Chem.* **2009**, *74*, 8261 .
10. Fan, G.J.; Wee, A.G.H.; Idem, R.; Tontiwachwuthikul, P., 2009. NMR studies of amine species in MEA-CO<sub>2</sub>-H<sub>2</sub>O system: Modification of the model of vapor liquid equilibrium (VLE), *Ind. Eng. Chem. Res.* **2009**, *48*, 2717.
11. Maneeintr, K.; Idem, R.O.; Tontiwachwuthikul, P.; Wee, A.G.H. Synthesis, solubilities and cyclic capacities of amino alcohols for CO<sub>2</sub> capture from flue gas streams. *Energy Procedia*, **2009**, *1*, 1327-1334.
12. Wee, A. G. H.; Zhang, B. Methanamine, 1,1-Bis(trimethylsilyl), *Encyclopedia of Reagents for Organic Synthesis* (eEROS), Crich, D., Editor-in-Chief, Wiley and Sons, New York, **2009** (on-line).
13. Zhang, B.; Wee, A.G.H. Metal-catalysed reaction of N-(2-indolyl)methyl, N-bis(trimethylsilyl)methyl diazoamides: an entry into the β-carboline ring system. *Chem. Commun.* **2008**, 4837-4839.
14. Wee, A. G. H.; G.-J. Fan. Asymmetric synthesis of (+)-isofebrifugine and (-)-sedacryptine from a common chiral nonracemic building block. *Org. Lett.* **2008**, *10*, 3869-3872.
15. Maneeintr, K.; Henni, A.; Idem, R.O.; Tontiwachwuthikul, P.T.; Wee, A.G.H. Physical and transport properties of aqueous amino alcohol solution for CO<sub>2</sub> capture from flue gas streams. *Process Saf. Environ. Prot.*, **2008**, *86*, 291.
16. Wee, A. G. H.; Zhang, B. Nucleophilic alkynylation of N-bis(trimethylsilyl)methyl aldimines. *Tetrahedron Lett.* **2007**, *48*, 4135.

Additionally 14 Conference Presentations

Patent: TontiwachWuthikul, P.; Wee, A.G.H.; Maneeintr, K.; Fan, G.; Veawab, A.; Henni, A.; Aroonwilas, A.; Chakma, A Patent No.: US 7,910,078 B2; Date of Patent: Mar. 22, 2011

## Henry Yee

### Laboratory Instructor III

[Henry.Yee@uregina.ca](mailto:Henry.Yee@uregina.ca), (306)585-4674

#### Education and Professional Development

- BSc.(Honors) University of Regina (1981)
- Laboratory Safety Training February 2017 (latest only)

#### • Employment History

- Laboratory Instructor III

#### • Teaching History

- Laboratory Instruction:
  - Chemistry 140
  - Chemistry 240
  - Chemistry 241
  - Chemistry 330
  - Chemistry 340
  - Chemistry 440
- Sessional Lecturer:
  - Chemistry 240 January 2007
  - Chemistry 140 May 2010
  - Chemistry 241 September 2012

#### Student Supervision

- Have supervised a number of teaching assistants every semester since 2007:
  - Fall: 3 or 4
  - Winter: 3 or 4
- In January 2007, was assigned 6 assignment markers for Chemistry 240

#### University Service

- Have been a source of “expert” chemistry information for general public inquiries
- Have performed *Chemistry Magic Shows* throughout my tenure for general public

### Scholarly Research and Publications

- Chemistry 140 Laboratory Manual 2009
- Chemistry 140 Laboratory Manual 2017
- Chemistry 241 Laboratory Manual 2017

**Appendix II –Statistics on Department of Chemistry & Biochemistry –Statistics are generated by Office of Resource Planning and provided to the department.**

1. CHEM&BIOC Course Enrolments, by Subject & Fiscal Year
2. CHEM&BIOC Course Enrolments, by Level & Fiscal Year
3. CHEM&BIOC Census Date Majors & Minors Oct2017-summary
4. CHEM&BIOC Census Date Majors & Minors Oct 2017-detail
5. CHEM&BIOC Course Enrolments by Course Year Level & Fiscal Year
6. CHEM&BIOC FB Convocations 2001thru2017
7. CHEM&BIOC Dept Budget & Staffing Data

**Dept2: CHEM & BIOC Dept Course Enrolments and Credit Hours, by Subject and Fiscal Year**

	Dept	CRSE	SUBJ	2007_08	2008_09	2009_10	2010_11	2011_12	2012_13	2013_14	2014_15	2015_16	2016_17
		LEVEL	CODE										
Enrolment	CHEM	GR	BIOC	2	4	8	5	1	3	2	7	30	
			CHEM	30	41	81	57	47	28	32	29	28	26
		UG	BIOC	239	276	245	251	252	219	248	155	217	206
			CHEM	1,392	1,345	1,512	1,622	1,750	1,792	1,916	1,993	2,069	2,034
		<b>Total</b>		<b>1,663</b>	<b>1,666</b>	<b>1,846</b>	<b>1,935</b>	<b>2,050</b>	<b>2,042</b>	<b>2,198</b>	<b>2,177</b>	<b>2,321</b>	<b>2,296</b>
Enrolled credit hours	CHEM	GR	BIOC	6	12	24	15	3	9	6	21	132	
			CHEM	114	153	294	225	195	123	123	120	129	93
		UG	BIOC	717	828	735	753	756	657	744	465	651	618
			CHEM	4,176	4,035	4,536	4,866	5,250	5,376	5,748	5,979	6,207	6,102
		<b>Total</b>		<b>5,013</b>	<b>5,028</b>	<b>5,589</b>	<b>5,859</b>	<b>6,204</b>	<b>6,165</b>	<b>6,621</b>	<b>6,564</b>	<b>7,008</b>	<b>6,945</b>

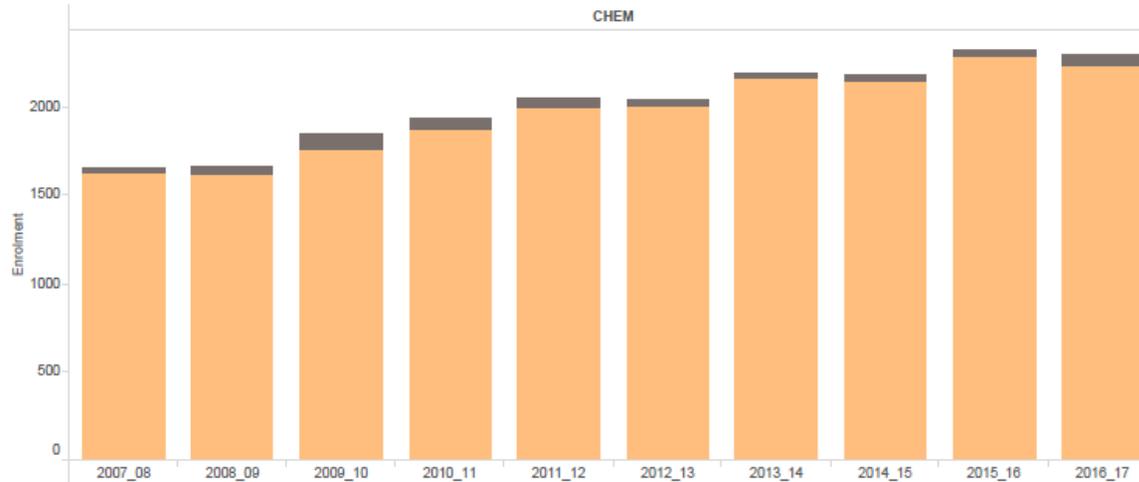
Faculty  
Science

Dept  
CHEM

vSEM  
All

CRSE LEVEL  
 GR  
 UG

Graph1: CHEM & BIOC Dept Course Enrolments, by Level and Fiscal Year



**Dept1: CHEM & BIOC Dept Course Enrolments and Credit Hours, by Level and Fiscal Year**

	Dept	CRSE LEVEL	2007_08	2008_09	2009_10	2010_11	2011_12	2012_13	2013_14	2014_15	2015_16	2016_17
Enrolment	CHEM	GR	32	45	89	62	48	31	34	29	35	56
		UG	1,631	1,621	1,757	1,873	2,002	2,011	2,164	2,148	2,286	2,240
		<b>Total</b>	<b>1,663</b>	<b>1,666</b>	<b>1,846</b>	<b>1,935</b>	<b>2,050</b>	<b>2,042</b>	<b>2,198</b>	<b>2,177</b>	<b>2,321</b>	<b>2,296</b>
Enroled credit hours	CHEM	GR	120	165	318	240	198	132	129	120	150	225
		UG	4,893	4,863	5,271	5,619	6,006	6,033	6,492	6,444	6,858	6,720
		<b>Total</b>	<b>5,013</b>	<b>5,028</b>	<b>5,589</b>	<b>5,859</b>	<b>6,204</b>	<b>6,165</b>	<b>6,621</b>	<b>6,564</b>	<b>7,008</b>	<b>6,945</b>

**Summary of Majors and Minors, with code list, for Unit: CHEM - Chemistry & Biochem**

MJ&MN4: Census Date Students, Summary of Majors, Minors & Conc for:  
**CHEM BIOC BIBC BCCH C&PH CH&P**

MajMin Level	LEVEL	MajMinLevelDetail	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017
Major	UG	MJ1 First Major (BCCH)	4	4	3	3	2	1	1	
		MJ1 First Major (BIBC)	6	3	1	3	4	3	3	3
		MJ1 First Major (BIOC)	46	46	43	41	46	65	60	94
		MJ1 First Major (CHEM)	50	52	54	53	57	63	55	62
		MJ2 Added Major (BIOC)					1	1	1	1
	Grad	MJ1 First Major (BIOC)	6	6	6	4	5	4	10	10
		MJ1 First Major (CHEM)	16	16	11	10	9	9	6	7
	Total			128	127	118	114	124	146	136
Minor	UG	MN1 Added Minor (BIOC)	1	2	2	1	2	1	1	1
		MN1 Added Minor (CHEM)	1			1	1	1	1	1
		MN2 Added Minor (CHEM)					1	1	1	1
	Total			2	2	2	2	4	3	3
Grand Total			130	129	120	116	128	149	139	180

**URegina Major/Minor codes**  
 for CHEM - Chemistry & Biochem  
 Stvm.. Stvmajr Desc  
 BCCH Combined Biochemistry & Chem  
 BIBC Combined Biology Biochemistry  
 BIOC Biochemistry  
 C&PH ~Chemical Physics  
 CH&P Chemistry & Physics  
 CHEM Chemistry

Census Date Students, Programs by Majors & Minors for CHEM BIOC BIBC BCCH C&PH CH&P

LEVEL	MajMin Level	MajMinLevelDetail	Degr Code 1	Program	Major Code 1	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017		
						201030	201130	201230	201330	201430	201530	201630	201730		
UG	Major	MJ1 First Major (BCCH)	BSC	SCBSC Bachelor of Science	BCCH	4	4	3	3	2	1	1			
		MJ1 First Major (BIBC)	BSC	SCBSC Bachelor of Science	BIBC	6	3	1	3	4	3	3	3		
		MJ1 First Major (BIOC)	BSC	SCBSC Bachelor of Science	BIOC	42	44	38	35	37	52	55	82		
				SCBSCC Bachelor of Science (Co-op)	BIOC	1	1	2	3	4	3	2	4		
				SCQUAL Science Qualifying	BIOC				3	5	10	3	8		
		MJ1 First Major (CHEM)	BSC	SCBSCHON Bachelor of Science Honours	BIOC	3	1	3							
				SCBSC Bachelor of Science	CHEM	46	44	51	46	45	55	46	52		
				SCBSCC Bachelor of Science (Co-op)	CHEM	1	1	2	3	3	3	3	4		
				SCQUAL Science Qualifying	CHEM				2	6	4	5	6		
				SCBSCHONC B of Science Honours (Co-op)	CHEM	3	6		1	2		1			
	MJ2 Added Major (BIOC)	BSC	SCBSC Bachelor of Science	BIOL					1	1	1	1			
	<b>Total</b>						106	105	101	100	110	133	120	160	
	Minor	MN1 Added Minor (BIOC)	BA	ARBA Bachelor of Arts	PHIL		1	1							
					PSYC		1	1							
			BSC	SCBSC Bachelor of Science	MATH	1								1	1
					PSYC										
					BSCHON	SCBSCHON Bachelor of Science Honours	PSYC				1	2	1		
		MN1 Added Minor (CHEM)	BSC	SCBSC Bachelor of Science	BIOL				1					1	
					GEOL	1									
					PHYS									1	
MN2 Added Minor (CHEM)		BSC	SCBSC Bachelor of Science	MATH					1	1	1	1			
<b>Total</b>						2	2	2	2	4	3	3	3		
<b>Total</b>						108	107	103	102	114	136	123	163		
Grad	Major	MJ1 First Major (BIOC)	MSC	GSCMSBIOCM MSc Biochemistry Thesis	BIOC	5	5	5	3	3	2	5	5		
				PHD	GSCPHBIOCD1 PhD BIOC Thesis Post-Bach	BIOC	1	1		1	1	1	1		
					GSCPHBIOCD2 PhD BIOC Thesis Post-Masters	BIOC			1		1	1	4	5	
	MJ1 First Major (CHEM)	MSC	GSCMSCHEMM MSc Chemistry Thesis	CHEM	10	8	3	4	4	5	2	4			
			PHD	GSCPHCHEMD2 PhD CHEM Thesis Post-Maste..	CHEM	6	8	8	6	5	4	4	3		
<b>Total</b>						22	22	17	14	14	13	16	17		
<b>Total</b>						22	22	17	14	14	13	16	17		
<b>Grand Total</b>						130	129	120	116	128	149	139	180		

**Dept3: CHEM & BIOC Dept Course Enrolments and Credit Hours, by Course Year Level and Fiscal Year**

	Dept	CRSE LEVEL	CRSE_YR	2007_08	2008_09	2009_10	2010_11	2011_12	2012_13	2013_14	2014_15	2015_16	2016_17
Enrolment	CHEM	GR	8xx	13	18	40	26	20	9	13	6	7	17
			9xx	19	27	49	36	28	22	21	23	28	39
		UG	1xx	661	687	1,248	1,368	1,503	1,494	1,615	1,760	1,841	1,794
			2xx	717	673	389	376	358	406	358	248	312	308
			3xx	177	180	84	95	89	77	159	89	78	93
			4xx	76	81	36	34	52	34	32	51	55	45
		<b>Total</b>			1,663	1,666	1,846	1,935	2,050	2,042	2,198	2,177	2,321
Enroled credit hours	CHEM	GR	8xx	39	54	120	78	60	27	39	18	21	51
			9xx	81	111	198	162	138	105	90	102	129	174
		UG	1xx	1,983	2,061	3,744	4,104	4,509	4,482	4,845	5,280	5,523	5,382
			2xx	2,151	2,019	1,167	1,128	1,074	1,218	1,074	744	936	924
			3xx	531	540	252	285	267	231	477	267	234	279
			4xx	228	243	108	102	156	102	96	153	165	135
		<b>Total</b>			5,013	5,028	5,589	5,859	6,204	6,165	6,621	6,564	7,008

Enrolment and Enroled credit hours broken down by sFisc\_Yr vs. Dept, CRSE LEVEL and CRSE\_YR. The data is filtered on vSEM and Faculty. The vSEM filter keeps 10, 20 and 30. The Faculty filter keeps Science. The view is filtered on Dept and CRSE LEVEL. The Dept filter keeps CHEM. The CRSE LEVEL filter keeps GR and UG.

URegina FB Convocations of Majors & Minors, by Calendar Year (Spring + Fall convocations) for CHEM - Chemistry & Biochem  
 codes: CHEM BIOC BIBC BCCH C&PH CH&P

Conv Level	Maj/Min Level	Maj/MinLevelDetail	DEG Type	PROG_DESC	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Grand Total					
Grad	Major	MJ1 First Major (BIOC)	PhD	PhD BIOC Thesis Post-Bach											1						1	2					
				PhD BIOC Thesis Post-Masters										1											1		
			Masters	~Master of Science		1																			1		
				MSc Biochemistry Thesis				2			1	1	2	1	1			2	1		2	1			14		
			MJ1 First Major (CHEM)	PhD	~Doctor of Philosophy		1	2																	3		
					PhD CHEM Thesis Post Bach												1									1	
		PhD CHEM Thesis Post-Masters					1			1						1				2	1	2			8		
		Masters	~Master of Science		2	1	3																	6			
				MSc Chemistry Thesis								2	1	1	1	1	1	1	5	2			1		15		
			<b>Total</b>			4	3	3	3		4	2	4	2	3	3	3	7	3	2	3	4	1	51			
		Under Grad	Major	MJ1 First Major (BCCH)	Bachelor	Bachelor of Science				2	1	3			2			3	2		1			14			
						Bachelor of Science Honours (Co-op)				1						2								1	1		5
				MJ1 First Major (BIBC)	Bachelor	Bachelor of Science		1							2	1						1				5	
						Bachelor of Science	6	4	12	9	4	10	11	5	6	8	2	8	3	3	8	3	8	3	10		112
						Bachelor of Science (Co-op)			1		2					1			1								5
Bachelor of Science Honours	1					4	3	5	4	1	3	3	1	4	4	1	2					1	2		39		
MJ1 First Major (CHEM)	Bachelor			B of Science Honours (Co-op)									1									1		2			
				Bachelor of Science	13	12	14	5	14	8	8	9	10	11	6	5	8	8	10	11	2				154		
				Bachelor of Science (Co-op)			2		2	1	2	2	1	1		1					1	1	1		15		
				Bachelor of Science Honours	2	1	2	1	1	3	1			2		4		1	1						19		
MJ2 Added Major (BIOC)	Bachelor			Bachelor of Science			1																	1			
				Bachelor of Science Honours								1													1		
Minor	MN1 Added Minor (BIOC)			Bachelor	Bachelor of Arts								1						2					3			
					Bachelor of Arts Honours										1										1		
					Bachelor of Science			1				2		2		1	1									7	
					Bachelor of Science Honours																1	2	2			5	
	MN1 Added Minor (CHEM)			Bachelor	Bachelor of Arts									1			1								2		
					Bachelor of Arts Honours			1						1												2	
					Bachelor of Science	1			1		1	1	1								1	1				6	
					Bachelor of Science (Co-op)																1			1		2	
					Bachelor of Science Honours	1											1									2	
		Conc. PC1 Added Conc (CH&P)	Cert/Dipl		Cert of Extended Studies In Ed						3														3		
<b>Total</b>					25	23	35	24	31	30	31	27	20	29	14	22	18	15	25	21	15	405					
<b>Grand Total</b>					29	26	38	27	31	34	33	31	22	32	17	29	21	17	28	25	16	456					

FB Convocations ConvMJ&MN2, Nov. 2017, URegina Office of Resource Planning www.uregina.ca/orp; note Conc. = Concentration

**Academic Unit Review 2017-18**

**Expenditure Budgets** - Beginning in 2014-15, benefits and market adjustments were decentralized and attributed to faculty and departmental budgets. To adjust for this difference 15% of salary has been attributed to all expenditures budgets from 2008-09 to 2013-14.

Organization 2560 - "Chemistry & Biochemistry" and Organization 2561 - "Chemistry Staff"

Within the overall budget for the Faculty of Science are two distinct budget envelopes related to Chemistry and Biochemistry. The expenditure budget amounts shown below represents just ORG 2561 from which salary and benefits paid to academic staff and lab instructors are paid. ORG 2560 primarily holds salary and benefits to be paid to teaching assistants and also holds a miscellaneous expenditure budget (\$12,000 annually from 2014-15 to 2017-18). In 2017-18, ORG 2560 was budgeted at \$123,762.

**Faculty and Staff** - Academic staff include professors (all ranks), lecturers and instructors. Non-academic include administrative support or technical support positions. Note that reported Faculty/Staff positions are as budgeted - not as actually occupied report is as of Nov 22 2017

**Chemistry & Biochemistry**

Expenditure Budget	
ORG 2561	
2017-18	\$1,938,776
2016-17	\$1,862,027
2015-16	\$1,829,809
2014-15	\$1,708,085
2013-14	\$1,733,835
2012-13	\$1,507,456
2011-12	\$1,448,863
2010-11	\$1,465,064
2009-10	\$1,389,737
2008-09	\$1,210,713

Faculty/Staff		
Academic	Lab Instructors	Non-academic
11	4	0
11	4	0
11	4	0
10	4	0
9	4	0
9	4	0
9	4	0
9	4	0
9	3	0
9	3	0

Contact:

Kevin O'Fee, Office of Resource Planning, 306-337-2137

[kevin.ofee@uregina.ca](mailto:kevin.ofee@uregina.ca)

**Appendix III –Department Program Information**

## Degree Programs

Degree in Biochemistry  
Degree in Honours Biochemistry  
Recommended Sequence of Courses

Degree in Chemistry  
Degree in Honours Chemistry  
Recommended Sequence of Courses

## BSc in Biochemistry

### A. Biochemistry/Chemistry/Biology (60 hr)

1. BIOC 220
2. BIOC 221
3. BIOC 321
4. BIOC 3xx
5. BIOC 3xx or 4xx
6. BIOC 3xx or 4xx
7. BIOC 4xx
8. BIOC 4xx
9. BIOL 100
10. BIOL 101

11. BIOL 205
12. BIOL 266 or 378\*
13. BIOL 305
14. BIOL 310
15. CHEM 104
16. CHEM 105
17. CHEM 140
18. CHEM 210
19. CHEM 215 or 250
20. CHEM 241

### C. Arts/Fine Arts (18 hr)

1. ENGL 100
2. ENGL 110
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_

### B. Science (24 hr)

1. CS 110 or 115
2. MATH 105 or 110
3. MATH 111
4. PHYS 109 or 111
5. STAT 160
6. Science elective
7. Science elective
8. Science elective

### D. Open Electives (18 hr)

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_

## BSc Honours in Biochemistry

### A. Biochemistry/Chemistry/Biology (66 hr)

1. BIOC 220
2. BIOC 221
3. BIOC 321
4. BIOC 3xx
5. BIOC 3xx or 4xx
6. BIOC 3xx or 4xx
7. BIOC 401
8. BIOC 402
9. BIOC 4xx
10. BIOC 4xx

11. BIOL 100
12. BIOL 101
13. BIOL 205
14. BIOL 266 or 378\*
15. BIOL 305
16. BIOL 310
17. CHEM 104
18. CHEM 105
19. CHEM 140
20. CHEM 210

21. CHEM 215 or 250
22. CHEM 241

### C. Arts/Fine Arts (18 hr)

1. ENGL 100
2. ENGL 110
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_

### B. Science (24 hr)

1. CS 110 or 115
2. MATH 105 or 110
3. MATH 111
4. PHYS 109 or 111
5. STAT 160
6. Science elective

7. Science elective
8. Science elective

### D. Open Electives (18 hr)

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

## Recommended Biochemistry Course Sequences

### Biochemistry Course Sequences

courses in (brackets) are honours only

#### Sequence 1 (recommended 4 year program)

term

1	CHEM 104	BIOL 100	PHYS 109	MATH 110	ENGL 100
2	CHEM 105	BIOL 101	CHEM 140	MATH 111	ENGL 110
3	BIOC 220	CHEM 241	CHEM 210	STAT 160	elective
4	BIOC 221	BIOL 205	CS 110 OR 115	CHEM215 or elective	elective
5	BIOC 321	BIOC 3XX	elective or BIOL 266	elective or CHEM250	elective
6	BIOC 3XX	BIOC 3XX	BIOL 378 or elective	elective	elective
7	BIOC 4XX	BIOL 305	BIOL 310	(BIOC 401)	elective
8	BIOC 4XX	elective	elective	(BIOC 402)	elective

#### Sequence 2 (recommended 5 year program)

term

1	CHEM 104	BIOL 100	elective	ENGL 100
2	CHEM 105	BIOL 101	CHEM 140	ENGL 110
3	BIOC 220	elective	CHEM 210	MATH 110
4	BIOC 221	CHEM215 or elective	BIOL 205	MATH 111
5	BIOC 321	elective or BIOL 266	elective	STAT 160
6	elective	BIOL 378 or elective	elective	CS 110 or 115
7	BIOC 3XX	Elective or CHEM250	CHEM241	BIOL 310
8	BIOC 3XX	Science elective	elective	BIOL 305
9	BIOC 4XX	BIOC 3xx	(BIOC 401)	PHYS 109
10	BIOC 4XX	elective	(BIOC 402)	elective

Note: in program options students have an option of CHEM250 (taught in fall semester) or CHEM215 (taught in winter semester)

**BSc IN CHEMISTRY**

**A. Chemistry (48 hr)**

1. CHEM 104
2. CHEM 105
3. CHEM 140
4. CHEM 210
5. CHEM 215
6. CHEM 230
7. CHEM 241
8. CHEM 250

9. CHEM 251
10. CHEM 312
11. CHEM 330
12. CHEM 340
13. CHEM 360
14. CHEM 4xx
15. CHEM 4xx
16. BIOC 220

**C. Arts/Fine Arts (18 hr)**

1. ENGL 100
2. ENGL 110
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_

**B. Science (36 hr)**

1. BIOL 100
2. CS 110 or 115
3. MATH 110
4. MATH 111
5. MATH 122
6. MATH 213

7. PHYS 109 or 111
8. PHYS 119 or 112
9. Science elective
10. Science elective
11. Science elective
12. Science elective

**D. Open Electives (18 hr)**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_

**BSc HONOURS IN CHEMISTRY**

**A. Chemistry (57 hr)**

1. Chem 104
2. Chem 105
3. Chem 140
4. Chem 210
5. Chem 215
6. Chem 230
7. Chem 241
8. Chem 250
9. Chem 251
10. Chem 312

11. Chem 330
12. Chem 340
13. Chem 360
14. Chem 401
15. Chem 402
16. Chem 4xx
17. Chem 4xx
18. Chem 4xx
19. Bioc 220

**C. Arts/Fine Arts (18 hr)**

1. English 100
2. English 110
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_

**B. Science (30 hr)**

1. Biol 100
2. CS 110 or 115
3. Math 110
4. Math 111
5. Math 122
6. Math 213
7. Phys 109 or 111
8. Phys 119 or 112
9. Science elective
10. Science elective

**D. Open Electives (15 hr)**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

## Recommended Chemistry Course Sequences

Courses in (brackets) are honours only

Sequence 1 (recommended 4 year program)

term

1	CHEM 104	BIOL 100	PHYS 109	MATH 110	ENGL 100
2	CHEM 105	CHEM 140	PHYS 119	MATH 111	ENGL 110
3	CHEM 210	CHEM 241	CHEM 250	MATH 122	elective
4	CHEM 215	CHEM 230	CHEM 251	CS 110 or 115	CHEM 230
5	CHEM 340	CHEM 360	BIOC 220	elective	elective
6	CHEM 312	CHEM 330	MATH 213	elective	elective
7	CHEM 4XX	(CHEM 4XX)	(CHEM 401)	elective	elective
8	CHEM 4XX	elective	(CHEM 402)	elective	elective

Sequence 2 (recommended 5 year program, physchem and math oriented)

term

1	CHEM 104	PHYS 109	MATH 110	ENGL 100
2	CHEM 105	PHYS 119	MATH 111	ENGL 110
3	BIOL 100	CHEM 250	MATH 122	elective
4	CHEM 140	CHEM 251	MATH 213	CHEM 230
5	CHEM 241	CHEM 210	CHEM 360	elective
6	CHEM 215	CS 110 OR 115	elective	elective
7	CHEM 340	BIOC 220	elective	elective
8	CHEM 312	CHEM 330	elective	elective
9	CHEM 4XX	(CHEM 4XX)	(CHEM 401)	elective
10	CHEM 4XX	elective	(CHEM 402)	elective

Sequence 3 (recommended 5 year program, organic and biology oriented)

term

1	CHEM 104	BIOL 100	ENGL 100	elective
2	CHEM 105	CHEM 140	ENGL 110	elective
3	CHEM 241	BIOC 220	PHYS 109	MATH 110
4	CHEM 215	elective	PHYS 119	MATH 111
5	CHEM 340	CHEM 250	CHEM 210	elective
6	CHEM 230	CHEM 251	CHEM 312	CS 110 or 115
7	CHEM 360	Elective	MATH 122	elective
8	CHEM 330	Elective	MATH 213	elective
9	CHEM 4XX	(CHEM 4XX)	(CHEM 401)	elective
10	CHEM 4XX	Elective	(CHEM 402)	elective

Course Titles which are active including BIOC3xx and BIOC/CHEM4XX offered within last 10 years

**BIOC 200 – Medicinal Plants and Culture** Prerequisite: 30 credit hours and one of the following courses at the 100 level: Anthropology, Biology, Chemistry, English, Indigenous Studies, or Psychology. Note: Biochemistry, Biology and Chemistry students can use this course in their program as an elective only.

**BIOC 220 - Biochemistry I – Biomolecules** Prerequisite: BIOL 100 and CHEM 105 (formerly 103 or 102)

**BIOC 221 - Biochemistry II – Metabolism** Prerequisite: BIOC 220 and CHEM 140 (formerly CHEM 240) Note: BIOC 221 replaces BIOC 320 and students cannot receive credit for both.

**BIOC 312 - Analytical Chemistry III - Instrumental Analysis** Prerequisite: CHEM 210 and 215 (formerly CHEM 310) Note: Students can only receive credit for one of BIOC 312 and CHEM 312.

**BIOC 321 - Biochemistry III – Macromolecules** Prerequisite: BIOC 221 (formerly BIOC 320)

**BIOC 330 – Enzymes** Prerequisite: BIOC 221 (formerly BIOC 320) Note: BIOC 330 replaces BIOC 420 and students cannot receive credit for both.

**BIOC 340 – Biophysics** \*\* Corequisite: BIOC 321

**BIOC 391 - Research Experience** Prerequisite: Permission of the Department Head and the faculty research advisor. Note: Research positions are limited. Students with a strong background in courses in the subdiscipline of research interest will be given preference.\* \* Note: Students can only receive credit for one of BIOC 391 and CHEM 391. \*Note: Students can use this course in their program as an elective only.

**BIOC 428 AC Cell Envelope Interactome** Prerequisite BIOC321

**BIOC 428 AG Network Medicine and Systems Biology** Prerequisite: Any second or third year Biochemistry course (however BIOC 321 would be beneficial)

**BIOC 428 AE Advanced Microscopy with Application to Medicine** Prerequisite BIOC340

**BIOC428AF Mechanisms of Toxicity** Prerequisite BIOC220 and 221

**BIOC 428AG –Network Medicine and Systems Biology** Prerequisite BIOC321

**BIOC 430 - Chemical Biology** Prerequisite: BIOC 330

**BIOC 440 - Advanced Microscopy** Prerequisite: BIOC 340

**BIOC 401 - Honours Research** Note: Students can only receive credit for one of BIOC 401 and CHEM 401.

**BIOC 402 - Honours Thesis** Note: Students can only receive credit for one of BIOC 402 and CHEM 402.

**CHEM 100 - Introductory Chemistry**

**CHEM 101- Chemistry in Cooking (to be offered fall 2018)** Prerequisites: CHEM 30 or CHEM 100 (minimum 65%), BIOL 30 (minimum 65%) Note: Biochemistry and Chemistry majors can use this course in their program as an open elective only.

**CHEM 104 - General Chemistry I** Prerequisite: CHEM 30 or CHEM 100 (minimum 65%) Note: Students cannot receive credit for both CHEM 102 and CHEM 104

**CHEM 105 - General Chemistry II** Prerequisite: CHEM 104

**CHEM 140 - Organic Chemistry I** Prerequisite: CHEM 102, 103 or 104 Note: CHEM 140 replaces CHEM 240 and students cannot receive credit for both.

**CHEM 210 - Analytical Chemistry I** Prerequisite: CHEM 105 (formerly CHEM 102 or 103) and 140 and PHYS 30

**CHEM 215 - Analytical Chemistry II - Spectrochemical Analysis** Prerequisite: CHEM 105 (formerly CHEM 102 or 103) and 140 (formerly CHEM 240) Note: CHEM 215 replaces CHEM 310 and students cannot receive credit for both.

**CHEM 230 - Inorganic Chemistry I** Prerequisite: CHEM 102, 103 or 105

**CHEM 241 - Organic Chemistry II** Prerequisite: CHEM 105 (formerly CHEM 102 or 103) and 140 (formerly CHEM 240)

**CHEM 250 - Physical Chemistry I** Prerequisite: CHEM 102, 103 or 105 and MATH 110

**CHEM 251 - Physical Chemistry II** Prerequisite: CHEM 250 and MATH 111

- CHEM 312 - Analytical Chemistry III - Instrumental Analysis** Prerequisite: CHEM 210 and 215 (formerly CHEM 310) \*\*\* \* Note: Students can only receive credit for one of CHEM 312 and BIOC 312.
- CHEM 330 - Inorganic Chemistry II** Prerequisite: CHEM 215 (formerly CHEM 310) and 230
- CHEM 340 - Organic Chemistry III** Prerequisite: CHEM 241
- CHEM 360 - Quantum Chemistry** Prerequisite: CHEM 230, MATH 111, and PHYS 119 or 112 Note: CHEM 360 replaces CHEM 460 and students cannot receive credit for both.
- CHEM 391 - Research Experience** Prerequisite: Permission of the Department Head and the faculty research advisor. Note: Research positions are limited. Students with a strong background in courses in the subdiscipline of research interest will be given preference. Note: Students can only receive credit for one of CHEM 391 and BIOC 391. Note: Students can use this course in their program as an elective only.
- CHEM 401 - Honours Research** Note: Students can only receive credit for one of CHEM 401 and BIOC 401.
- CHEM 402 - Honours Thesis** Note: Students can only receive credit for one of CHEM 402 and BIOC 402.
- CHEM 411 - Organic Chemical Analysis** Prerequisite: CHEM 312
- CHEM 431 - Magnetic Resonance Spectroscopy in Inorganic Chemistry** Prerequisite: CHEM 330
- CHEM 433 - Organometallic Chemistry of the Transition Metals** Prerequisite: CHEM 330 and 340
- CHEM 440 - Stereocontrol in Organic Synthesis** Prerequisite: CHEM 215 (formerly CHEM 310) and 340
- CHEM 441 - Modern Organic Synthesis** Prerequisite: CHEM 215 (formerly CHEM 310) and 340 Note: CHEM 441 replaces CHEM 442 and students cannot receive credit for both.
- CHEM 444 – Photochemistry** Prerequisite: CHEM 251 and 340
- CHEM 445 – Supramolecular Chemistry** Prerequisite: CHEM241 and one of CHEM250 or CHEM251
- CHEM 461 - Computational Chemistry** CHEM 251 and CHEM 360 (formerly CHEM 460)
- CHEM 491AB - Advanced Analytical Chemistry: Inductively Coupled Plasma-Mass Spectrometry**  
Prerequisite: CHEM 312 or BOIC 312
- CHEM 491AE - Supramolecular Chemistry** Prerequisite: CHEM 241 and one of CHEM 250 or CHEM 251
- CHEM490 AF - Physical Methods and their Chemical Applications** Prerequisites: CHEM 230, CHEM 250 and CHEM 251
- CHEM491AG -Advanced Techniques in Analytical Chemistry: Mass Spectrometry in Chromatography**
- CHEM 492AB - Advanced Topics in Supramolecular Organic Photochemistry** Prerequisite: CHEM 241.

**Appendix IV Faculty of Science STATS for Summer Regina and Off-campus Courses (La Ronge, Swift Current, Yorkton), 201220-Present**

Term	Course	Enrolment (Max Capacity)	Delivery Mode	Location
201720	CHEM100-070	40(48)	Summer	Regina
	CHEM104-040	48(48)	Summer	Regina
	CHEM104-314	15(35)	F2F-Regional College	La Ronge
	CHEM105-040	36(40)	Summer	Regina
201730	CHEM104-302	9(35)	F2F-Regional College	Swift Current
	CHEM104-303	41(50)	F2F-Regional College	Yorkton
201810*based on current enrolment	CHEM140-302	0(35)cancelled	NORPAC[contract]	Swift Current
	CHEM100-314	21(35)	F2F-Regional College	La Ronge
<b>2017-18 YR = 7 courses</b>		<b>210(289)</b>		
201620	CHEM100-070	37(48)	Summer	Regina
	CHEM104-040	47(50)	Summer	Regina
	CHEM104-314	16(35)	F2F-Regional College	La Ronge
	CHEM105-040	46(50)	Summer	Regina
201630	CHEM104-302	16(35)	F2F-Regional College	Swift Current
	CHEM104-303	47(50)	F2F-Regional College	Yorkton
	CHEM100-380	9(35)	NORPAC[contract]	Regina
201710	CHEM104-380	5(35)	NORPAC[contract]	La Ronge
	CHEM140-302	11(35)	F2F-Regional College	Swift Current
	CHEM140-303	10(35)	F2F-Regional College	Yorkton
	CHEM100-314	13(35)	F2F-Regional College	La Ronge
<b>2016-17 YR=11 courses</b>		<b>251 (428)</b>		
201520	CHEM100-070	35(48)	Summer	Regina
	CHEM104-040	42(50)	Summer	Regina
	CHEM104-314	25(35)	F2F-Regional College	La Ronge
	CHEM104-380	9(35)	NORPAC[contract]	La Ronge
	CHEM105-040	32(31)	Summer	Regina
201530	CHEM104-302	8(35)	F2F-Regional College	Swift Current
	CHEM104-303	39(35)	F2F-Regional College	Yorkton
	CHEM100-380	6(35)	NORPAC[contract]	La Ronge
201610	CHEM140-302	8(35)	F2F-Regional College	Swift Current
	CHEM140-303	12(35)	F2F-Regional College	Yorkton
<b>2015-16 YR=8 courses</b>		<b>216 (373)</b>		
201420	CHEM100-070	46(48)	Summer	Regina
	CHEM104-040	46(49)	Summer	Regina
	CHEM104-380	11(35)	NORPAC[contract]	La Ronge
	CHEM105-040	36 (60)	Summer	Regina
201430	CHEM104-302	14(35)	F2F-Regional College	Swift Current
	CHEM104-303	37(35)	F2F-Regional College	Yorkton
	CHEM100-380	6(35)	NORPAC[contract]	La Ronge
201510	CHEM140-302	7(35)	F2F-Regional College	Swift Current
	CHEM140-303	7(35)	F2F-Regional College	Yorkton
<b>2014-15 YR=9 courses</b>		<b>210 (370)</b>		
201320	CHEM100-070	33(48)	Summer	Regina
	CHEM104-040	47(53)	Summer	Regina
	CHEM104-380	8(25)	NORPAC[contract]	La Ronge

	CHEM105-040	43 (60)	Summer	Regina
201330	CHEM104-302 CHEM104-303 CHEM100-380	13(35) 23(35) 9(30)	F2F-Regional College F2F-Regional College NORPAC[contract]	Swift Current Yorkton La Ronge
201410	CHEM140-302 CHEM140-303	9(35) 8(35)	F2F-Regional College F2F-Regional College	Swift Current Yorkton
<b>2013-14 YR=9 courses</b>		<b>193 (356)</b>		
201220	CHEM100-070 CHEM104-380 CHEM105-040	25(45) 0(0)cancelled 53 (60)	Summer NORPAC[contract] Summer	Regina La Ronge Regina
201230	CHEM104-302 CHEM104-303	9(35) 22(35)	F2F-Regional College F2F-Regional College	Swift Current Yorkton
201310	CHEM140-302 CHEM140-303 CHEM100-380	7(35) 8(35) 5(30)	F2F-Regional College F2F-Regional College NORPAC[contract]	Swift Current Yorkton La Ronge
<b>2012-13 YR=7 courses</b>		<b>129 (275)</b>		