CHANGING OF THE GUARD

REFLECTING ON DR. SHEPHERD'S SEVEN YEAR TENURE AS DEAN
Changing of the Guard

AFTER SEVEN AND A HALF YEARS IN THE TOP JOB, MIKE SHEPHERD STEPPED DOWN AS DEAN OF THE FACULTY OF COMPUTER SCIENCE ON JULY 1, 2015. TO RECOGNIZE HIS LEADERSHIP TENURE, WE’D LIKE TO TAKE THE OPPORTUNITY TO REFLECT A LITTLE ON THE IMPACT HE HAS HAD ON THE FACULTY DURING THIS TIME.

Back in 2008, Dr. Shepherd prioritized his focus into three main challenges he felt the Faculty of Computer Science had been facing at that time: falling enrolment numbers, problematic low retention rates, and a shortfall in capitalizing on research talent. All three challenges were fixable but would take some work, creativity – and a lot of help.

ENROLMENT NUMBERS
Falling enrolment numbers meant a shrinking student body and a serious budgetary problem. Enrolment has increased by 85% from 2008 to 2014 and the Faculty has benefited from a budget surplus for the past five years.

In part, the increase in enrolment numbers over recent years came from national trends of overall rising computer science enrolment, but the Faculty itself played a major role in increasing attendance. Dr. Shepherd enhanced the Outreach Committee, a committee comprised of faculty and staff members focusing on recruitment into Computer Science at Dalhousie. Through this initiative, he actively promoted programs like the annual Computer Science Day, programming competitions, and participation in university-wide initiatives such as Open House. Dr. Shepherd always recognized the importance of connecting directly with high school students, parents, and teachers and – even through a busy dean schedule – visited many schools in Nova Scotia and Ontario to talk with students about the opportunities that exist in studying computer science or informatics at Dalhousie.

STUDENT RETENTION
Low retention figures for students created another budgetary concern. The Faculty of Computer Science was having trouble keeping first-year students in the program.

The Faculty worked hard to review the issues and completely revamped the first two years of the undergraduate program. Required labs and tutorials were added to all core first and second year courses, which created a seamless path from year to year for students. Retention levels rose from 56% in 2008 to 82% in 2014. Dr. Shepherd credits a lot of this success to the efforts and contributions from the faculty and staff who were all willing to go the extra mile to make the improvement – especially those who held the associate dean academic position during those years.

CAPITALIZING ON RESEARCH TALENTS
The Faculty of Computer Science has always been fortunate in being full in research talent, but it was not properly capitalizing on this talent.

To address this concern, a new associate dean research position was created to focus on supporting research within the Faculty. Evangelos Milios took on this role in 2008 and was asked to double the amount of research contracts and grants from $1.5 million a year. Now – with more than $3 million in research funding (grants and contracts) – Dr. Milios’ dedication and hard work enabled him to surpass this target.

HIS PHILOSOPHY
Dr. Shepherd’s philosophy as dean has been to create an environment in which everyone can be successful: students, staff and faculty.

The community within the Faculty of Computer Science flourished in this framework. The Faculty is now considered one of Dalhousie’s success stories by senior university administration. Although there have been successes over these last seven and a half years, it hasn’t always been the easiest path to be on. Dr. Shepherd’s own research and teaching had to be put completely on hold. The dean’s position is a 24/7 job without departments or department heads to aid with human resources, student issues and outreach activities.

“I felt that I had reached a point in my career where I wanted to give something back in a different way,”
Dr. Shepherd says, “So this was a step I was willing to take in order to help the Faculty and the University.”

WHAT’S NEXT?
After July 1, Dr. Shepherd will immediately take an administrative leave, but will find his old office once again on the third floor of the Goldberg Computer Science Building. In October, he is chairing the Big Data for Productivity Congress at the World Trade Centre – which will bring business, government and academia together to explore, debate and understand the impacts of big data on productivity in the world.

He’d like to get involved with some of the newer Faculty projects such as the new ICT sandbox – ShiftKey Labs – and the Institute for Big Data Analytics. He’s hoping to continue on with some of his outreach initiatives, specifically visiting high schools to talk with students and teachers.

When asked if he had any advice for his successor, he replied: “I learned quickly that progress has to be achieved from the bottom up. It takes time and lots of important discussions to get a Faculty full of independent thinkers all rowing in the same direction.”

“I see a need to recruit more research faculty and to move the Faculty of Computer Science up another level to become the very best of the mid-sized computer science faculties/departments in Canada,” he continues. “The Faculty is developing a transformational fundraising campaign that will make Dalhousie a recognized Centre of Excellence for Big Data Analytics in Canada.”

The Faculty of Computer Science offers its thanks to Dr. Shepherd for his dedicated work as dean over the past seven and half years.
Industry partners gain access to the unique knowledge and expertise of researchers in order to solve problems relevant to their organization. Researchers apply their knowledge to real-world problems while staying abreast with current technologies used within the private sector. Students and postdocs gain exposure to problems with a practical significance, which often becomes part of their thesis work – and connections are made within industry that can lead to future employment.

Agencies fund collaborations like this to enhance graduate and undergraduate research programs – and to ultimately make a positive impact on the Canadian economy. The Natural Sciences and Engineering Research Council of Canada (NSERC) is the most prominent agency currently funding industrial research collaborations in computer science.

The NSERC Engage Grant is one of their most popular funding programs, offering up to $25,000 for a maximum period of six months with the intention of fostering the development of new research partnerships.

**HOW IT WORKS**

Industry partners provide a problem and academic partners provide the researchers. Typically, the Engage Grant pays a stipend for a graduate student or post-doctoral researcher, under the guidance of a supervising professor.

As part of each agreement, companies are expected to provide an in-kind contribution. This often translates to a staff member working closely with the academic team on the project. The Engage Grant project is a well-defined and complete project on its own, but can also be seen as a stepping-stone towards a more intensive research collaboration. NSERC has other funding programs that support longer-term projects.

**SAMPLE PARTNERSHIPS**

The Faculty of Computer Science has experienced productive partnerships through 36 grants for a total revenue of $804,000 through the Engage Grant program over the past five years.

**iWave Information Systems Inc.**

iWave Information Systems Inc. is a Charlottetown-based company that has provided prospect research services to international fundraising professionals for over 20 years through their web-based Prospect Research Online (PRO) system. This system was out-dated, lacking logic mechanisms for information integration and data analysis functionalities. Users were spending too much time manually assessing individual records produced by the system. These shortcomings were affecting the product's competitiveness.

To transform their PRO into a more comprehensive information system, iWave worked with Dr. Qigang Gao to develop a project plan using an Engage Grant. The plan was to develop a logic-based information integration framework for combining data from a variety of information sources and to identify best data mining strategies and modules to transform useful patterns into proper rules and rating predictors to generate quality prospect leads. Dr. Gao’s expertise in logic based information integration, data cleaning and reconciliation, and data mining made this a very fitting partnership.
“My role was mainly as the project supervisor/team leader,” says Dr. Gao. “The real work was carried out by two excellent graduate students: MEC student Colin Conrad and MCS student Naureen Al. The project achieved its proposed goal and the final result was well received by iWave.”

“We [also] gained valuable insights into possible future directions we would like to take our product and services,” notes Mark MacBeth of iWave at the conclusion of their work together.

Pleiades Robotics
Pleiades Robotics is the Halifax-based company behind Spiri – a personal, programmable flying robot. Pleiades teamed up with researcher, Dr. Thomas Trappenberg to make some enhancements to Spiri.

“We were working on some adaptive tracking algorithms in my lab – on mobile robots and on drones,” says Dr. Trappenberg. “After talking with Pleiades, we realized that adapting some of our research to their system might be quite a useful first step to help them advance some of their applications.” The team put a proposal together and MCS student Vignesh Babu and alumnus Rohan Bhargava got to work.

The result of this project will allow Spiri to follow its user – or anything else – using only machine vision.

“The demand for this in the market has been demonstrated by a variety of “follow-me” drones – notably AirDog and HexoPlus – which both garnered substantial crowd-funding interest last year,” explains Paul Edwards-Daugherty of Pleiades. “These robots, however, require the user to carry a beacon. Spiri will be able to follow anything, relying only on its cameras.”

With the fusion of vision algorithms and the already established stereo camera system, simulations have shown that great improvements to the following and tracking precision are possible. Spiri will be able to maintain a safe and steady distance from its owner – or whatever it might be following, enabling this to be useful in robotized workplaces and in the consumer market.

“Although the work is still ongoing, we already think that it was a great success in that it shows a lot of other potential developments for the Spiri system,” says Dr. Trappenberg.

Innovatia Inc.
Innovatia Inc. of Saint John, New Brunswick is a software company that provides knowledge management services to its clients around the world. Part of their core service offering is the authoring of technical documentation.

Technical writing in professional environments for things like user manual authoring for new products is a task that heavily relies on the reuse of content. Technical content is typically created following a strategy where modular units of text have references to each other. One of the main challenges faced by these authors is how to avoid duplications of existing content.

To improve Innovatia's systems, they teamed up with Dr. Evangelos Milios and his associates, Dr. Axel Soto, Dr. Aminul Islam, Dr. Abdul Moh'd, and Brazilian collaborators Prof. Rosane Minghim and Prof. Cristina Oliveira. Their experience in natural language processing, text mining, document clustering, and text visualization has led to the design and implementation of a tool that helps technical authors understand the differences in a collection of documentation text fragments and identify opportunities for reuse. Using this tool significantly improves efficiency.

After the successful completion of the original six-month Engage project, Innovatia is proceeding with Engage Plus, a program that requires the industry partner to contribute half of the funding for the research project. The academic team is currently working closely with Innovatia to evaluate the interactive tool and measures its impact on author efficiency. A jointly authored publication describing this joint research will appear in the ACM Symposium on Document Engineering in September.

All of these projects start with simple beginnings – a phone call, an email, or a conversation about possibilities. To build a project, all that is needed is an identified and defined challenge that can lead to a research plan that benefits everyone involved.
Cyber “Sherlocks” from the Faculty of Computer Science came together in April for a full day of detective work in the first ever Dal-JD Irving live case competition.

Twenty-six computer science students in ten teams vied for cash prizes in two different two-hour long challenges as part of the competition, dubbed “Hands-On Security” and held at the Goldberg Computer Science Building.

THE CHALLENGES
Up first was the offensive challenge, where students were asked to parse data, network connections and system logins to find vulnerabilities, and document how they found them. This is an extremely important exercise with real-world applicability: many Computer Science graduates will find themselves working the front lines to defend organizations, companies and networks from hackers and other threats. To properly defend and protect, one must first find and understand their own vulnerabilities.

The afternoon challenge was a forensic one. Students were presented with a scenario where the computer system of a small business got compromised. They were told that a couple of users admitted to opening suspicious links, but what happened after that was a mystery. Students had to find the attacker, determine how the infiltration happened, and what had been impacted because of it. In order to protect companies – big or small – people need to learn how cyber attackers leapfrog through current defenses, and very quickly see what the impacts were. It’s important to learn how attackers infiltrate systems so companies can improve their defenses through technology or employee training — and so that organizations understand what information or data may have been compromised.

WHY IT MATTERS
Nur Zincir-Heywood teaches students concepts, techniques, systems and important skills in her Network and Design Management course. She even has a project component disguised as a game at the end of each term, providing students with a chance to practice what they’ve learned in a fun and friendly environment.

“My course is relaxed and fun, with an emphasis on learning,” says Dr. Zincir-Heywood. “A competition like this one provides a situation where students can actually test what they’ve learned under the pressure of time – something that is so important as it exists in all real life cyber security situations.”

Security is a huge driver in IT investment for most companies today, says Jon Smit, director of IT operations and development at JD Irving.

“PCs, networks, or even Cloud technologies do not matter compared to securing and protecting personal and corporate data. Case competitions like this help build the knowledge and skills that make a real difference in the world we live in,” says Mr. Smit.

INDUSTRY INVOLVEMENT
The event was made possible thanks to support from JD Irving, which provided the “victim” machines for the morning challenge and the log files for the afternoon challenge.

The lab equipment used for both competitions was donated last fall by Cisco Systems. One of the world’s leading companies in networking technologies, Cisco Systems contributed a range of equipment and technologies to Dr. Zincir-Heywood’s lab. With new routers, switches, security tools and desktops, it has essentially become a new lab.

“We put together the network for the competition using the Cisco equipment,” says Dr. Zincir-Heywood, “however this competition differed from our regular course challenges as physical attacks like changing wires and swapping disks were not allowed.”

Cisco Systems was pleased to learn about this competition.

“We were pleased to see the donation of lab equipment being used with real life data from our customer JD Irving,” says Rod Murphy, regional vice president.
Atlantic of CISCO Systems Canada. “Equally important was the engagement with the students and the learning that was acquired from the event.”

AND THE WINNER IS...
Having the opportunity to take the lessons learned in class and put them to test in a simulated real-world setting gave students a rich, fun and valuable experience they would not otherwise get. To be able to do this with friends, in a fun way, was the icing on the cake.

After a long day and a hard-fought battle, the team with Vahid Ahgaei Foroushani and Corrie Watt were named the offensive challenge gold winners and the team including Kyle Ramey, Jason Tait and Matthew Tetford were named the forensic challenge gold winners and each team was awarded $700 from JD Irving. The two teams each finished as the runner-up in the other competition, also taking home a $500 silver prize.

$300 bronze awards were also given to two teams: Aimee Burrows, Simon Dugas and Sara Khanchi; and Loai L. Felemban, Tianye Wang and Amr Zokari.

Cisco also awarded three personal firewalls to students Vahid Ahgaei Foroushani, Matthew Tetford and Jason Tait and provided an additional five personal firewalls to Dr. Zincir-Heywood’s lab.

“This type of support from both Cisco and JD Irving validates, to me, the quality of our faculty and students and all the work that has gone into making the Faculty a first-class learning environment for the students,” says Mike Shepherd, dean of the Faculty of Computer Science. “With these concepts and the skills our students are learning, they are ready for the workforce so much more than they would be at other places where such labs and courses are not available.”
Man on the street[view]

FCS ALUMNUS MAKES SURE GOOGLE MAPS WILL GET YOU WHERE YOU’RE GOING

NOBODY HAS SEEN A PAPER MAP IN YEARS. LONG PAST ARE THE DAYS WHEN ONE RISKED LIFE AND LIMB TO FUMBLE WITH AN OVERSIZED ROADMAP IN THE CAR. WE NOW ENTRUST OUR PHONES TO DO THE TASKS, BARKING OUT INSTRUCTIONS WITH EVERY TURN.

Dalhousie Computer Science alumnus, Ryder Ziola, is aiding this navigation revolution as a Google developer for Android devices. “I’m a software engineer,” he says. “And I work on Google Maps for Android, specifically the turn by turn navigation part.”

At the end of March of this year, Ziola gave a couple of talks to Dalhousie computer science students as part of a Google recruitment trip. He discussed some current work being done on the app as well as a few persistent problems that they had encountered, with the hope that some students may find the problems enticing enough to consider tackling.

WORKING AT GOOGLE

The Seattle Google engineering offices are the third largest in the world. Situated on Lake Washington in the heart of Downtown Seattle, the offices host a number of amenities that merge a traditional office environment with the unconventionality that Google offices are famous for.

“Down in California it’s a very suburban office park,” Ziola explains. “There are slides and ping pong tables and that kind of thing. The offices in Seattle are a little bit ‘classier’. They’re really nice, but it’s much more of a comfortable toned down environment.”

Despite being toned down, it’s still not quite all work and no play. If you’re looking for a Seattle Google engineer on their break, you might want to take a look at Lake Washington. Part of the office complex is a gym that is stocked with kayaks and paddleboards, which engineers are free to check out for an excursion on the water.

And of course, don’t forget a ride in the Google street view car. “From the outside you have these bright primary colors and it sort of has this amusement park kind of feel,” he recounts. “But then on the inside it’s just computers everywhere. Not as friendly on the inside.”

“The most distinguishing aspect of working at Google,” Ziola says, “is the quality of the people that you’re working with. Pretty much without exception,

THE MOST DISTINGUISHING ASPECT OF WORKING AT GOOGLE IS THE QUALITY OF THE PEOPLE THAT YOU’RE WORKING WITH ... IT’S AN ATMOSPHERE OF DRIVEN PEOPLE DOING EXCITING THINGS.

everyone there is the good kind of nerd and everyone I work with is really generous with their time, insights and all their knowledge. It’s an atmosphere of driven people doing exciting things.”

THE STUDENT CONNECTION

“I actually came to Dal for the architecture program,” Ziola admits. When he realized he didn’t know what he wanted to do, he began looking into other
Empowering youth to shape their world through code

For Joe Bassil (BCSC’03), teaching his three sons how to code has been on his radar since his oldest was born seven years ago.

In January 2015, Bassil and three other Dalhousie alumni – Ian Bezanson (BCSC’04), Patrick LaRoche (MCSC’06), and Jonathan Amyotte (BCSC’05) – launched the Halifax chapter of the global CoderDojo.

CoderDojo is a global movement of free, volunteer-led, community-based programming clubs for young people between the ages of 7 and 17. Within this movement, the focus is on community, peer learning, youth mentoring and self-led learning – with an emphasis on showing how coding is a force for change in the world.

“The provincial audit on our education system late last year was the catalyst that set the idea in motion,” Bassil explains. “The report cited a lack of curriculum to support critical thinking and programming at a young age – concepts that are introduced to children at a young age in other countries around the world. It was the first time I felt that I had to do something to help our youth avoid missing out on an important life skill.”

And with that, the chapter was created.

CoderDojo Halifax has its own mandate to break down barriers, challenge social and economic stereotypes and to empower youth to shape their world through code. Their mission is: to introduce young Nova Scotians to the joy of computing; to provide fun, free and open learning for students and parents; and to offer a social space where young people can go to explore technology together and alongside skilled mentors.

There are currently ten volunteers that help in a variety of areas to make things run smoothly. To date, the Halifax chapter has held four workshops and plans to now host one a month.

“Our hope is that every child in Nova Scotia has the opportunity to learn how to code at a young age,” says Bassil. “They don’t have to love it, but they shouldn’t be afraid of it.”

Eds Note: CoderDojo HFX is in need of sponsorship for laptops, hardware (robots, drones, etc), event advertising, refreshments and committed volunteers. Contact them at coderdojohfx.ca or Facebook.com/coderdojohfx
Meet one of our recent graduates–
Raghav Sampangi

Originally from Mysore, India, Raghav came to Dalhousie in 2011. He was inspired by Dr. Srini Sampalli’s dedication to teaching, and quickly became interested in the opportunities that Dalhousie presented to him.

In just under four years, Raghav has shown passion and determination, resurrecting an in-house conference and starting a new student society.

The Dalhousie Computer Science In-House Conference – also known as DCSI – began in 2002 as a way for students and professors to showcase their research to industry. While successful in the past, it lay dormant for five years before Raghav and a group of CS students resurrected it in 2012. The success of this conference made it a – now – annual event.

“Before DCSI, we were all working away on our individual research projects, with minimal collaboration with other students and knowledge about others’ work,” he says.

While graduate students make up 30 per cent of the Computer Science student body, Raghav felt they were under-represented on the Faculty Council, on the CS Society and on the board of the Dalhousie Association of Graduate Students (DAGS) and needed a voice.

“In one of the crucial graduate committee meetings discussing pending changes to PhD regulations, no one was there to represent us,” he says. “This motivated us to quickly start the new Computer Science Graduate Society (CSGS).”

Today, CSGS works hard to engage graduate students, create a community and to collaborate with sister societies and the Faculty.

DCSI and CSGS aren’t the only two groups Raghav has been involved with since joining the Faculty of Computer Science (see box below), and his service hasn’t gone unnoticed.

“We have seen a lot of great students in this Faculty, but I do not recall one other student who had such an immediately positive impact on the faculty, students, and staff,” says Dean Mike Shepherd. “To recognize his contributions, we presented Raghav with a one-off Special Faculty Appreciation Award at the 2015 Snowball Gala.”

WHAT’S NEXT?
Raghav was as committed to his studies as he was to his extra-curriculars, maintaining high grades and winning awards at conferences. His thesis for his PhD examined security in wireless networks.

While his skills and work ethic would allow him to work anywhere in the world, Raghav wants to stay in Halifax.

“I’m working as a post-doctoral fellow and an instructor here as of May,” he says. “I’ve had the best educational experience of my life, with a chance to work with several highly motivated individuals and to learn from each and every interaction... and Halifax is just a beautiful city to live in!”

Raghav’s long-term ambition is to build a career as an academic. The Faculty of Computer Science is proud that Dalhousie has been an important springboard for that path.
ICT Sandbox shifts to ShiftKey Labs

COLLABORATION WITH DAL MANAGEMENT STUDENTS LEADS TO NAME CHANGE AND NEW LOGO

In March 2014, the Province of Nova Scotia launched four new sandbox projects. “It’s my understanding that the names given to each of these sandboxes were functional placeholders,” explains Grant Wells, program manager for the ICT Sandbox. “Sandboxes would start developing their own identity under the given name or a new name if that better aligned with their vision and had more impact with their target stakeholders.”

Without Borders (MWB) course to collect information on the perceptions target stakeholders had about the sandbox. The MWB students created and distributed an online survey to partner institutions that garnered almost 350 responses. The final report made the recommendation that branding opportunities – such as a new name and logo – must be attractive to participants and other stakeholders. This supported the need to find a new name and brand.

After weeks of meetings and brainstorming with students, faculty, staff, and other sandbox partners, a list of over seventy-five name possibilities was generated. Sandbox representatives at each partner institution whittled this down to a shortlist of three names. The final name – ShiftKey Labs – was selected by majority vote in March.

ShiftKey Labs represents a “shift to a more entrepreneurial mindset amongst students,” explains Wells. President Richard Florizone elaborates further, “This is an innovation playground where post-secondary students connect with researchers, industry, and government to generate and experiment with ideas that may eventually lead to the creation of new social and commercial ventures.”

“I’m very pleased to have worked collaboratively with faculty, staff, students and sandbox partners to develop a new identity for the sandbox that inspires,” says Wells. “I hope it encourages even more students to access the great support and resources at their disposal.”

For more information on ShiftKey Labs, please visit shiftkeylabs.ca.

FCS NEWS & NOTES

CS DAY
On February 28, the Faculty of Computer Science hosted another successful CS Day, welcoming 50 students and 30 parents to experience what life as a computer science or informatics student might be like. Junior high and high school students heard from FCS students, alumni, and profs. They also explored sessions on graphics and experiential media, network security, smartphones and augmented reality, and robotics. This annual event is held every February.

BIG DREAM MOVEMENT
Together with Women in Science and Engineering (WISE) and Atlantic and Atlantic Association for Research in the Mathematical Sciences (AARMS), the Faculty of Computer Science welcomed 80 guests to the Goldberg Computer Science Building for the first Canadian viewing of the documentary, Big Dream. Big Dream immerses viewers in a world designed to inspire the next generation of girls by following the stories of seven young women who are currently breaking barriers and overcoming challenges to follow their passion in science, math, computing & engineering.

PETER O’HEARN
Alumnus Peter O’Hearn (BSc’85) returned to campus and presented a public talk, “From Categorical Logic to Facebook engineering,” which charted a line of development from category-theoretic models of programs and logics to automatic program verification/analysis techniques that are in deployment at Facebook, where he currently works.

TYLER PACHAL WINS COMPUTER SCIENCE CO-OP STUDENT OF THE YEAR AWARD

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TOP: Celebrating this year’s Schulich Scholars with the Goldberg family. March 2015. ABOVE LEFT: CS Society’s executive at Snowball. March 2015. ABOVE RIGHT: Women in Technology Society’s (WITS) executive with the We Talk Tech: We Interview Tech volunteer speakers. April 2015