SFU
SIMON FRASER UNIVERSITY
FACULTY OF APPLIED SCIENCES

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Better health. Best in health care.

# Building health technology clusters:

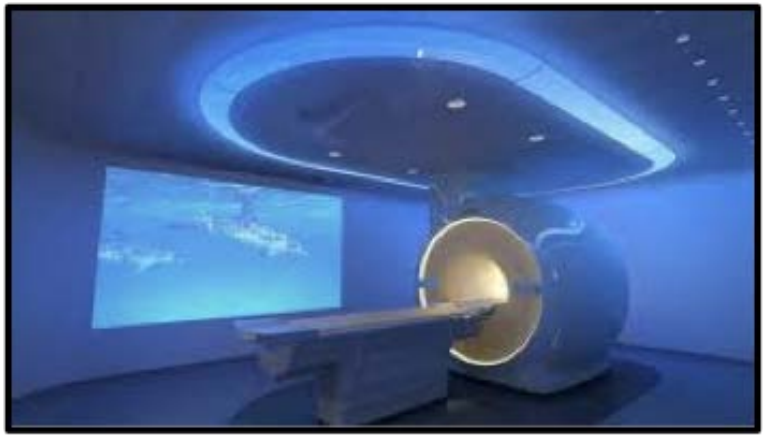
# A case study of BC's innovation boulevard


***Dr. Ryan C.N. D'Arcy***

BC Leadership Chair and Professor of Medical Technologies, Simon Fraser University

Head, Health Sciences and Innovation, Surrey Memorial Hospital, Fraser Health

President and Chief Scientific Officer, HealthTech Connex, Inc.

Surrey Hospital
& Outpatient Centre
FOUNDATION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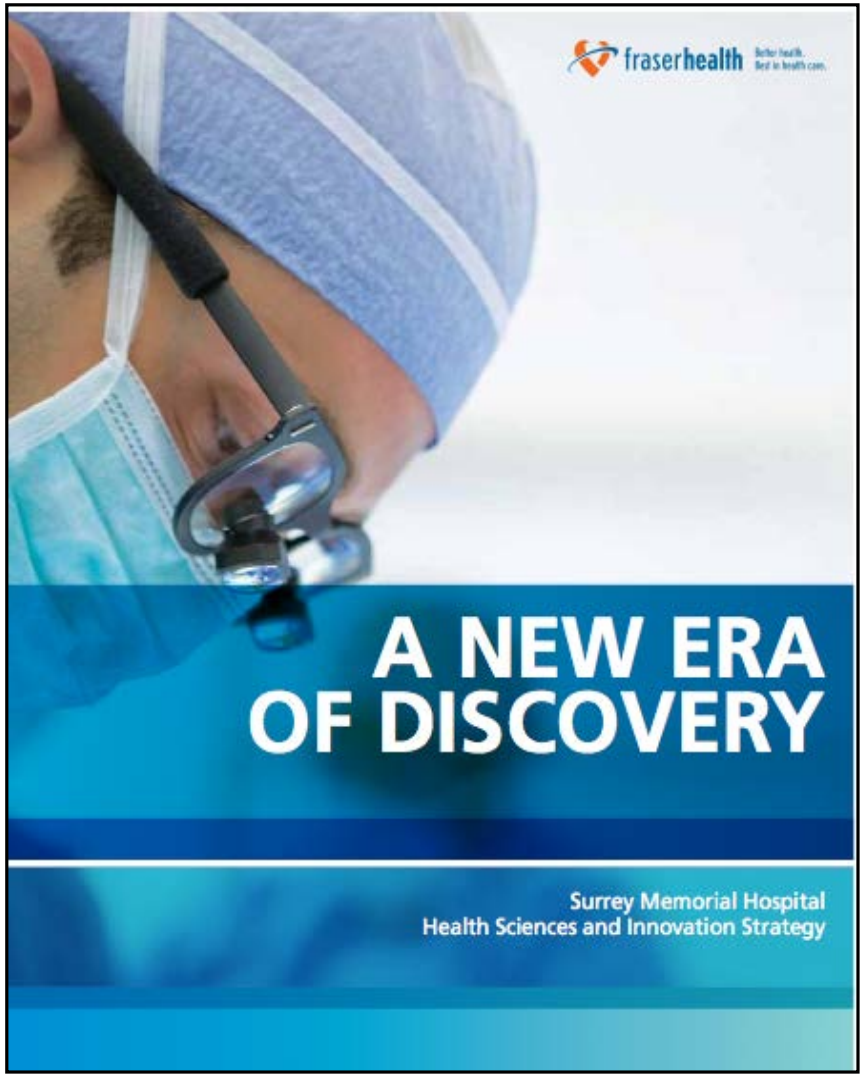
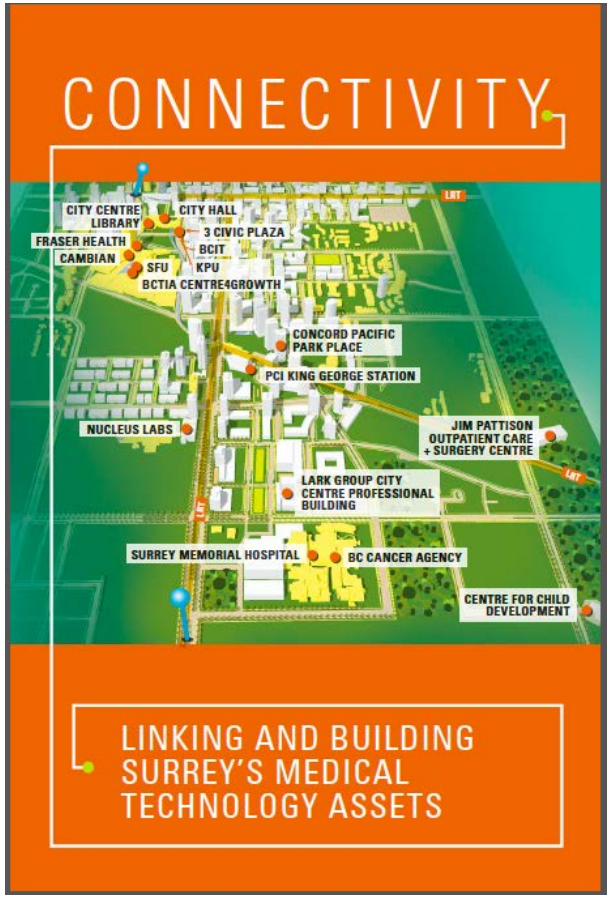



CITY OF SURREY
the future lives here.

# Our Research Vision

To become a globally recognized academic health research campus, a driving force for Fraser Health's vision of
"Better Health,
Best in Health Care"

*This Research Strategic Plan presents our bold vision and strategy to progressively increase Surrey's academic profile over the next decade.*

We will focus and build strategically to achieve four main goals:

1. **To be an international research leader** in targeted areas

2. **To fast track our ability to generate & translate new knowledge** into improved care and outcomes

3. **To utilize real world research and research findings** to drive down costs through innovative approaches

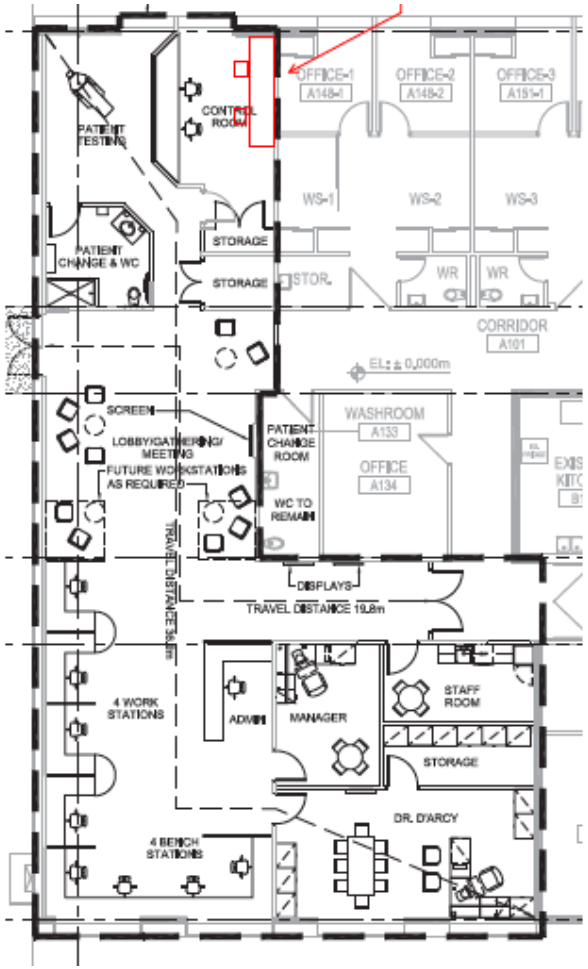
4. **To create a culture of curiosity** that recognizes and celebrates discovery in health care, enabling us to attract and retain the very best clinicians & researchers.

creating possibilities together.
SURREY MEMORIAL HOSPITAL
fraserhealth

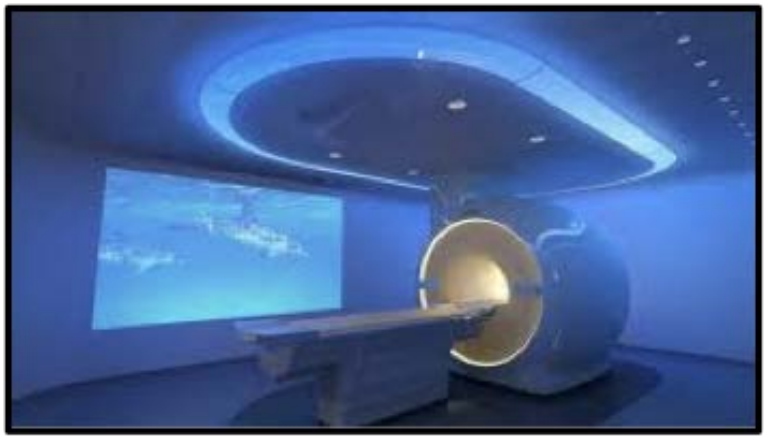

# INNOVATION BOULEVARD

# Embedded Labs.


NEUROTECH LAB

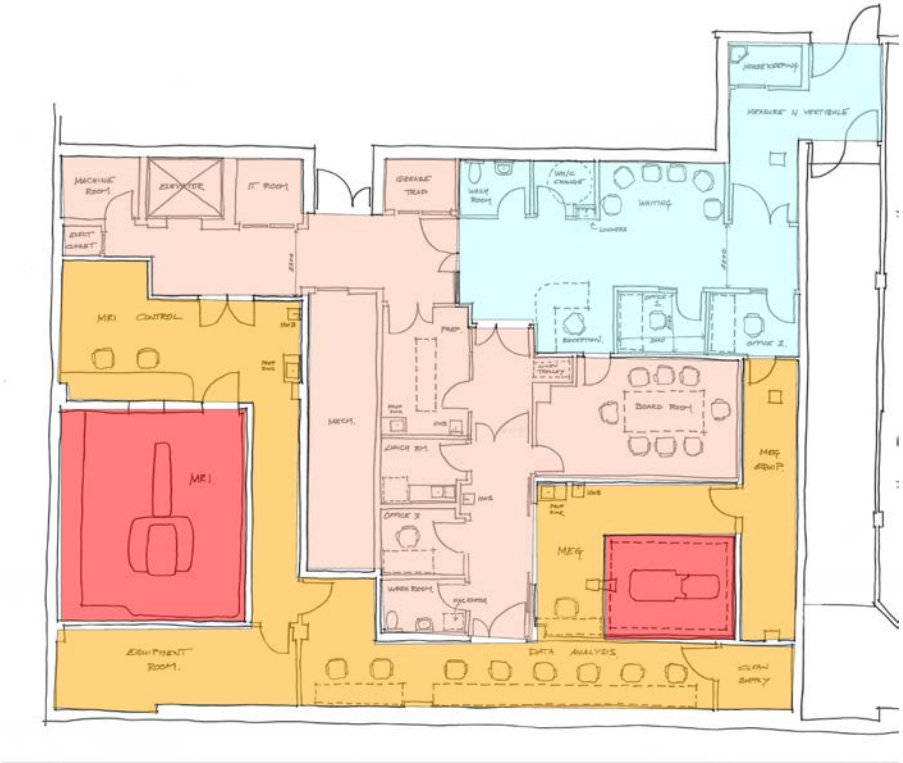


IMAGETECH LAB



High field MRI

Magnetoencephalography (MEG)



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Digital Health Hub

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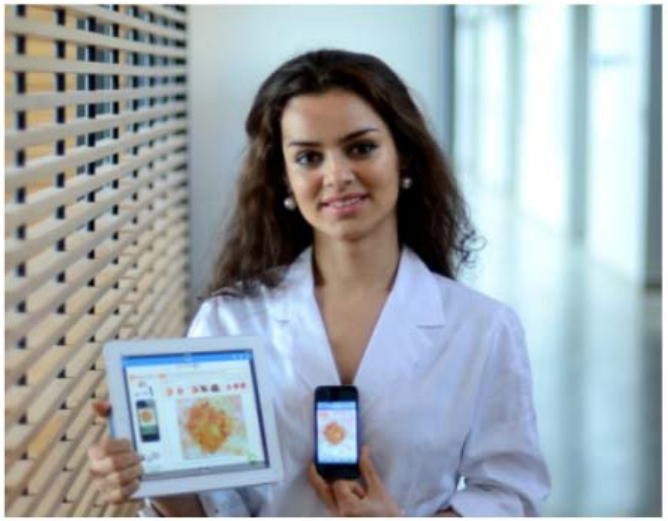
Today's News

New Search

## SFU Computing Scientist to Steer New Digital Health Hub

Wednesday, September 25, 2013

Company Profile | Careers | Follow Company

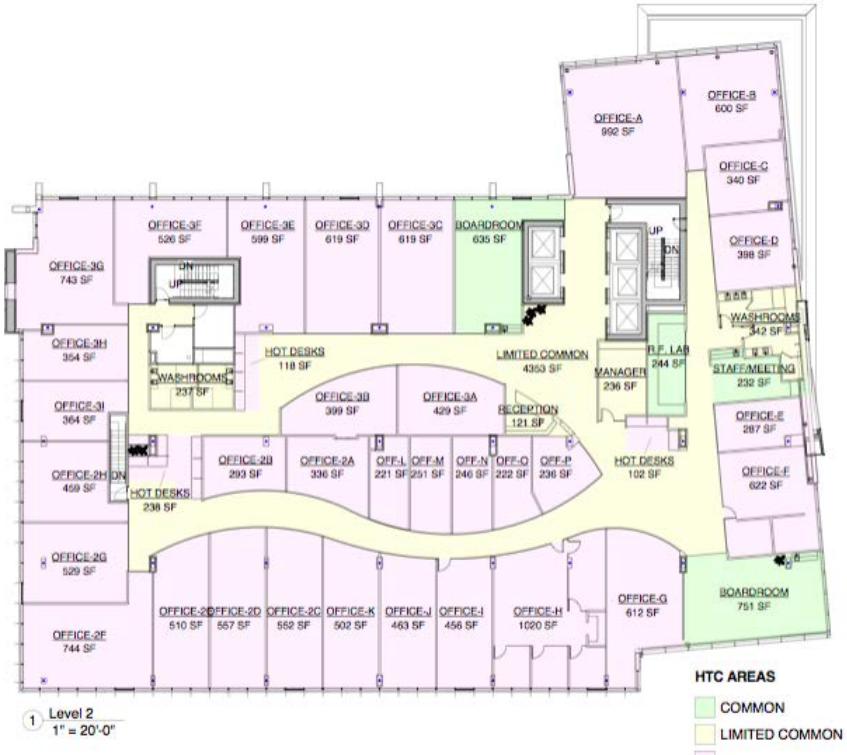


Vancouver, BC, September 25, 2013--(T-Net)--A new "hub" that will help drive health innovation at Simon Fraser University will be headed by **recent SFU PhD graduate Maryam Sadeghi**, an entrepreneur whose own health-tech

fraserhealth

# HEALTHTECH


CITY CENTRE 1


OFFICE-A
992 SF
OFFICE-B
600 SF
OFFICE-C
340 SF
OFFICE-D
398 SF
OFFICE-E
287 SF
OFFICE-F
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OFFICE-3E
526 SF
OFFICE-3E
599 SF
OFFICE-3D
619 SF
OFFICE-3C
619 SF
BOARDROOM
635 SF
OFFICE-3G
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OFFICE-3H
354 SF
OFFICE-3I
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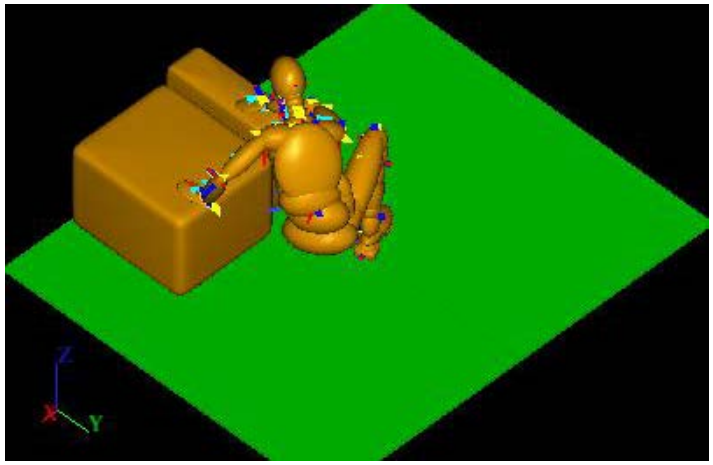
OFFICE-2H
459 SF
OFFICE-2G
529 SF
OFFICE-2F
744 SF
HOT DESKS
118 SF
WASHROOMS
237 SF
HOT DESKS
238 SF
OFFICE-3B
399 SF
OFFICE-3A
429 SF
LIMITED COMMON
4353 SF
RECEPTION
121 SF
MANAGER
236 SF
R.F. LAB
244 SF
WASHROOMS
342 SF
STAFF MEETING
232 SF
HOT DESKS
102 SF
OFFICE-2B
293 SF
OFFICE-2A
336 SF
OFF-L
221 SF
OFF-M
251 SF
OFF-N
246 SF
OFF-O
222 SF
OFF-P
236 SF
OFFICE-2E
510 SF
OFFICE-2D
557 SF
OFFICE-2C
552 SF
OFFICE-K
502 SF
OFFICE-J
463 SF
OFFICE-I
456 SF
OFFICE-H
1020 SF
OFFICE-G
612 SF
BOARDROOM
751 SF
UP
DN
1 Level 2
1" = 20'-0"
HTC AREAS
COMMON
LIMITED COMMON

AGEWELL


Wheelchair airbags

Assistive devices in rehabilitation



Falls simulations and monitor

Brain monitoring in dementia

# HEALTH - AND - TECHNOLOGY DISTRICT

# Testing 'brain vital signs'

Kate Lunau

October 16, 2013



Jennifer Roberts

# Brain Vital Signs

**ORIGINAL RESEARCH ARTICLE**

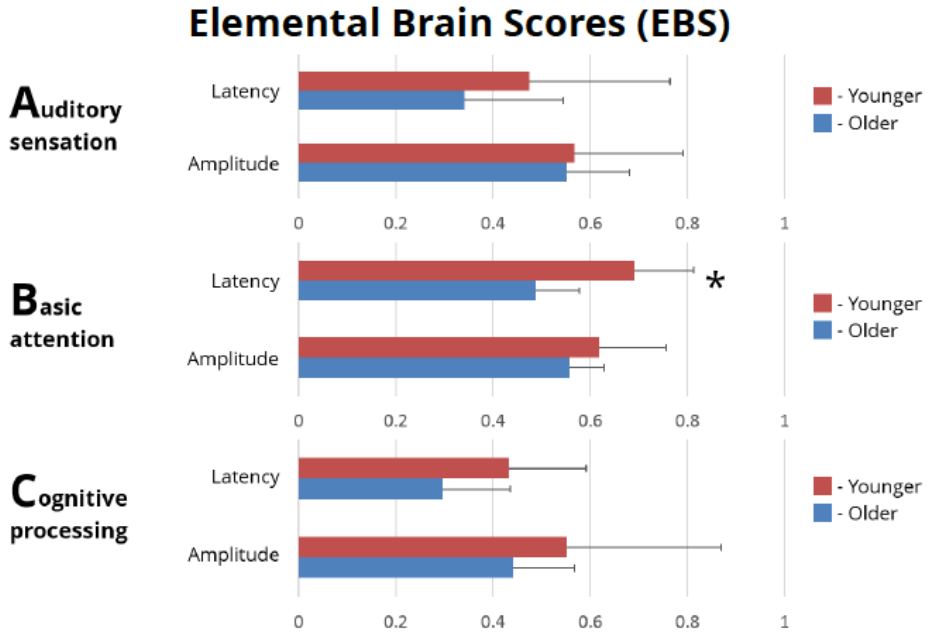
Front. Neurosci., 12 May 2016 | http://dx.doi.org/10.3389/fnins.2016.00211



## Developing Brain Vital Signs: Initial Framework for Monitoring Brain Function Changes Over Time

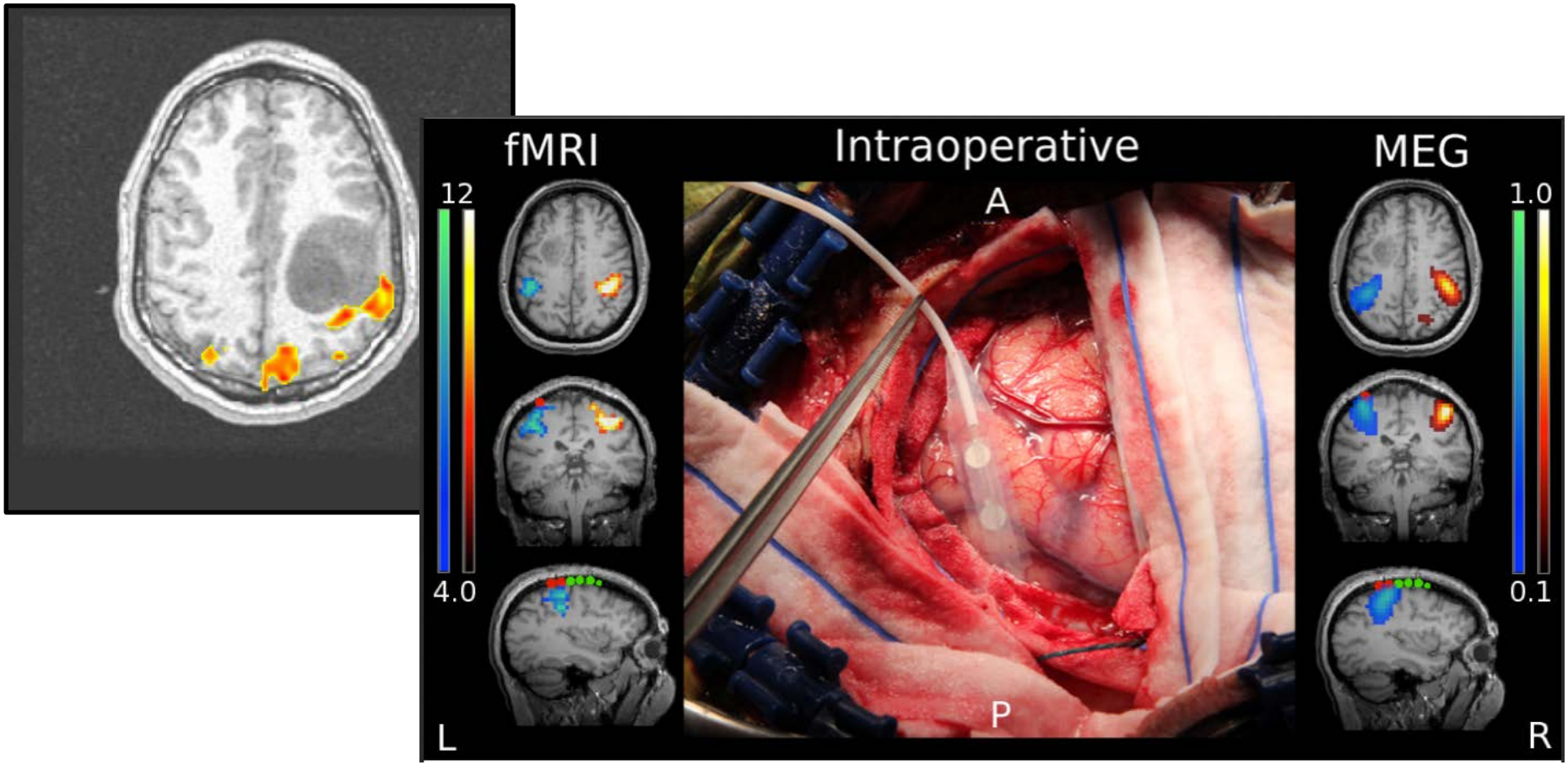
Sujoy Ghosh Hajra[1,2], Careesa C. Liu[1,2], Xiaowei Song[1,2,3], Shaun Fickling[1,2], Luke E. Liu[2], Gabriela Pawlowski[2,4], Janelle K. Jorgensen[5], Aynsley Schnaider-Beeri[6,7], Rudi Van Den Broek[8], Rowena Rizzotti[8], I D'Arcy[1,2,3,4,8*]

[1]Faculty of Applied Science, School of Engineering Science, Simon Fraser University,
[2]NeuroTech Lab, Simon Fraser University and Fraser Health Authority, Surrey, BC, Ca
[3]Health Sciences and Innovation, Surrey Memorial Hospital, Fraser Health Authority,
[4]Biomedical Physiology and Kinesiology, Faculty of Science, Simon Fraser University,
[5]Sports Medicine Center, Mayo Clinic, Rochester, MN, USA
[6]Department of Psychiatry, Icahn School of Medicine at Mount Sinai, New York, NY,
[7]Joseph Sagol Neuroscience Centre, Sheeba Medical Centre, Ramat Gan, Israel
[8]HealthTech Connex Inc., Surrey, BC, Canada

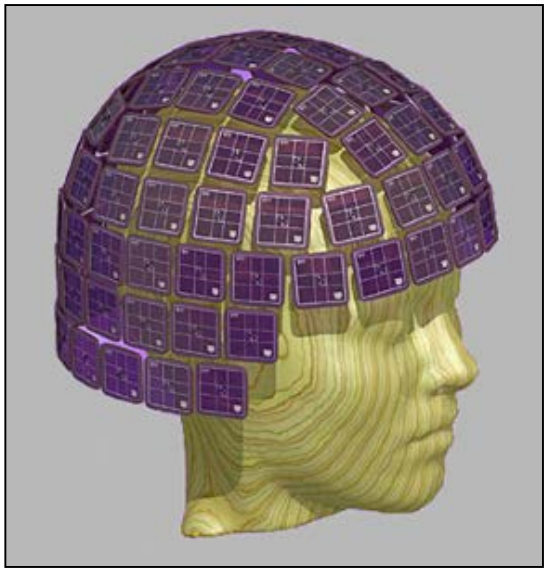



. EBS for group-level comparison. Mean ± SD. * denotes p<0.05 across groups.

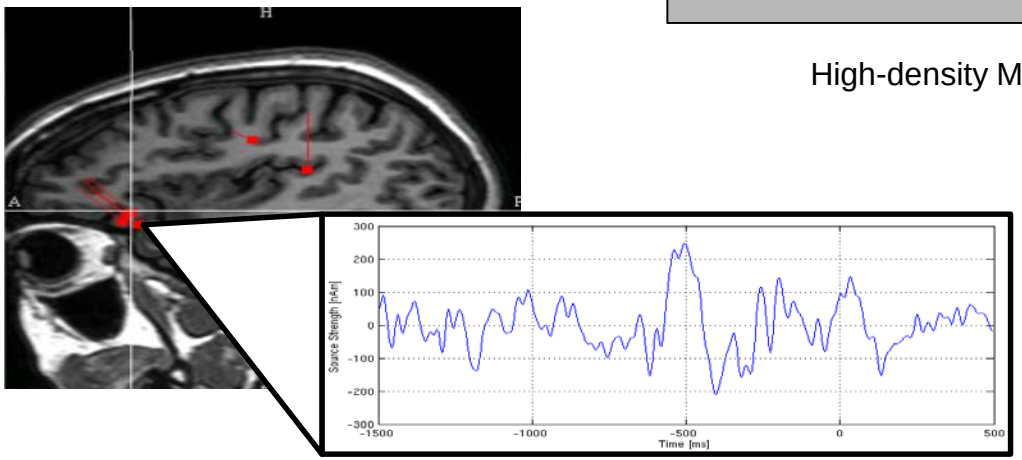
# Presurgical mapping



# Epilepsy

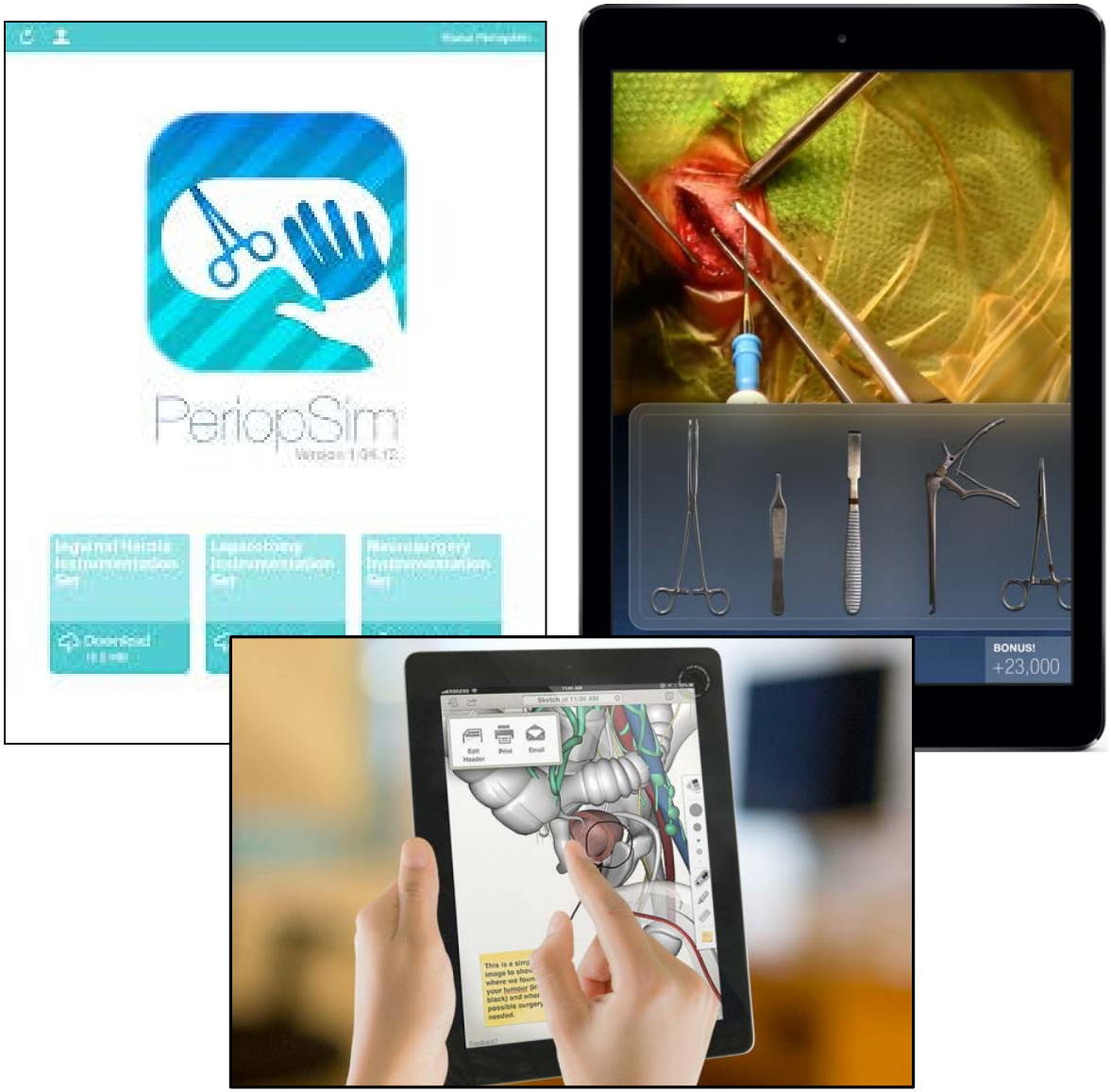


High-density MEG



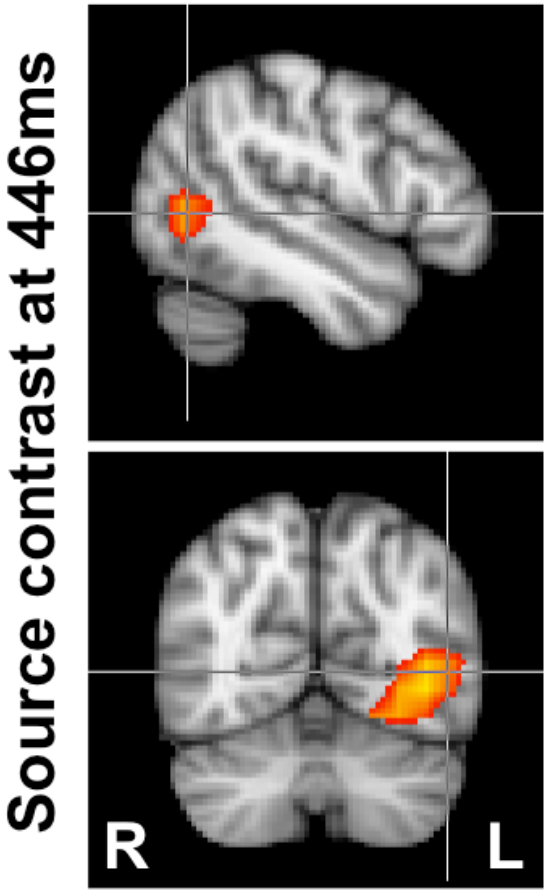
# Surgery

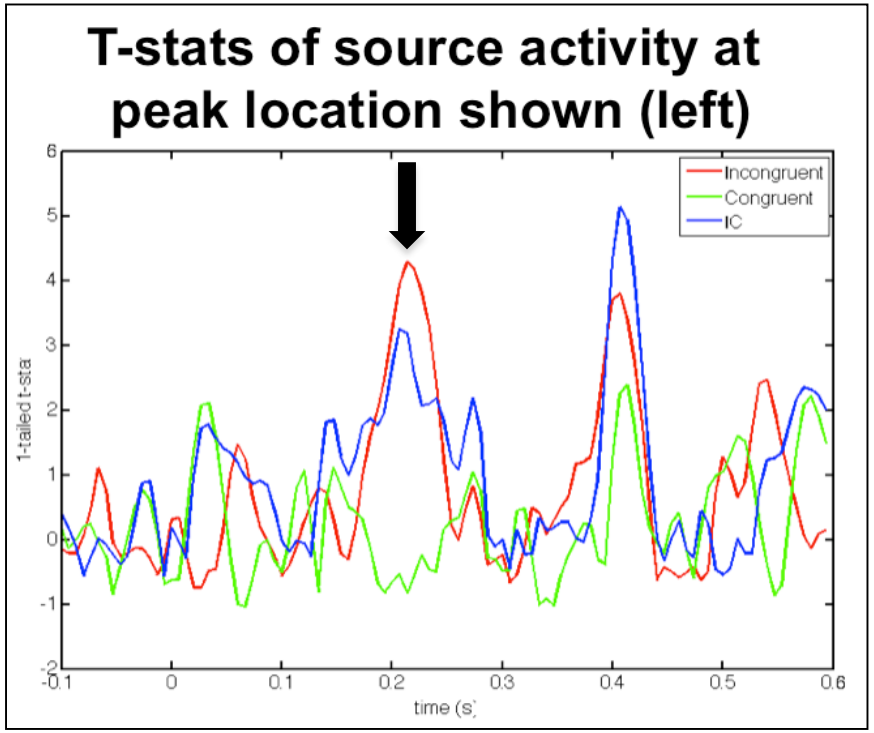
# Simulation




Medical education

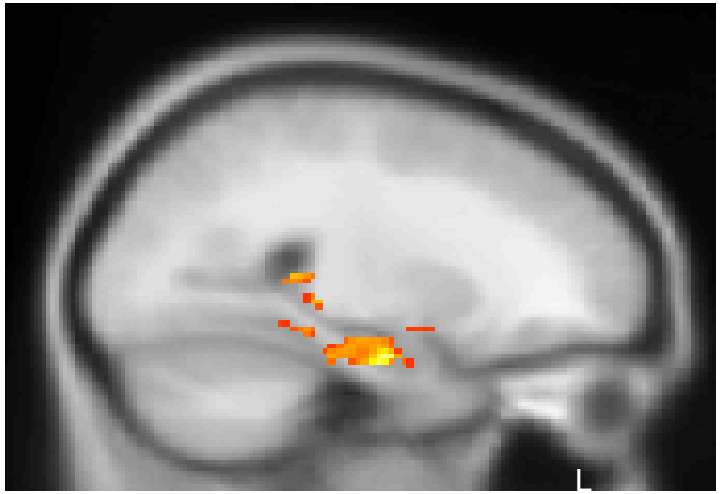
# Brain Development

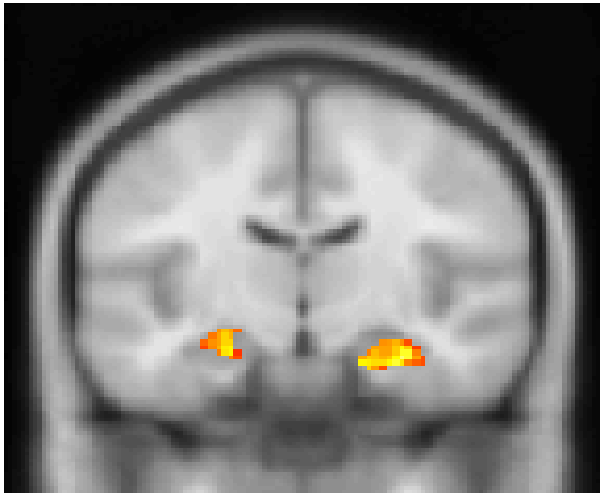


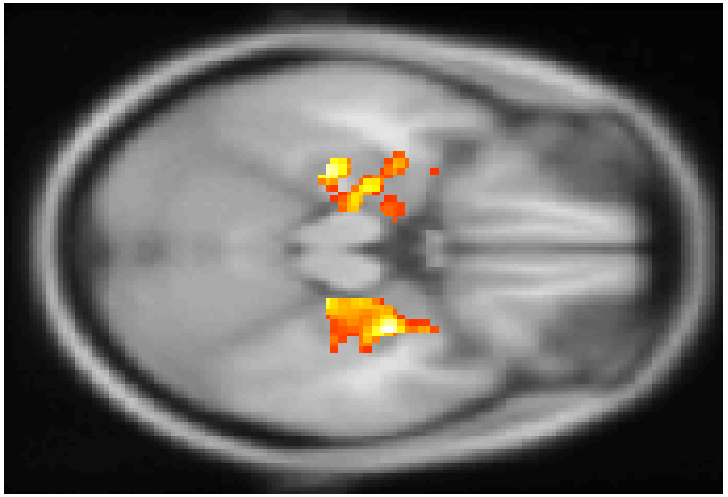




Down syndrome, autism and other disorders: Significant gains in brain plasticity during language therapy

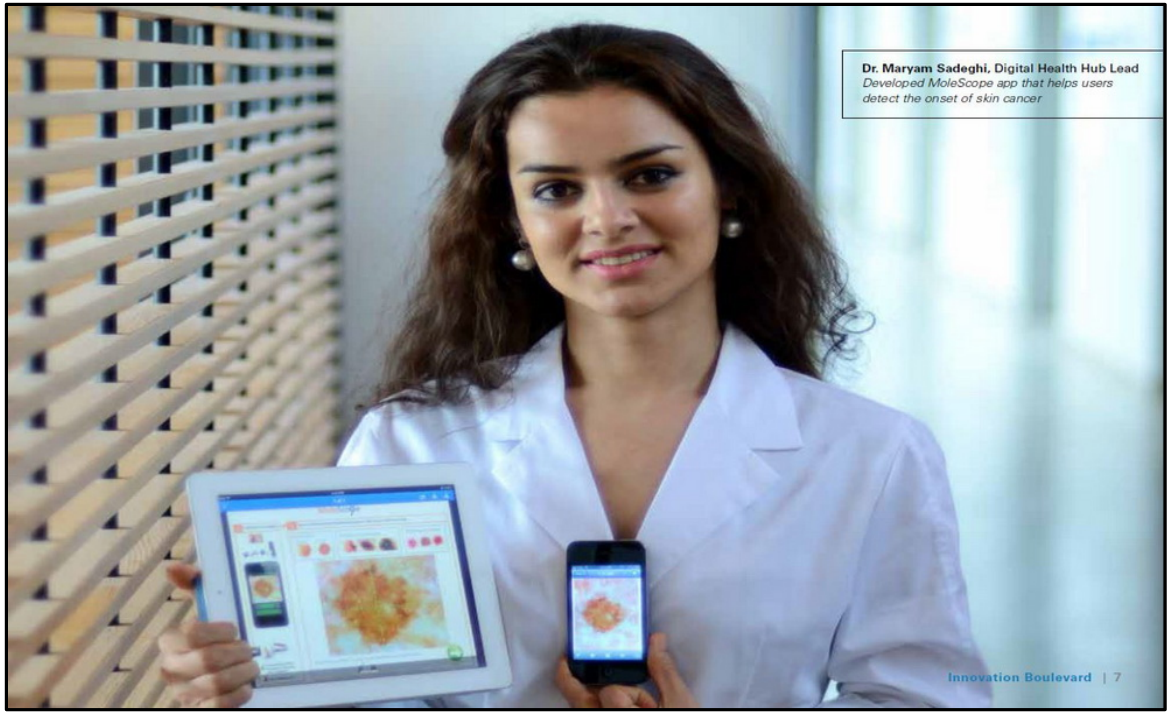
# Dementia







# Point-of-care



The Greene family
Grace, Trevor, Debbie, and Noah

# False Hope.


“Will you be able to walk, I don’t think so.”
Peace warrior: Rebroadcast December 2009

Trevor and Debbie’s wedding, July 2010

Society

MILITARY

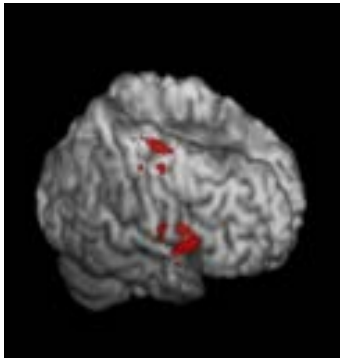
# THE IRON SOLDIER

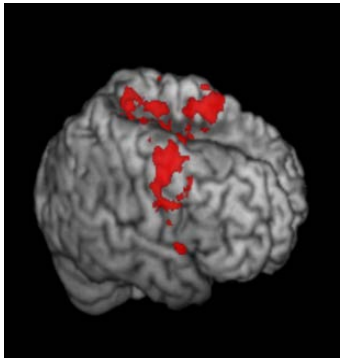
Nine years after Capt. Trevor Greene took an axe to the head in Afghanistan, he is walking again, with the help of an exoskeleton and the Royal Canadian Legion. It is a journey that could change the lives of millions.

BY KEN MACQUEEN - Trevor Greene has a new tattoo on his left forearm. It appears to show a rugged mountain peak and, above it, a string of letters I can't decipher. It's mid-June, an exciting morning for the forcibly retired Army Reserve captain, his wife, Debbie, and a cast of characters who crowd the main floor of the Greene family home in Nanaimo, B.C. Greene, in his wheelchair, is sharing the focus of attention with a silent partner sitting nearby, something that looks eerily like a headless robot. The Greenes, in ways they couldn't possibly have foreseen, have been building to this moment for more than nine years, really, since the aftermath of March 4, 2006, the day Capt. Greene first did the impossible by refusing to die in the dust of a remote Afghan settlement.

By 2006, the Canadian Forces had long since abandoned the concept of peacekeeping; our soldiers were in a shooting war against the Taliban. It was Greene's role, as civil-military co-operation officer, to build bridges to a more peaceful future by offering aid and infrastructure assistance to impoverished villages in Kandahar province. It is why he was sitting on the ground with the elders of Shinkay village, why he had set down his rifle and removed his helmet as signs of respect; why, as he spoke of Canada's desire to help this village, he was vulnerable to a 16-year-old

**Powered steps:** *The Legion funded the robotics; Greene brought the work and determination*





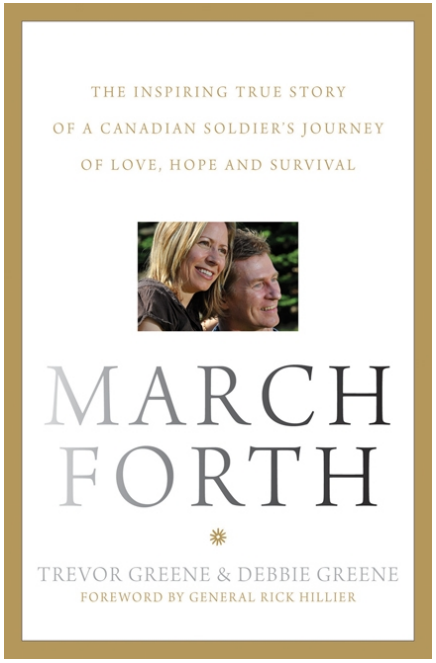
*J Head Trauma Rehabil*


# Long-Term Motor Recovery After Severe Traumatic Brain Injury: Beyond Established Limits

*Ryan C. N. D'Arcy, PhD; D. Stephen Lindsay, PhD; Xiaowei Song, PhD; Jodie R. Gawryluk, PhD; Debbie Greene, CA; Chantel Mayo, BSc; Sujoy Ghosh Hajra, BEng; Lila Mandziuk, OT; John Mathieson, MD; Trevor Greene, BJ (Hons)*

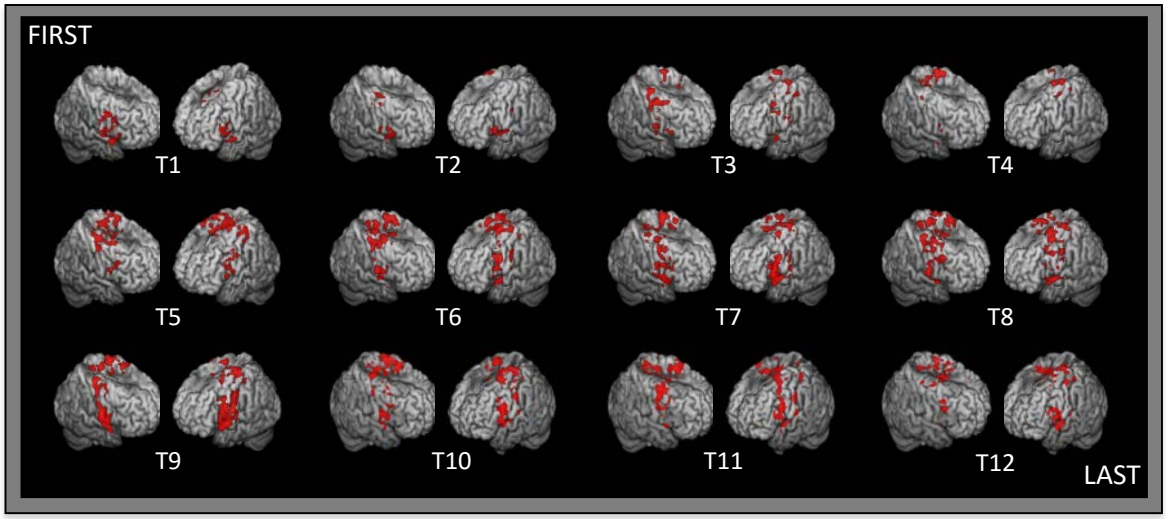
**Objective:** To report neural plasticity changes after severe traumatic brain injury. **Setting:** Case-control study. **Participants:** Canadian soldier, Captain Trevor Greene survived a severe open-traumatic brain injury during a 2006 combat tour in Afghanistan. **Design:** Longitudinal follow-up for more than 6 years. **Main Measures:** Twelve longitudinal functional magnetic imaging (fMRI) examinations were conducted to investigate lower limb activation changes in association with clinical examination. Trevor Greene's lower limb fMRI activation was compared with control fMRI activation of (1) mental imagery of similar movement and (2) matched control subject data. **Results:** Trevor Greene's motor recovery and corresponding fMRI activation increased significantly over time ($F = 32.54$, $P < .001$). Clinical measures of functional recovery correlated strongly with fMRI motor activation changes ($r = 0.81$, $P = .001$). By comparison, while Trevor Greene's mental imagery activated similar motor regions, there was no evidence of fMRI activation change over time. While comparable, control motor activation did not change over time and there was no significant mental imagery activation. **Conclusion:** Motor function recovery can occur beyond 6 years after severe traumatic brain injury, both in neural plasticity and clinical outcome. This demonstrates that continued benefits in physical function due to rehabilitative efforts can be achieved for many years following injury. The finding challenges current practices and assumptions in rehabilitation following traumatic brain injury.
**Key words:** *functional MRI, neuroplasticity, recovery of motor function, rehabilitation, traumatic brain injury*

## Phase 1 - Experimental design: To walk again..

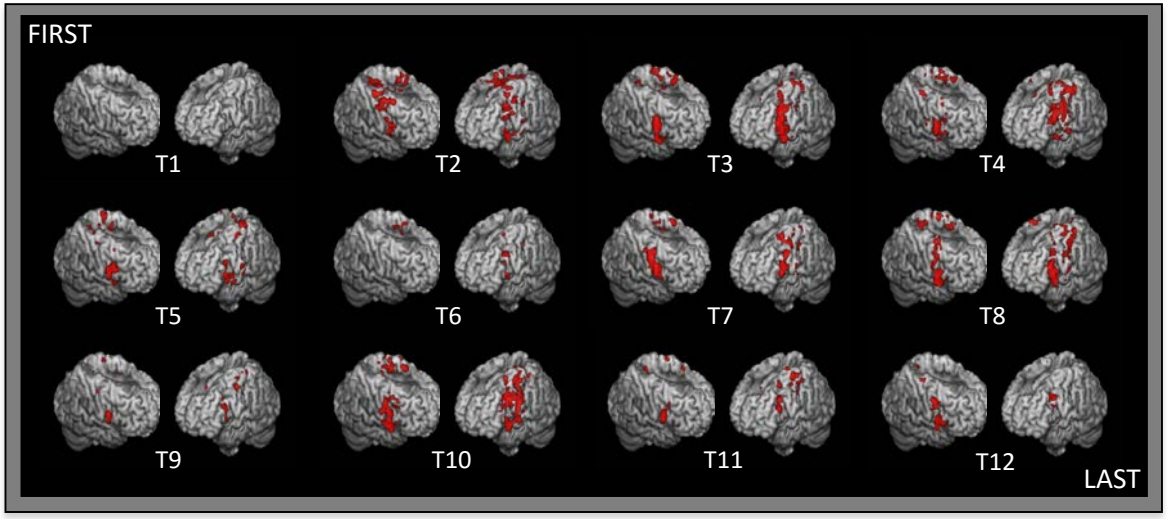




## Recovering: Walking movement




## Recovering: Mental imagery




Courtesy of Xiaowei Song


Legion
BRITISH COLUMBIA/YUKON FOUNDATION

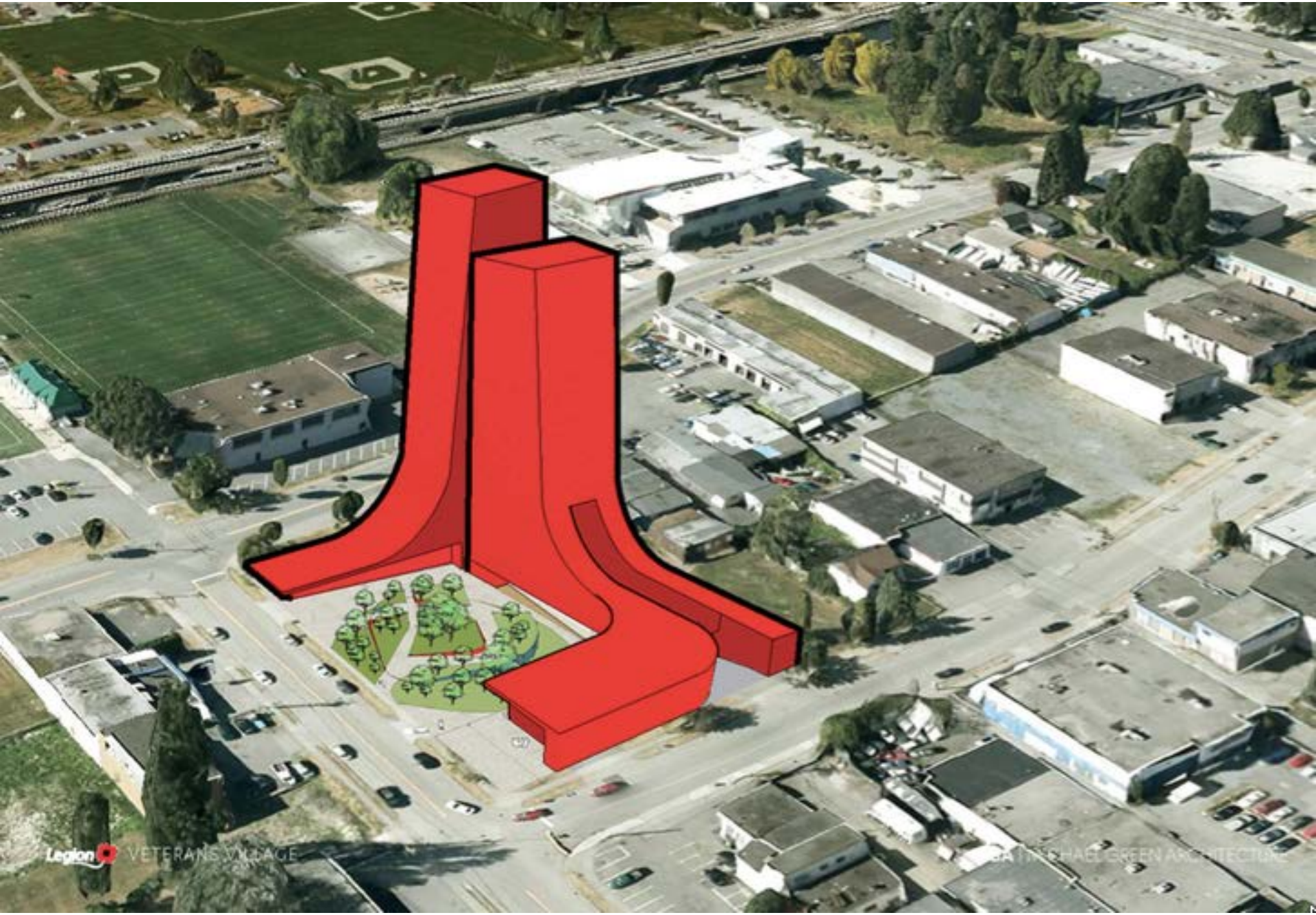
# Iron Soldier: Mission to Everest

Global National - Year in Review: Top Canadian stories of 2015

## Year in Review: Top Canadian stories of 2015

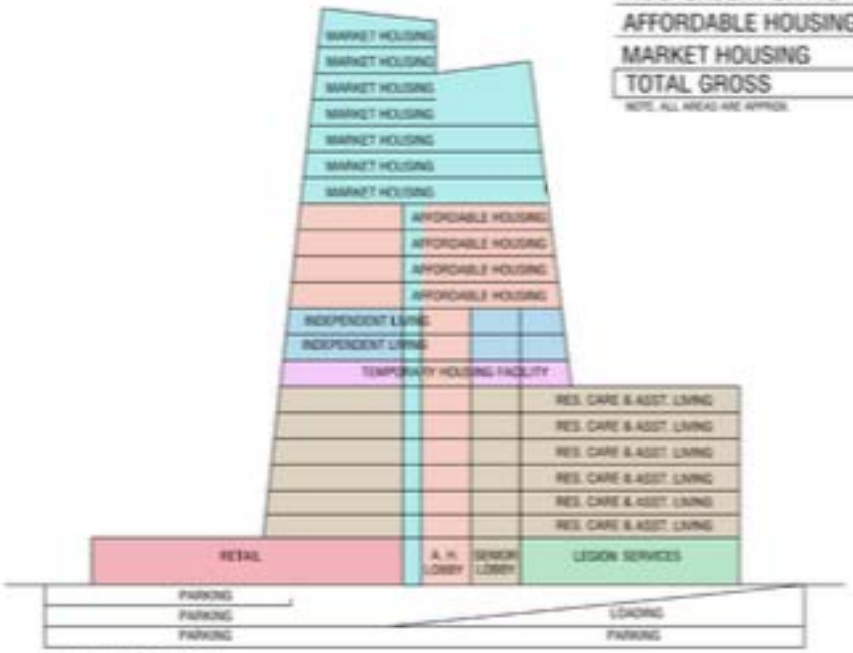
Wed, Dec 30: 2015 has been a year of change in Canada and a year of extremes. Eric Sorensen looks back at the significant moments that touched Canadians, from the tragic to the triumphant.

# NEW ERA
# NEW LEGION

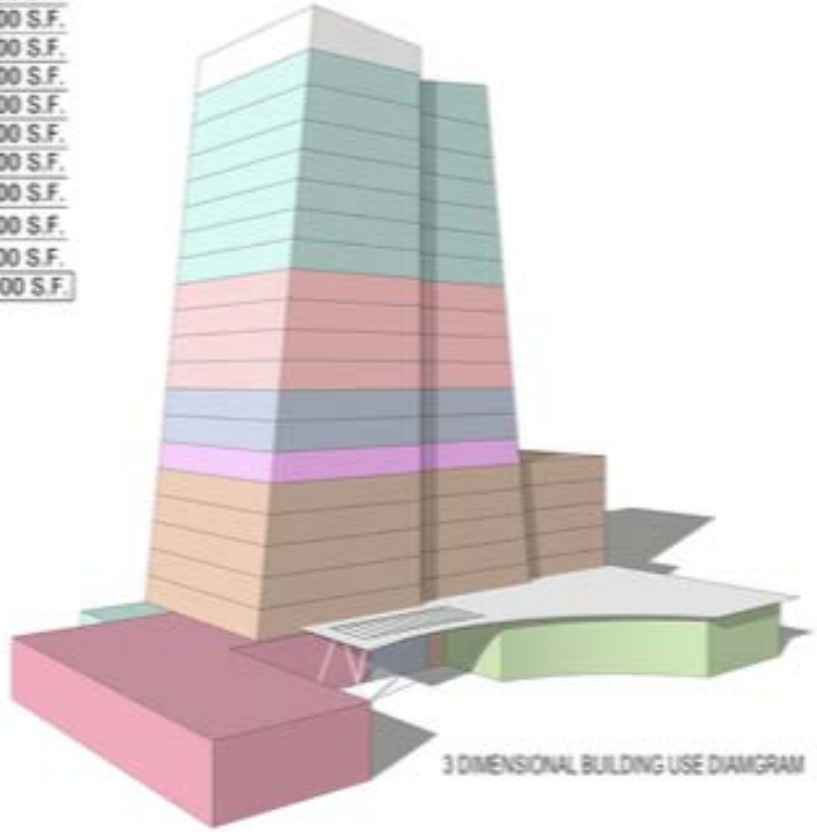

Legion
VETERANS VILLAGE

| | |
|---|---|
| LEGION | 5,000 S.F. |
| RETAIL | 9,000 S.F. |
| OFFICE MARKET | 1,000 S.F. |
| PTSD | 1,000 S.F. |
| PHYSICAL REHABILITATION | 2,000 S.F. |
| COMM. CLINIC | 2,000 S.F. |
| SENIORS | 68,000 S.F. |
| TEMP. HOUSING FAC. | 8,000 S.F. |
| INDEPENDENT LIVING | 16,000 S.F. |
| AFFORDABLE HOUSING | 33,000 S.F. |
| MARKET HOUSING | 55,000 S.F. |
| TOTAL GROSS | 200,000 S.F. |

NOTE: ALL AREAS ARE APPROX.




BUILDING SECTION



3 DIMENSIONAL BUILDING USE DIAMGRAM

LARK GROUP WA

* WENSLEY ARCHITECTURE LTD

# LEGION VETERANS VILLAGE

## PROPOSED PROGRAM DIAGRAM

Legion

OCT 26, 2010

NSERC CRSNG

CIHR IRSC

Canada Foundation for Innovation
Fondation canadienne pour l'innovation

Western Economic Diversification Canada

BRITISH COLUMBIA

Surrey Memorial Hospital FOUNDATION
*Making life better.*

Department of Foreign Affairs and International Trade

Ministère des Affaires étrangères et du Commerce international

MITACS

NOVA SCOTIA Health Research FOUNDATION

Atlantic Canada Opportunities Agency

Agence de promotion économique du Canada atlantique

Canada

National Research Council Canada

Conseil national de recherches Canada


SURREY
INNOVATION
BOULEVARD