Geophysics alumnus
Empowering the next generation

Andrew Bonvicini, BSc’83
Message from the dean

In the Faculty of Science, we have a bold new vision and mission, and we’ve been building momentum since the fall launch of Curiosity Sparks Discovery, our strategic plan.

Our mission is to work together to advance research, scholarship and innovation, create authentic learning experiences and inspire careers of the future. In this issue I am proud to share with you some innovative ways that we are enriching student experience by offering our students ever increasing opportunities to deepen their learning and experience during their time with us.

We believe that, by taking part in extraordinary experiences, our students will challenge their perspectives, broaden their horizons, and gain the knowledge and confidence to transform the world. These experiences open new pathways in learning and in life for students, are valuable in shaping careers and are often the most memorable parts of students’ learning at the University of Calgary.

Our partnerships with other institutions are allowing our students to think big. One such partnership, with the University of Oslo through the new Canada-Norway Satellite training and research program will enable students to complete a joint International Space Master’s Degree that also offers an exchange component. This partnership has allowed us to do world-class research in space physics that includes undergraduates, graduates, postdocs and researchers that is second to none.

Science has created a new leadership position to elevate the faculty. I am pleased to announce that Frank Maurer has been appointed as Associate Dean – Innovation and Strategic Partnerships. Through this position, we will see a substantial increase in collaborative projects, technology transfer practices, and work with outside organizations to solve real-world problems.

We are a faculty of innovators, inventors and entrepreneurs. We are also surrounded by an engaged community, supporting the future of society and is a critical part of creating solutions locally and internationally. The Faculty of Science is poised to make major impacts in many of these solutions.

After more than a year of inclusive engagement, consultation, and inspiration, the Faculty of Science launched its strategic plan, Curiosity Sparks Discovery, on Thursday, September 28.

The plan, says dean Lesley Rigg, takes the faculty in a bold and ambitious direction – one that leverages the faculty’s strengths to position Science as a leader on campus, in the community, and on the world stage.

Says Rigg, “What I was really excited to do was to think about what made us special; what’s really remarkable about Calgary, our university, and Science at the University of Calgary? It was important to me to be able to let people know who we are, what we do, how we do it, why that’s important, and how we can fuel transformational change in the world.”

The strategic plan outlines the faculty’s vision, mission, goals, values, and strategic priorities propelling it forward for the next five years.

From an ambitious mission to catalyze Canada’s transformation to a vibrant and sustainable future to a mission to work together to advance research, scholarship and innovation, create authentic learning experiences, and inspire careers of the future, the Faculty of Science aims to generate curiosity-driven discovery and contribute to solutions to societal grand challenges.

The plan is built upon three strategic priorities:
• Develop and support champions of science
• Advance solutions to our Grand Challenges
• Promote and support an engaged and impactful team

Complementing the strategic plan, four Grand Challenges direct the faculty’s research efforts, and align with the University of Calgary’s Academic and Strategic Research Plans.

Together, the faculty’s strategic plan and Grand Challenges will create and inspire new opportunities for science students and researchers.

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Learn more about Curiosity Sparks Discovery at ucalgary.ca/science/strategic_plan
ERIC DONOVAN REMEMBERS THE FIRST TIME HE WORKED ON A COMPUTER. IT WAS 1982, AND THE LATEST IN PERSONAL COMPUTING WAS A FIRST GENERATION IBM PC complete with a 5¼ inch, 64 kb floppy disk drive. At the time, floppy disks cost about $10 apiece.

Donovan is now the Faculty of Science’s Associate Dean Research and Graduate Education, in an age where computers are integral to everyday life. After purchasing a 2-terabyte hard drive for around $100, he was curious: how much would it cost to store 2 terabytes of data on 5 ¼ 64kb floppy drives in 1982?

“The answer is more than $300-million,” he says. “And the volume required for all that storage would be about 1500 cubic metres.”

In 1982, things like quantum networks and smartphones were inconceivable to the general public. Indeed, as Donovan says “if you look at what’s happening with computer technologies, as an example, this transformation is as significant as the invention of the printing press, and it’s all taking a lot less time to happen than anyone ever thought possible.”

The world is changing rapidly – faster than the brightest researchers could have imagined 35 years ago, when 64kb floppy disks were on the cutting edge of technology. The ever-accelerating innovation in scientific areas such as computing, space exploration, clean technologies, renewable energy, and molecular research bring indisputable benefits, and help us address some of society’s local and global challenges.

As part of its renewed strategic priorities, the Faculty of Science will be directing its research efforts toward four Grand Challenges that harness current strengths, look to future opportunities, and allow the faculty’s researchers to explore and discover.

The four themes arose naturally from input from faculty members across all departments. The Grand Challenges align with the University of Calgary’s Strategic Research and Academic Plans, and are research areas where the faculty is poised to make major strides. “We matter on the world stage under these banners,” Donovan says. “These are areas where we have people who are positioned to have a huge impact on the world.”

**Understanding Earth’s evolving systems**
- Including Earth as a system from the core to the magnetosphere, biodiversity and conservation, and the intersection of the natural and built worlds.

**Energy in transition**
- Including lower impact energy production, environmental remediation, and renewable energy.

**Unlocking our digital future**
- Including security in the digital age, privacy protection, visual computing, and quantum information.

**Personalized health at the molecular level**
- Including drug synthesis, delivery, and diagnostics, minimizing antibiotic resistance in bacteria, and understanding the role molecules have in our health.

The Grand Challenges are built on four research platforms: fundamental research, major facilities, data science and our sensorized world. Donovan says the process to identify the Grand Challenges was straightforward, though his call to faculty members to identify their strengths, their colleagues’ strengths, and the faculty’s capabilities yielded over 350 responses.

“The Grand Challenges process was a lot of fun, and it really made me feel good about the faculty,” Donovan says. Matching strengths with opportunity is at the core of the university’s strategic research plan. We’re doing a good job of this here,” he says, while also noting that the Grand Challenges are well aligned with the university’s strategic research plan. The research we do has purpose, and I think we should try to inspire people with what we do.”

Read more about the Grand Challenges at ucalgary.ca/science/strategic_plan
Partnering for the future

Solving real-world problems with innovative research

Faculty of Science creates new senior leadership position to boost innovation and strategic partnerships

Canadian scientists rank among the world’s best in doing high-quality research, but, like many others, we have room for improvement in the innovation ecosystem – going from the great ideas to making an impact in society.

Frank Maurer aims to “shorten the path from ideas to impact,” as the new associate dean of innovation and strategic partnerships in the Faculty of Science at the University of Calgary.

“Innovation is the transfer of an idea into practice,” says Maurer, a professor in the Department of Computer Science.

“My new role is about translating the great ideas that our colleagues develop here in their research into industry and businesses, into social impact and cultural impact. It’s about helping to grow the digital economy in Calgary.”

“Innovation is important because it allows us to actually change the world for the better,” Maurer notes.

Faculty of Science Dean Lesley Rigg created the new senior leadership position, which builds on the faculty’s strategic plan with its “Grand Challenges” aimed at finding solutions for real-world problems.

“What we’re working on is establishing stronger connections with industry and corporations as well as developing solution-focused talent,” Rigg says.

Maurer has already started working with faculty, post-doctoral scholars and students, to help them adopt the entrepreneurial thinking needed to connect their research and discoveries to the community.

“There’s actually a lot of overlap between what a researcher and an entrepreneur does, he says. Both must start with a hypothesis or assumptions, define a goal and then build a team and a sustainable organization with sufficient funding to accomplish that goal.

Strategic partnerships are also necessary, he adds, because “we cannot have an impact on society by talking and working amongst us alone.”

“The goal is to build sustainable, long-term, partnerships with organizations outside of the university, and with faculties on campus, to do collaborative research that has substantially bigger impact on society,” Maurer says.

“Innovation is a ‘contact sport,’ with researchers, students, government, entrepreneurs, investors and industry all having a role to play. By establishing this position, the Faculty of Science is at the forefront of ensuring impact from university-derived ingenuity is maximized,” says Peter Garrett, associate vice-president (innovation) at the University of Calgary.

Maurer, a highly regarded innovator, has been conducting software research and development for more than three decades. “Software is basically the lifeblood of innovations,” he says.

Besides being an expert on agile software methodologies (collaborative, team-based development of software), his research interests include application engineering for digital surfaces and immersive analytics.

Maurer has worked with large companies like IBM and Nova Chemicals, as well as small-medium enterprises such as Physicod4D, CanOils, C4i Consultants and Ivrnet.

He is one of the co-founders and the chief technical officer of a fast-growing Calgary startup called VizworX, which develops custom solutions to solve real-world problems.

As the former principal investigator of the NSERC Digital Surface Software Application Network (SurfNet), Maurer led a cross-Canada team conducting research on multi-surface systems and application engineering for digital surfaces.

Since joining the University of Calgary in 1997, he has served as associate vice-president (research), as special advisor on entrepreneurship and innovation, and as department head – among other administrative roles.

Maurer maintains an active research program, currently focused on immersive analytics (using augmented reality and other new display and interaction technologies to support analytical reasoning and decision making). Last summer, close to 20 students worked in his laboratory.

He and his team’s newest innovation is a tool that uses augmented reality, generated with custom-built software in a wireless headset. Their system allows non-scientists to create visualizations of large data sets that are virtual, three-dimensional holograms floating in space.

The holograms are similar to the images seen in the military operations centre in the Hollywood blockbuster Avatar, except those were computer-generated images of a fictional ‘Tree of Souls’ site.

Maurer’s team created a prototype 3-D hologram, or map, of an actual space – Calgary’s downtown core – for use by emergency responders in coordinating evacuations. “With this map, you saw the skyscrapers in three-dimensional space. You could actually ‘dive your head’ into the skyscraper to see the floor plans of the building.”

When he’s not busy with administrative work or research, Maurer enjoys downhill skiing, reading and playing soccer.

“What’s his vision for his new role in the Faculty of Science? “As my heart is in innovation, within five years I would like to see a substantial uptick of collaborative projects, of technology transfer practices, and of working with outside organizations to solve real-world problems.”

“...”

James R. Garfield, president and vice-chancellor, University of Calgary
A few years ago, geophysicist and energy entrepreneur Andrew Bonvicini, BSc’83, decided to start giving back to the University of Calgary programs that shaped his career.

“Since global demand for conventional energy is not about to stop all at once, it is important we continue to invest in programs like geology and geophysics to create the highly trained graduates that industry will need,” explains Bonvicini who recently retired from a successful oil and gas career capped with 16 years as Vice President of Exploration at MEG Energy.

Born and raised in an energy family with both parents working around the globe for geoscience world-leaders, Bonvicini’s own trajectory into geoscience did not follow a straight path. “At 17, I took a brief detour at Royal Roads Military College in Victoria to pursue a dream career in aviation, followed by a very short stint at the University of Calgary in engineering. My passion for math, computers, physics, and geology eventually guided me back to the geosciences.”

As a student in the Department of Geology and Geophysics at the University of Calgary, Bonvicini was a member of the Geophysics Undergraduate Student Society and even worked as a photographer for the Gauntlet. In the summertime, he supplemented his education with internships at Chevron Canada. “Those early work experiences definitely helped my career. After graduation, being a geophysicist at Chevron was also invaluable as I received exceptional foundational training.”

A decade later, he was presented with an opportunity to work for smaller oil and gas firms. Subsequently, he established his consulting practice which allowed him to participate in various energy start-ups including MEG Energy. “There’s no doubt that being a part of growing MEG, going from the original nine sections to over 970 and zero production to over 85,000 barrels per day, was extremely rewarding. Those years were an exciting and stimulating time to be working in oil sands.”

Throughout his professional journey, Bonvicini remained committed to the University of Calgary and to the importance of offering the next generation practical, hands-on learning experiences through laboratories and field schools. “In 2014, while at MEG, I started to make giving back a real commitment of mine. That year, I traded surplus gear for a recording instrument that MEG donated to the university which doubled the seismic recording capabilities of the field school.” In addition to MEG’s hardware support, Bonvicini also donated personal funds towards the repair and maintenance of the seismic equipment used in the Geophysics Field School, such as the Vibroseis source and recording instruments.

With Calgary’s energy sector currently in transition, Bonvicini has leveraged his retirement time, contacts, and resources to further increase his support on an even wider range of fronts. Last April, he augmented his contributions when he was invited to participate in the University of Calgary’s first-ever Giving Day. “When I received the Giving Day email with a goal of raising 50 scholarships in 50 hours for the university’s 50th anniversary, it sparked my motivation to contribute even more.”

“With all of us being University of Calgary alumni, my wife in psychology, and my two daughters in chemistry and neuroscience, we decided to establish an undergraduate bursary in geophysics as well as graduate scholarships in geophysics, psychology, chemistry, nanotechnology, and neuroscience.” Building on the Giving Day momentum, Bonvicini has continued to help the Department of Geoscience at the University of Calgary with more targeted gifts. “In August, I made a donation that was matched by the Faculty of Science to fund a new Rock Compressibility System and new gear for the Geophysics Field School.”

Looking ahead, there’s no stopping for Bonvicini. “I know the Geophysics Field School could use even more support such as extra warehouse space and a new mini Vibe. Finding other donors would be a huge benefit,” he concludes.

Learn more how you can get involved with Giving Day or other giving initiatives contact Leitha Cosentino at leitha.cosentino@ucalgary.ca

Alumnus empowers next generation
Alumni Mentorship Program

As some of our senior science student’s inch closer towards graduation, they are faced with the question, what next? Graduating is full of mixed emotions. Students are both excited and terrified to head out into the unknown “working world.” With this in mind, the University of Calgary’s Faculty of Science is excited to announce the launch of the Science Alumni Mentorship Program! With this program, Alumni Relations Specialist, Leanne Marriott, and Student Engagement Coordinator, Kathleen Ralph, connect senior science students to University of Calgary Science Alumni in the hopes of helping ease students into professional life. Mentors and mentees are equipped with training and support to aid them through this program.

True mentoring is more than just a pair. Our Alumni Mentorship Program aims to create a professional friendly relationship that allows for both individuals to grow, learn, and connect over the course of the academic year. After recently hosting our kickoff event with our first group, we are more excited than ever! Almost all pairs attended and the energy was electric as pairs met for the first time. Here, pairs negotiated and signed their contracts stating their goals for the program and then got to mingle with one another and other peers in a casual and fun setting.

On top of the social benefits for both mentee and mentor, the Alumni Mentorship Program gives students exclusive access to a large pool of resources. In Dinos spirit, Alumni are hand-matched with their mentor and are encouraged to share their wisdom in both career and life advice to make a positive change for their mentees professional and personal growth.

We can’t wait to watch not only our program grow, but also our participants as they continue to learn from one another.

Would you like to share your story with a fellow Dino? We will begin recruiting new mentors and mentees over the summer and would love to have you join our team!

Mentee Testimonials

“I am excited to build a new relationship with my mentor, learn about my mentor’s experiences, and have the opportunity to improve myself through unique perspectives that my mentor can provide!” – Raza Qazi, 4th year undergraduate student in Computer Science

“I’m looking forward to creating a relationship with an industry professional that’s been in my shoes as a student before. I think it not only will save me from taking some wrong steps, but also pushing forward to forge my own path, give me encouragement to make mistakes and push me to reach my highest goals. This project has given me so much encouragement to move into the work force with no hesitation, I hope I can give back to students just like my mentor has!” – Michael Tretiak, 4th year undergraduate student in Computer Science

“`I connected with my mentor, Colleen, via Skype during the Alumni Mentorship Kick-Off. She is very easy to talk to and I loved hearing about her — both her university and career experiences. Even in the short amount of time I have known her, she has already provided so much valuable insight not only in the context of her experiences, but she has also helped me identify how my own experiences are applicable in the field of Computer Science. I think the program is off to a fantastic start and I am very excited to see how it unfolds over the course of the semester.” – Sharon Wang, 4th year undergraduate student in Computer Science

“What I liked is that I could meet my mentor and discover all the things we have in common and how knowledgeable she is. I am convinced that she will be an amazing mentor and I would like everyone to have the support and guidance from one like her!” – Olga Titica, 4th year undergraduate student in Chemistry

For more information or to get involved contact leanne.marriott@ucalgary.ca

Did you have a fantastic mentor? We would love to hear the story! Contact scialumni@ucalgary.ca
Canada and Norway commit to 10 years of collaboration in space education and research

Canada and Norway have joined forces to help the next generation of researchers explore the wonder of space.

The universities of Calgary and Oslo have partnered since 2009 to offer students opportunities in space research and discovery, including through the Canada-Norway Sounding Rocket (CanNoRock) program that launched in 2011. In October, the two universities signed a Memorandum of Understanding (MoU) announcing their joint commitment to continue developing mission-based programs for the next 10 years that will include joint curriculum and research opportunities for graduate-level students on prioritized rocket and satellite projects in Norway and Canada.

The popular CanNoRock program is an intensive course at Andøya Space Center offering undergraduate students in Norway and Canada hands-on training for the space industry. Over the course of a week, the students work together to design, construct and launch sounding rockets. CanNoRock is a collaboration between the universities of Calgary, Alberta, and Saskatchewan in Canada, the European Space Agency, the Canadian Space Agency and a number of universities in Norway, including the University of Oslo. Since the program started, researchers at the various institutions have created a CanNoRock – STEP program, sponsored by the Norwegian Space Centre and the Canadian Space Agency, where graduate students participate in an exchange program.

Building on the success of these programs, the collaboration will expand into research utilization nanosatellites with the introduction of the Canada-Norway Satellite (CaNoSat) training and research program.

With the signing of the MoU, 14 signatories from Norway and Canada will jointly create the CaNoSat program and a mission-based joint International Space Master’s degree between the universities of Oslo and Calgary. The programs will provide graduate-level students with valuable experience working directly with industry experts from both Canada and Norway, and will also offer internship and academic training with a half-year exchange component.

“We are especially appreciative of the support and encouragement we have received from the Canadian Space Agency, and for the incredibly powerful dynamic of partners working together for a common goal. We could not do any of this without the support of the many universities in Norway and the three space agencies,” says Cindy Graham, BSc’94, PhD’01, Vice Dean in the Faculty of Science. “The powerful relationship that has grown has allowed us to do world-class research in space physics together within a collaboration that includes undergraduates, graduate, postdocs and researchers that is second to none. We are able to achieve more together than we ever would on our own.”

* Canadian and Norwegian collaborators for developing the new programs include the University of Calgary, the University of Saskatchewan, UOttawa, U Tromsø, the Norwegian University of Science and Technology, University Centre in Svalbard, EIDEL, Andøya Space Centre, and the Norwegian Centre for Space-related Education.

Internationalization grant provides astrophysics undergrads a unique opportunity to combine hands-on science with class-to-class collaboration

Separated by nearly 9,000 kilometres, two classes of astronomy students simultaneously observe a cosmic phenomenon one billion light years from earth.

It could be a scene from a movie, but it’s actually a real-life moment from a unique international collaboration led by Phil Langill, senior instructor in physics and astronomy, and director of the Rothney Astrophysical Observatory (RAO). The project started because Langill, BSc’85, PhD’94, loathes an idle telescope. “I’m always looking for ways to make good use of the observatory,” he says. “And because the equipment can be operated remotely, you don’t have to be on site to use it. So I’d started to think of how we could interest people off campus — even internationally.” While Langill searched for potential observatory operators last summer he learned about the Internationalization At Home grant. “The program provides international activities in science classrooms, giving students access to experiences worldwide without requiring them to travel,” says Heather Clitheroe, BSc’94, an international coordinator in the Faculty of Science. Clitheroe and Langill joined forces to apply for the grant.

As the proposal came together, Langill realized that the project was more about developing the new programs than about the grant. “We have been working with BNU already so we were familiar with their course content; we knew there was alignment,” Clitheroe says. “And we soon learned that Jianghua Wu at BNU and Phil shared similar research interests. From there, things moved very quickly.”

Wu was equally excited about the project. Poor air quality in Beijing means he can’t use the telescope at BNU, so Wu’s students usually travel five hours to one of China’s national observatories to see a telescope in operation. “This hands-on training provides my students with a new opportunity to operate a telescope by themselves,” Wu says. “It also opens a window for the students to communicate with a foreign teacher and students.”

The successful proposal outlined how Langill’s second-year astrophysics students would travel to the RAO and also take measurements by web connection. Wu’s undergraduate astronomy students in Beijing would connect remotely at the same time. Using this method, the two astronomy classes researched a particular phenomenon: a blazar — an active galactic nucleus or giant black hole — a billion light years away.

Langill says one of the greatest benefits of this work is the opportunity for students to experience real hands-on science. “We are especially appreciative of the support and encouragement we have received from the Canadian Space Agency, and for the incredibly powerful dynamic of partners working together for a common goal. We could not do any of this without the support of the many universities in Norway and the three space agencies,” says Cindy Graham, BSc’94, PhD’01, Vice Dean in the Faculty of Science. “The powerful relationship that has grown has allowed us to do world-class research in space physics together within a collaboration that includes undergraduates, graduate, postdocs and researchers that is second to none. We are able to achieve more together than we ever would on our own.”

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Annual Innovation Reactor sparks entrepreneurial spirit on campus and beyond

Faculty of Science hosts showcase for University of Calgary student-led innovations

As an undergraduate student at the University of Calgary, Teddy Seyed, BSc’11, MSc’13, was the shy guy who sat at the back and seldom spoke up in class.

All that changed as he grew into one of the hottest entrepreneurs on campus, joining the university’s expanding community of innovators.

“I think everyone is an entrepreneur, they just don’t know it,” says Seyed, who’s working on UCalgary’s first-ever entrepreneurial PhD degree, in the Department of Computer Science in the Faculty of Science.

“Everyone has a passion about something, and there’s always a problem that everyone wants to solve that’s related to his or her passion,” he says. Seyed received the first Calgary Tesla Award, presented mid-September at the Innovation Reactor event, organized by the Faculty of Science and the Skunkworks Innovation program.

His bright idea – a dual-screen smart watch that prioritizes emergency pager messages for doctors – received $1,500 and a statuette of genius inventor Nikola Tesla from the Calgary Tesla Society.

“The Innovation Reactor solidifies the university as a great place for innovation and sparks interest in the community,” says Lesley Rigg, Dean of the Faculty of Science.

The society aspires to raise a full-size statue of Tesla on campus, “to inspire even more students to – as Tesla did – dream big, work hard and be selfless,” Todorovic says.

The Hunter Hub for Entrepreneurial Thinking at UCalgary presented the other $1,500 award of the night. The Hunter Hub Student Innovation Award went to Maggie Young and Alex Chalamova. Young is a communications student in the Faculty of Arts and Chalamova a computer science student in the Faculty of Science.

The pair co-founded ParkChamp, a Calgary company whose software application enables drivers using their mobile phone to find, reserve and pay for affordable and convenient parking, and property owners to rent their empty parking stalls.

“By being a part of the Innovation Reactor, we were able to make connections with important people, learn from experts in the field, and share our new business with people just as passionate about entrepreneurship as we are,” Young says.
Alumni top reads

**Designing Your Life: How to Build a Well-Lived, Joyful Life**
By Bill Burnett and Dave Evans

In this book, Bill Burnett and Dave Evans show us how design thinking can help us create a life that is both meaningful and fulfilling, regardless of who or where we are, what we do or have done for a living, or how young or old we are.

**Quiet: The Power of Introverts in a World that Can’t Stop Talking**
By Susan Cain

This extraordinary book has the power to permanently change how we see introverts and, equally important, how introverts see themselves.

**Adaptive Markets: Financial Evolution at the Speed of Thought**
By Andrew Lo

A fascinating intellectual journey filled with compelling stories, Adaptive Markets starts with the origins of market efficiency and its failures, turns to the foundations of investor behaviour, and concludes with practical implications – including how hedge funds have become the Galápagos Islands of finance, what really happened in the 2008 meltdown, and how we might avoid future crises.

**When Breath Becomes Air**
By Paul Kalanithi

What makes life worth living in the face of death? What do you do when the future, no longer a ladder toward your goals in life, flattens out into a perpetual present? What does it mean to have a child, to nurture a new life as another fades away? These are some of the questions Kalanithi wrestles with in this profoundly moving, exquisitely observed memoir.

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