



UNIVERSITY OF
CALGARY

CUMMING SCHOOL OF MEDICINE | Graduate Science Education |
Professional Skill Development

What Can You Be With Your Grad Degree? A Symposium

December 12, 2019
Foothills Campus | Calgary, AB

cumming.ucalgary.ca/gse/current-students/proskills

About

Most graduate students do not know what they can do after they graduate. They have little awareness of what careers they can pursue with their graduate degree other than professorship careers.

“What you can be with your grad degree” will expose students to over 25 careers in areas of Research & Development, Regulatory and Business.

Did you know that over 70% of graduates work in areas unrelated to their degree? At some point in their lives they abandoned the sunk cost fallacy of remaining in research and pivoted to a career that leveraged their love for science, while catering to their values and interests.

In this symposium, we will introduce you to the concepts of career exploration, and how to use a design-thinking approach to find a career path that is perfect for you.

Participants in the symposium are part of the BMEN 602: Biomedical Engineering Core I, taught by Dr. Derrick Rancourt.

Through an informational interview, students gained insight into career opportunities identified as targets for those who have completed a research-based graduate degree.

Schedule

Thursday, December 12, 2019

1 pm	Registration	HSC G500
1:15 pm	Keynote Address	HSC G500
2:30 pm	Poster Presentations	HMRB Atrium
4:30 pm	Wrap Up	HMRB Atrium

Keynote Address:



Randall K. Ribaldo, PhD

**President CEO, Human Workflows LLC
Co-Founder, SciPhD.com**

SciPhD and Human Workflows co-founder Dr. Randall Ribaldo has over twenty years of experience in the Scientific Research and biotechnology field and has successfully made the transition from academia to industry to entrepreneur. These experiences form the foundation of the SciPhD training programs that are now offered at over 120 institutions across the US. After receiving a Ph.D. in Immunology at the University of Connecticut, he completed a postdoctoral fellowship at the NIH before becoming a Principal Investigator at the National Cancer Institute, leading a team of postdocs, technicians, and students resulting in patents and numerous publications. In 1997 Dr. Ribaldo left academia to pursue opportunities in the biotech industry that culminated at Celera Genomics during the Human Genome revolution. At Celera, Dr. Ribaldo was a liaison to pharmaceutical, biotechnology and academic communities, served as a product manager for proteomics and led a task force to define strategic direction. Dr. Ribaldo's experience as an academic and industry scientist, coupled with his experience consulting with industry scientists provides unique insight to the critical skills necessary to promote success in academic and industry settings, and forms the basis for the SciPhD training programs.

Presentations

Thursday, December 12, 2019 @ 2:30pm

Presenter	Poster Title
Brett Abraham	A Graduate Degree in Biomedical Engineering Prepares for a Career in Bioprocess Engineering
Kimberly Amador	Design & Development: Transforming Ideas into Lifesaving Technology
Ryan Baxter	A graduate degree in biomedical technology can be a useful stepping stone into entrepreneurship
Anupam Bisht	Clinical Trial Manager: One of the reasons behind success of clinical trials
Matt Daalder	A graduate degree in biomedical engineering can be an asset for a career in medical device sales.
James Griffiths	Epidemiology, and how a graduate degree in biomedical engineering can get you there.
Alejandro Gutierrez	Working on a field with relevant challenges allows motivation for deep understanding of engineering methods.
Safia Ihsan Ali	Medical Affairs – A Growing Career Path
Hansuk Kim	Essential supporter for the successful research – Grant Facilitator
Thomas Lijnse	Making the most of a BME degree in the engineering consulting
Mohammad Jahromi	Business Development
Alex Olsen	Can Biomedical Engineering help you further your career development as a clinical ethicist?

Presenter	Poster Title
Milena Overhoff	A graduate degree in biomedical engineering can be a good start for a career as a project manager
Kassondra Pedenko	Clinical Research Associate
Leonardo Queiroz	The Biomedical Engineering background can be applied to a Data Science analysis
Tahereh Rashnavadi	Competitive Intelligence
Sophia Shah	A graduate degree in biomedical engineering (BME) can lead to a career in health economics
Milad Shamsi	Medical Science Liaison
Sukhjot Sidhu	A Graduate Degree in BME can Translate into an Effective Career in Public Policy
Anupriya Singh	A graduate degree in Biomedical Engineering can be an asset for a career in Technology Assessment and Alliance Manager
Pratham Singh	A Biomedical Engineering Degree can help you win the Major League Baseball World Series
Katrin Smith	Graduate studies in biomedical engineering: An asset in hardware engineering
Tim Van der Zee	Machine Learning Engineer
Murray Wong	A Biomedical Engineering Graduate Degree is a Valuable Differentiator in the Competitive Orthopaedic Surgery Job Market

Presentations Information

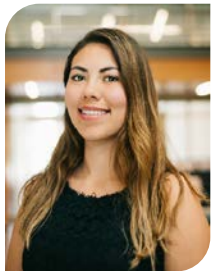


Brett Abraham

A Graduate Degree in Biomedical Engineering Prepares for a Career in Bioprocess Engineering (Authors: Brett Abraham, Benjamin Youn)

Bioprocess engineering is a specialization of chemical engineering and bioengineering that focuses on the manufacturing of biological products including pharmaceuticals, biopolymers, and regenerative medicine. Biopharmaceuticals and regenerative medicine contribute to an industry that is growing rapidly, and skilled bioprocess engineers are required to translate these therapies to market. According to Benjamin Youn, a senior scientist at BioMarin Pharmaceutical, there is currently a hot market for bioprocess and a shortage of good candidates. However, there are very few jobs in Canada with current hot spots like San Francisco, Los Angeles, Boston, Washington DC, as well as Singapore and Japan.

A bioprocess engineer typically works in a manufacturing sciences group, which conducts ongoing research after a drug process has been commercialized. This team works to increase process efficiency and to problem-solve should anything go wrong. A strong knowledge of chemical engineering fundamentals is required for this role including heat and mass transfer, as well as a good understanding of statistics and fundamental biology. A master's degree is effectively the minimum requirement for a Canadian to break into the field, however it becomes harder to progress in the sector without a PhD. With a PhD, there is essentially no ceiling for progression in a bioprocess career. Overall, a BME graduate degree prepares a candidate for this role by providing required technical and critical thinking skills. Beyond this, a candidate must differentiate themselves with soft skills, motivation, and passion. And of course, they must be willing to move.



Kimberly Amador

Design & Development: Transforming Ideas into Lifesaving Technology (Authors: Kimberly Amador, Karelia H. Delgado)

Biomedical Engineering (BME) combines engineering skills with medicine to solve problems related to living systems. Both, technology industry and academia are strongly involved in the design and development of new biomedical products by bringing together knowledge and resources. However, this field not only requires a degree expertise, but also the understanding of the clinical needs and applications.

BME design and development can be clustered into two major groups: medical devices and instrumentation. While some people may dedicate their time designing or testing medical devices (advanced prosthetics, therapeutic devices, biomaterials), others may design electrical circuits (wearable technologies, imaging equipment, artificial organs) or even computer software for instrumentation (diagnostic tools, bioprocessing methods). However, transforming ideas into products is not enough to advance in the medical field, but the need of life-saving technologies that transcend in our community instead. A graduate degree in BME will help you develop the skills required to design new technologies by conducting high quality research, enabling solutions for current clinical problems that are diagnostic or therapeutic-oriented. The challenges of this field require creative, intelligent people with a growth-mindset that are willing to work with a multidisciplinary team to enhance human's performance.



Ryan Baxter

A graduate degree in biomedical engineering can be a useful stepping-stone into entrepreneurship
(Authors: Ryan Baxter, Adam Gapinski)

An entrepreneur can be described as one someone who starts a business and takes on risk with the hope to see that business achieve success. They are able to generate and create value in a marketplace, with the end goal of being rewarded for the value that they provide (whether that be through a product, service, software, etc.). Entrepreneurship can be found in every marketplace, covering a broad range of topics which makes each entrepreneurial venture different from one another. In 2018, Canada had 3.5 million entrepreneurs with 8% operating within healthcare/bioscience industries.

Failure rates for new businesses are high, though according to CBInsights the number one reason for failure is that there is no market need for the product or service. There are no particular qualifications or skills needed to become an entrepreneur, though in order to be successful one must able to address market needs and be willing to take risks, albeit calculated ones. Success can range widely from one entrepreneur to another, though the possibilities are endless for an entrepreneur with the drive and ambition to succeed.

My interview with Adam Gapinski highlighted the above information and more. He is a successful young entrepreneur in the transportation sector, and says that the ability to drive your own success and take control over your career path are two of the best things about pursuing entrepreneurship. A biomedical engineering degree would suit this career path well in the pursuit of entrepreneurship in the health sector particularly. Gaining experience and understanding of biomedical engineering principals can provide a technical knowledge base, and research projects conducted during a BME grad program can provide inspiration and lead to the discovery of new technologies and services for which to build a company around.



Anupam Bisht

Clinical Trial Manager: One of the Reasons behind success of clinical trials
(Authors: Anupam Bisht, Jeehyun Karen You, Erin Mosca)

Clinical trials are expensive in terms of both time and money and require a large workforce for timely completion of the projects. An integral member of this workforce is a Clinical Trial Manager (CTM). In this work, Dr. Erin Mosca, (Manager, Clinical & Regulatory Affairs at Zephyr Sleep Technologies, Calgary, CA) and Jeehyun Karen You (Clinical Trial Manager (2014-2017), Department of Surgery, Stony Brook University, New York, USA) were interviewed to find more about their jobs. Typically, CTMs are involved in team management, checking project status and timeline, liaising between the different collaborating teams. They also design and approve the protocols from FDA, Health Canada, HIPAA (USA). CTMs require technical skills such as data management, understanding about patient data and ability to fix appropriate things. Creativity, strong communication skills, organization and administrative skills are assets for the job. A minimum degree in Bachelor of Science is needed, although a graduate degree can overcome the little experience with clinical trials which is the important skill required. Candidates with biomedical engineer graduate

degree, usually have worked closely in projects involving both biology and technology giving them an edge over other applicants, provided they have the necessary clinical experience. Although the job market for a CTM is location dependent yet is growing due to the increase in the research in drug/devices and their need to be tested. The CTM salary ranges from \$40K -70K (academics) to \$70K –100K (companies).



Matt Daalder

A graduate degree in biomedical engineering can be an asset for a career in medical device sales (Authors: Matt Daalder, Cam Anonymous (interviewee, Orthopedic Device Sales Rep))

Medical device sales require the ability to sell a product for medical use, generally to a hospital or to clinicians for long term contracts. However, the position requires the ability to understand and stay up-to-date on biomedical research and clinical practices to teach and support clients in the use of your product. A salesperson will require a strong understanding of medical device instrumentation to provide technical advice to the customer. Some professionals will be an integral part of the surgical team, directing physicians and nurses in the operating room as needed. As such, technical sales often fill the role of product consultant to ensure procedures using their devices run smoothly. This makes a degree in biomedical engineering useful in pursuing this career: An individual will have the ability to integrate their existing knowledge and communication skills to quickly understand and critically analyze their products, their use-cases, and the changing technological environment to make and support a customer.

While variable by company, an entry-level position in Canada is a Sales Representative at a salary of ~\$50k. Career progression can lead to a Regional Sales Manager position with a salary or commission-based compensation above \$200k with bonuses. Experience in sales is beneficial to getting employed, although some companies will provide training. You can also shadow salespeople if you develop a relationship with them. Overall, interviewees in orthopedic device sales and physicians buying products unanimously emphasized the ability to be personable and respectful, reinforced by a strong science background and conscientiousness to be successful in the position.



James Griffiths

Epidemiology, and how a graduate degree in biomedical engineering can get you there (Authors: James Griffiths, Le Quyen Duong, Epidemiologist at the World Mosquito Program (WMP))

Epidemiology is the study of the dynamics of disease distributions, and the burden of those diseases at a population level. Specializations within the discipline range from a focus on mathematical models measuring the distributions of diseases, through to aiding government agencies in the creation, or measuring the efficacy, of policies relating to public health. Historically, epidemiologists studied the effects of communicable diseases, such as HIV, on a given population. More recently, they have begun to study the burden of non-communicable diseases, such as diabetes. Although all epidemiologists require an understanding of public health, skills and qualifications required to work in this career largely depend upon the specialization in question. For instance, a focus on modelling dynamics of disease distributions would require a strong working

knowledge of mathematical, statistical, and data science techniques. Although many epidemiologists study degrees specifically in this field, biomedical engineers can gain experience in the study of public health by pursuing graduate certificate programs. Epidemiologists typically work with government departments, using public health data to inform policy makers. The job market for this career is projected to increase in demand, as factors such as climate change and globalisation facilitate, and exacerbate, the spread of many communicable and non-communicable diseases. The graduate program of biomedical engineering offers the opportunity to learn the required skills to pursue this path, as well as to synergise my existing skills, such as my experience in ecology, data science, and working in vector biology, to make me the ideal candidate for this career.



Alejandro Gutierrez

Working on a field with relevant challenges allows motivation for deep understanding of engineering methods

(Authors: Alejandro Gutierrez, Aron Talai)

Our nature as human beings is to save energy unless there is a higher underlying motivation. How come schools are not outdated if we are able to learn everything online? It is because schools provide something more important which is, among other things, the will to learn. Under this context, there are careers such as biomedical engineering which allow for such motivation to be constant, giving you real problems and challenges in the medical field which are immediately relevant. The type of engineering methods used in the biomedical field is becoming increasingly extrapolatable across disciplines. One of those engineering methods is data science; it is widely used from medical image analysis to water pipeline analysis, and that is the case found in an interview with Aron Talai, who earned a master's degree in biomedical engineering at the University of Calgary just to find himself today leading a data science project at Xylem. During his master's he worked with machine learning methods. "It was the same analytical methods, just different engineering problems" said Aron. Data science is the combined set of disciplines that englobe statistics, machine learning and data analysis; the job market is very large and diverse. The salary for an entry level data scientist is \$95,000.00 USD a year [1] and it substantially increments by years of experience. Most importantly, employers seek for certain soft skills in their data scientists such as creativity and critical thinking, all which are stimulated when there is high motivation [2]. Biomedical Engineering stimulates skills and knowledge in a meaningful way, it does it by giving students real problems that provide the experience they need to satisfy the emerging and more challenging jobs explored by the industry. Having a challenge such as discovering disease patterns on medical images can be a great source of motivation, in return, this will allow you to get hands-on experience in creatively analyzing data, a skill highly demanded by today's industry.

[1] "How Much Is a Data Scientist's Salary?: University of Wisconsin." University of Wisconsin Data Science Degree, <https://datasciencedegree.wisconsin.edu/data-science/data-scientist-salary/>.

[2] Amabile, Teresa M. How to Kill Creativity. Harvard Business School Publishing, 1998.



Safia Ihsan Ali

Medical Affairs – A Growing Career Path
(Authors: Safia Ihsan Ali, Dr. Rahman Ali)

Medical Affairs plays two key roles. On the external side, the medical organization serves as the bridge between a company and numerous external stakeholders. Internally, Medical Affairs is the bridge between the research and development organization and the commercial organization.

One of the first steps into Medical Affairs is usually in a Junior Medical Information role. Medical Information involves handling enquiries around company products, both externally from healthcare professionals and patients and internally from sales and marketing teams and providing an accurate response. Some more Medical Affairs roles include: Senior Medical Information roles, Scientific Advisors and Medical Science Liaisons.

To move into this area the minimum requirements are usually a bachelor's degree in Pharmacy or Life Sciences. It is essential to have a good ability to interpret scientific information in both written and verbal forms and be able to communicate this to customers at all levels. As of Oct 25, 2019, the average annual pay for a Medical Affairs in the United States is \$110,187 a year.

Dr. Rahman Ali, a Medical Science Liaison at The Iranian Hospital, Dubai, described his role as being challenging and addicting. He pointed out that no two days are same in this career and it's a perfect position for anyone who likes to solve scientific and engineering problems, and most importantly, loves to help people.

By gaining knowledge in the fields of engineering, medicine and biology to create solutions for medical problems, my Graduate Degree in BME will help me prepare for a growing career path in Medical Affairs. Medical affairs acts like a bridge between medical and commercial groups in the company and the markets, offering a variety of roles and progression pathways for a successful career.



Hansuk Kim

Essential supporter for the successful research – Grant Facilitator
(Author: Hansuk Kim, Angela McCormick from the University of Alberta)

Grant facilitator is a job that identifies funding opportunities, delivers them to the faculties and works together to write competitive proposals. Usually a master's degree and three or more years of post-secondary or related research experience is required. Also, communication is essential for this job since this position should continuously communicate with many researchers. Background knowledge and understanding in their research field are helpful to enrich communication and completeness of a proposal. In this point of view, BME graduates, who have perspective in a wide range of biology, medicine and engineering, have benefits in relevant field of studies and interdisciplinary studies. Their starting salary is between \$60,000 - \$85,000, according to the institution.

Angela McCormick is Research Administrator in University of Alberta. Although her role is more focused on administration, I could learn about the pleasure and difficulties from the grant related job. Successful

obtaining of research grant is not only the purpose of this job but also makes her satisfied. On the other hand, they must work very hard in specific periods of year before the deadline for major grant agencies.

This job would fit well for graduates who want to do a role in academia but not to be submerged in a single research area and love to exchange ideas and organize them in writing.



Thomas Lijnse

Making the most of a BME degree in the engineering consulting field

(Authors: Thomas Lijnse, Sandy Williams – President/Founder, Access Biomedical Solutions LLC)

Biomedical engineering consulting consists of almost any required task for companies of any size, large or small. This may include technical writing of patents for large companies, or product development for startups. Typical qualifications for the consulting field consist of a graduate degree, mostly a PhD, and plenty of industry-relevant experience. Typical salaries in this field average \$85,000 USD, but are projected to be rising with increasing demand. As this job heavily requires a strong exposure to multiple disciplines, a strong desire to push one's own boundaries in learning and education, as well as an extensive network, a BME degree is ideally suited.

I contacted Sandy Williams through targeted LinkedIn searches and messages, looking for persons with experience in BME currently working for health consulting companies. The main messages to take away from the conversation were that consulting can be an intensely busy, but interesting field that bridges the need for advanced technical skills, a desire to learn new skills, and well-developed soft skills.

Experience is key, and this is only developed through involvement in various industries in a variety of roles, as even the best technical skills cannot account for a lack of baseline financial, clinical practice, or product development knowledge. This wide variety of skills and strengths aligns quite well with a BME graduate degree, if utilized to the full extent.



Mohammad Jahromi

Business Development

(Authors: Mohammad Jahromi, Interviewee: Kelly Fyfe)

When a potential client is seeking information on products and services that a company provides, the very first point of contact is often a business developer. I started my research to survey reputable start-up companies within Calgary to find their business developer. My interviewee, Kelly Fyfe, is a business development manager in the Hawkiiii at 4iiii innovation. The business development manager's responsibilities include planning and overseeing new marketing initiatives, researching organizations and individuals to find new opportunities and develop new markets to improve sales. Part of his duties includes finding oil and gas companies to get them to use their optimal and real-time monitoring Internet of Things (IoT) solution.

To state the obvious, communication and networking skills play an essential role in this job. A business development manager like Kelly, who has excellent knowledge and skills in marketing and research, can help them achieve new market goals in their related areas.

Based on my interviews, the IoT field is a flexible solution for different businesses and can be utilized in different areas, such as health monitoring. Moreover, the number of industrial companies in Calgary is growing, and this presents thriving opportunities for business development. A successful business developer combines engineering, marketing, and innovation – all productive resources – to smooth the path to the goals of an innovative company. Entry-level salaries for this position start at \$68,000 and with experience go as high as \$150,000 per year.



Alex Olsen

Can Biomedical Engineering help your further your career development as a clinical ethicist?
(Authors: Alex Olsen, Ryan Pferdehirt, Director of Membership and Ethics Education at the Center for Practical Bioethics)

Clinical Ethicists are individuals that physicians turn to when they're faced with moral or ethical dilemmas. Individuals that work in this field sit on different hospital ethics boards and participate in ethics consultations; they also prepare educational material. When acting in these capacities, bioethicists have to have humour, interpersonal skills, communication skills, and self-trust. These individuals see both sides of every dilemma and communicate this to coworkers. As medical technology advances, the field of bioethics also advances. More now than ever there are many questions that need to be answered regarding the implementation of medical devices in the clinical setting. Although the field is advancing it is still challenging to be hired as a full-time bioethicist. Many individuals in medicine and law are passionate about bioethics so they pursue it as a side hustle. To be a prime contender in this field, one must have an extensive understanding of philosophy, ethics, and clinical settings.

As everyone knows, medical technologies are advancing. A degree in biomedical engineering helps one understand the aspects of these technologies and articulate these to patients and doctors. There are also many soft skills that one learns from a graduate degree that are beneficial, such as interpersonal skills, communication, and self-trust.

The main take away from my interview with Ryan was that, at the end of the day, to be successful in this field, one has to be constantly evaluating themselves and others to ensure that every individual they face is done right by.



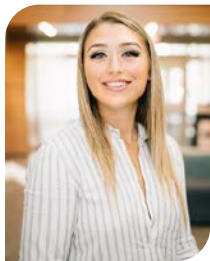
Milena Overhoff

A graduate degree in biomedical engineering can be a good start for a career as a project manager
(Authors: Milena Overhoff)

The position of a project manager is very multifaceted. No matter if it is about research or developing a new product, any project needs at least one person to keep the overview and manage the project. Apart from getting things done and being good at managing risk, change, time, resources and more, a project manager needs great communication skills as it is part of the job to deal with different departments. That's why the project manager may be seen as the glue between the departments within a project. But aside from challenges with different

groups of people, a project manager needs to be able to deal with change as nearly no project proceeds as it was planned in the beginning.

Concerning the qualification, there are a few certificates such as the Project Manager Professional certification from the Project Management Institute, that can work as door openers, but technically a degree in biomedical engineering and the above skills are enough to start a career as a project manager.



Kassondra Pedenko

Clinical Research Associate
(Author: Kassondra Pedenko, Emily Bishopis)

Clinical trials are indispensable to the prosperity of society. Healthcare systems require sound scientific evidence on the effectiveness and safety of a product before it can be released to a clinical population. A clinical research associate (CRA) plays a vital role in ensuring information generated from clinical trials is reliable, that it is obtained safely and ethically, and that it complies with investigation protocols and federal regulations.

A CRA coordinates the collection, distribution, and storage of data obtained in a clinical trial, and ensures the study remains on track with clinical and company objectives. A CRA has their hand in every aspect of a clinical trial. Due to the diverse spectrum of responsibilities involved in being a CRA, employers often show a preference towards Ph.D. graduates when hiring for a CRA position, especially those with ample clinical research experience. The majority of employers are looking for competent and highly organized individuals with in-depth knowledge and experience in their respective fields of study and analytical techniques.

Emily Bishopis a CRA at Spring Loaded Technology who completed her doctorate at the University of Calgary in Biomedical Engineering. She explained that her job as a CRA is, in fact, just an accelerated version of her graduate work, with the timelines shortened considerably by company pressures. As the responsibilities of a CRA closely mirror those of a biomedical engineering graduate student, Emily's experience acquired during her graduate degree set her up for success in the fast paced environment in which she works now.



Leonardo Queiroz

The Biomedical Engineering background can be applied to a Data Science analysis
(Authors: Leonardo Queiroz, Niloofar Nayebi – Avanade Inc.)

Data science is a field that uses scientific methods, processes, algorithms, and systems to extract knowledge and insights from data [1]. A biomedical engineering (BME) grad degree is useful to understand some specific problems and types of data (such as MRI, EEG, and ECG), how to use certain scientific methods, and how to present the results. Within the field of BME, a data scientist can improve the ability to diagnose and treat diseases more effectively while reducing costs.

I found my interviewee on the LinkedIn and we talked for 40 min. Her main message was that it's more important to understand the context of the problem than a specific tool to solve it.

As a data scientist in BME presented with a problem, we first need to understand what the data represent, what the problem is, and how data analytics can help. Once that's done, we clean the data, find patterns and trends using statistical methods, construct the model to predict, and put the results into good visual format.

The typical qualifications include a degree in science or engineering with master's or PhD, as well as experience in machine learning, algorithms, understanding accuracy, and interpreting results. Familiarity with various coding languages and softwares is also required. These can be learned through online courses or company-provided training.

The data science market is growing: The salary in Calgary is around \$60,000.00, 31% below of national average but it can be up to \$ 107,000.00 if we look at the whole country [2].

[1] Wikipedia contributors. (2019, October 27). Data science. In Wikipedia, The Free Encyclopedia. Retrieved 02:41, November 1, 2019, Available: https://en.wikipedia.org/w/index.php?title=Data_science&oldid=923200162

[2] Indeed (2019, September 20). Data Scientist Salaries in Calgary, AB. In Indeed, November 1, 2019, Available: <https://ca.indeed.com/salaries/data-scientist-Salaries,-Calgary-AB>



Tahereh Rashnavadi

Competitive Intelligence

(Author: Tahereh Rashnavadi, Interviewee: Shaghayegh Taghipour, MEng, BME & MBA)

Competitive intelligence (CI) consists of monitoring rival companies in order to ethically gather information from them, then analyzing that information and presenting them to the current company to make strategic decisions.

A CI person needs to be abreast of the latest developments and best practices in the field and is responsible to maintain the current company competitive with the rivals. The duties can be articulated into three stages. First, resources and the required information need to be identified and gathered as well as properly organized and classified. Second, the obtained data should be precisely analyzed. Finally, the results with clear objectives are presented to the company for making strategic decisions. Having a degree in both fields of business and information technology are essential. Insights into business development and knowledge in big data analysis techniques and tools are imperative.

My interviewee was Shaghayegh who owns a startup. She recommended me to be updated with the most recent data analysis tools, e.g. machine learning. The market is highly demanding for this job, and the salary is starting from \$90K.

Through the BME degree, I get experience with the latest technology and tools in the field of bioengineering. I can expand my knowledge on the current companies in multiple areas and how they tackle the related problems and what could be the possibility for advancing the technology in the future.

Overall, CI is playing a crucial role in the market especially for the companies active in high-tech as the technology is growing rapidly.



Sophia Shah

A graduate degree in biomedical engineering (BME) can lead to a career in health economics (Authors: Sophia Shah)

A health economist is responsible for managing the economic aspect—including optimizing efficiency and efficacy of both consumption and production—of healthcare. A bachelor's degree in a relevant scientific discipline (life sciences, public health, etc.) is the basic academic requirement for a career in health economics. However, as a professional interacting with people from different disciplines on a daily basis, a BME graduate degree provides both a competitive advantage and the interdisciplinary knowledge and skills required for the profession. Those passionate about improving healthcare standards, along with an interest in innovation, a drive for results, and the ability to communicate complex topics in a simple manner can find success in a career in health economics. With continual government austerity, opportunities in public health economics (especially in regard to working for the government) can be limited, however positions in the private sector are generally more available. Working as a health economist, one can expect a salary range of anywhere between \$60,000-\$120,000, or even higher if working in management. I interviewed someone working in health economics with the Government of Alberta, who I found through LinkedIn. He has asked to remain anonymous, however his main message is that a BME graduate degree and its interdisciplinary applications would make a good candidate for the position. Apart from the academic side, it all comes down to one's work ethics and abilities to think innovatively whilst leading people.



Milad Shamsi

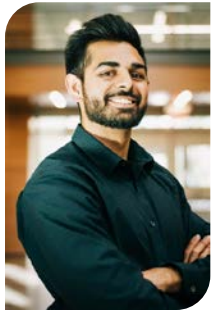
Medical Science Liaison (Authors: Milad Shamsi, Suharsh Shah, Rose Dabas, Kyla Jamieson)

A medical science liaison (MSL) is a specialized role within the pharmaceutical industry. Briefly, an MSL is the link between pharmaceutical companies and medical doctors. MSLs work to identify key opinion leaders (KOLs) in therapeutic areas and build professional relationships with these KOLs. An MSL most often concentrates on a specific therapeutic area. As such, for this work, three MSLs working in three different fields of Immunology (Dr. Shah), Hematology (Dr. Dabas), and respiratory diseases (Dr. Jamieson) were interviewed.

MSLs traditionally hold a graduate degree in life sciences. However, biomedical engineers are also emerging as a new generation of MSLs within the evolving job market. An MSL is expected to build and maintain an in-depth knowledge of diseases, products, and therapies while following key care gaps, treatment trends, and emerging clinical science. Moreover, MSLs are required to support medical and

scientific meetings, interpret logical and therapeutic data, and provide educational support to their peers and colleagues.

Obviously, academic and research skills developed during a graduate degree in Biomedical Engineering (BME) could well prepare the individual to meet the aforementioned responsibilities. Nevertheless, MSLs must also have excellent communication skills and the ability to maintain and develop effective business relationships. Hence, working towards a future job as an MSL requires students to build strong interpersonal skills during their graduate studies in BME. According to the interviewees, the job market of this career holds great potential as pharmaceutical companies will be recruiting more and more experts to improve the lives of patients.



Sukhjot Sidhu

A Graduate Degree in BME can Translate into an Effective Career in Public Policy

(Author: Sukhjot Sidhu, Interviewees: Brendan Frank – Institute for Science, Society and Policy, Kyle Hukezalie – STEMCELL Technologies)

Public policy is a rapidly growing field which provides structured approaches to problems related to governing interactions, laws, and funding. Within this field there is also science policy, which focuses on aligning scientific pursuits with the interest of the public, requiring knowledge of science and the ability to relay this information to the public and decision makers. As the field of science is multi-disciplinary, there exist multiple facets of science policy, covering topics from climate change to animal testing. Qualified individuals for these jobs possess excellent communication skills, the ability to understand issues from multiple perspectives, outstanding project management, and leadership or decision making capacity. Interestingly, a graduate degree in BME provides candidates with almost all of the necessary traits to be successful within this field. This multi-disciplinary program will help students develop project management skills, provide opportunities to improve both oral and written communication, grasp scientific issues, and readily put them in a leadership position during completion of their thesis. To assess the ability of a graduate degree in BME to further a career in public policy, interviews across the field were conducted from climate change to life sciences public policy. Interviewees were found via both LinkedIn and through local networking, consisting of members of both the life sciences and universities. Overall, they concluded that a degree in BME can provide students with the tenacity to face hardships, pursue opportunities, while also improving the necessary skills to be a successful candidate in public policy, through the thesis-based graduate program.



Anupriya Singh

A graduate degree in Biomedical Engineering can be an asset for a career in Technology Assessment and Alliance Manager

(Author: Anupriya Singh)

The translation of the innovative research unless made available for the good of humans does not fully serve its purpose of meaningfulness. A Technology Assessment and Alliance manager is the new emerging bridge that brings together innovative researchers and the translator corporate world. This collaborative and multifunctional role performs the duty of assessing innovative technologies and eases academia/industry collaboration leading to the commercialization of new inventions. In doing so, the training which a Ph.D. candidate goes through (presenting the findings, collaborating with other laboratories) prepares the individual for this role which requires them to have interpersonal skills and the ability to function well in a team environment and have an excellent understanding of the scientific area they are dealing with and be able to identify and prioritize technologies of interest and the research that have higher potential for commercialization. In addition to this, finance management and dealing with intellectual property rights are skills that are of utmost importance. Depending upon experience level and location, the salary per annum in Canada is between CAD\$77000- CAD\$ 155000.

I found the interviewee via LinkedIn. “If you love research and have a heart of business-person then this is the job for you”, was the overall message that I concluded from my informational interview.

Overall, this is an interesting job that does not come with the same title and we tend to miss it. Especially with a Ph.D., it keeps the charm of still being in touch with research while allowing you to enjoy watching when someday you try one of those commercialized products.



Pratham Singh

**A Biomedical Engineering Degree can help you with the Major League Baseball World Series
(Authors: Pratham Singh, Joseph Myers, PhD, ATC)**

The career I have chosen is Performance Scientist. My chosen career entails collecting data for injury risk prevention. The main duties are disseminating knowledge, optimizing performance with the medical staff, and exploring novel initiatives. This career requires a M.Sc. in the relevant field (i.e. engineering, physiology, psychology etc.). The actual salary for an entry-level position for a Performance Scientist is \$30,000 USD. The skills required to be a Performance Scientist include applying biomechanical principles to health care systems. A graduate degree in biomedical engineering (BME) prepares you by gaining knowledge in biomechanics through problem-based learning. I got in touch with my interviewee, Joseph Myers, PhD, ATC, Director of Baseball Performance Science with the Tampa Bay Rays, through email. Dr. Myers’s main message was to establish relationships, as trust must come first before any implementation can occur. Furthermore, he said performance science is a broad field and the key is becoming an expert in a specific area. Overall, being a Performance Scientist can be a fulfilling career for a BME graduate student by applying biomedical engineering knowledge in biomechanics, human locomotion, wearable technologies, and machine learning to a love of sports. There is a promising job market and salary outlook; however, BME graduate students do need to specialize in a specific area of Performance Science.



Katrin Smith

Graduate studies in biomedical engineering: An asset in hardware engineering
(Authors: Katrin Smith¹, Muhammad Omer², Alexandra Talparu², Alborz Amir-Khalili²)

Affiliations: 1. Biomedical Engineering Department, University of Calgary; 2. Circle Cardiovascular Imaging

Hardware engineers are responsible for the design, implementation testing and maintenance of physical electronics, known as hardware. They are experts in circuits, components, computers, and embedded systems. Typically, hardware engineers are qualified by a bachelor's degree in computer or electrical engineering and make, on average, 84 000\$ yearly in Calgary. Hardware engineering is emerging in new fields such as mobile computing, robotics, computer vision, and medical technology. In medical technology alone, hardware engineers are developing electronic devices for a range of applications such as diagnostics, therapy, surgery, and recreation. As the applications become more specialized, engineers can seek graduate degrees to expand their skills, for instance, graduate studies in biomedical engineering. To learn more about the role engineers play in medical technology, I spoke with three members of the machine-learning R&D group at Circle CVI in Calgary, Muhammad Omer, Alexandra Talpaluru, and Alborz Amir-Khalili. While all three had backgrounds in electrical or systems engineering, Omar and Alborz had PhD degrees in a biomedical engineering field, and Alexandra had a MEng in biomedical engineering. They highlighted the importance of understanding the healthcare problem in order to engineer a suitable solution and how graduate studies helped them develop those skills. Directly helping people was important to them in finding fulfilment in their work as engineers. As medical technology expands, more and more engineering skills will be needed. With a graduate degree in biomedical engineering, hardware engineers can find themselves at the forefront of innovation.



Tim Van Der Zee

Machine Learning Engineer
(Author: Time van der Zee, Interviewee: Tom van Loef – Co-Founder of Geronimo.AI)

Machine learning engineers (MLEs) implement machine learning algorithms within companies to increase task efficiency and/or reduce financial cost. Such algorithms typically display some form of artificial intelligence (AI), which implies that they can solve problems through self-learning. Geronimo.AI is a fast-growing start-up located in the Netherlands, gradually hiring more and more MLEs. Within the last two months, the team has expanded from 6 to 8 individuals at present: a CEO, a software engineer and six MLEs. I interviewed Tom van Loef, an old high school friend who is co-founder of the start-up. Tom explained that the duties of a machine learning engineer at Geronimo.AI include (1) data filtering and processing, (2) creating pipelines for data analysis and (3) implementing and improving machine learning algorithms. A machine learning engineer at Geronimo.AI should have high-level skills in (1) Python coding, (2) creative problem solving, (3) project management and (4) collaborating with others. Because the company is still in its start-up phase, salaries are moderate but decent (~40k CAD/year). Tom mentioned that what matters most to Geronimo.AI is that every employee understands the machine learning algorithms to their very core. A

degree in BME can help getting a job as a machine learning engineer, because it shows proof of problem-solving skills and project management skills. During my time as a BME PhD-student, I aim to get experience with Python coding and machine learning algorithms so that I will be an excellent candidate for the position of machine learning engineer after graduating.



Murray Wong

A Biomedical Engineering Graduate Degree is a Valuable Differentiator in the Competitive Orthopaedic Surgery Job Market

(Authors: Murray Wong, Sahil Kooner)

The day to day activities of an orthopaedic surgeon involve evaluating and managing patients in clinic, performing surgery in the operating room, and being available to manage orthopaedic emergencies. An academic orthopaedic surgeon may also have non-clinical responsibilities related to education, research or administration/leadership. After medical school and residency, the majority of academic surgeons have completed 2 sub-specialty fellowships and many have graduate degrees. The job market remains extremely competitive with only 14 academic centres in Canada. Earnings can be upwards of \$300,000 per year. In order to succeed in surgery, candidates require a growth mindset for lifelong learning and strong interpersonal skills. A graduate degree in biomedical engineering (BME) can prepare surgeons for success by developing research acumen. In clinical orthopaedics an understanding of biomechanics, biomaterials, and biology of healing is crucial and BME experience can be valuable to respect these principles and make good clinical decisions. Dr. Kooner is a previous graduate of the University of Calgary residency program and is now a Foot and Ankle surgeon at the University of Toronto. When discussing BME and orthopaedics he emphasized the competitiveness of the job market and that candidates must find areas of need for an institution and demonstrate what differentiates them from other candidates. He believed BME graduate studies could be a unique and powerful value proposition to contribute to a centre's research and clinical programs. Overall, academic orthopaedic jobs are scarce and pursuing BME studies is a strong strategy to differentiate an applicant from other candidates.

Thank You

Participants in the Symposium are part of the BMEN 602: Biomedical Engineering CORE I Course, taught by Dr. Derrick Rancourt. Through an informational interview students gained insight into the careers they presented.

Special Thanks

Special thank you to the 2019 course TA, Catherine Swytink-Binnema, Tarryn Bourhill and GSE PDP Coordinator, Sabrina Anderson for the planning, organization, event photos and creative design for this symposium.

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