



Grand Challenges Canada®  
Grands Défis Canada

## News Release

December 19, 2014

# Thinking Outside the Xbox: Gaming Technologies plus 3D Printing Leveraged to Help Fit African Child Amputees With Artificial Legs

## *Canada funds 23 bold new ideas for global health*

**Toronto, Canada** – Ultra high-speed gaming laptops and a sensor that lets computer gamers battle foes in the virtual world proved early stepping stones on the path to a quick, inexpensive way to create fittings for artificial legs needed by child amputees in the developing world.

And, with a new grant from Grand Challenges Canada, funded by the Government of Canada, scientists will field test their innovation at a children's hospital in Uganda early next year.

The \$112,000 CAD grant to Christian Blind Mission (**cbm** Canada) of Stouffville, near Toronto, Ontario, is one of 23 announced today under the Grand Challenges Canada Stars in Global Health program, which supports unique, transformative ideas for addressing health challenges in developing regions.

In all, almost \$2.6 million CAD in funding will support projects based in 10 countries and



implemented in 17 countries. Each of the innovators will receive a grant of \$112,000 CAD to develop their innovations. If their ideas prove effective, the innovators will be eligible for additional Grand Challenges Canada scale-up funding of \$1 million CAD.

Building on extensive research and development led by Dr. Matt Ratto at the University of Toronto, the **cbm** Canada project uses a 3D printer to make a precision-fitted plastic socket to connect a child's residual limb and a standard

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artificial leg provided by aid agencies.

Step one requires a precise digital image of a child's limb: early efforts involved a \$200 Xbox scanner accessory used in computer gaming, which follows a player's physical movements to put him or her in the action. Now, a next-generation "Sense" scanner, rotated in an arc around the leg stump for 45 seconds, is used that, in tandem with inexpensive Skanect software, recreates the residual limb virtually.

The next breakthrough was enabled when Dr. Ryan Schmidt of Autodesk Research enhanced a software program he created (while he was a University of Toronto student) called Meshmixer. His adaptation enabled project leaders to create the socket virtually and quickly, using the powerful graphics card in a high-end portable gaming laptop. A 3D printer then produces the custom-fitted socket using about \$3 of cornstarch-based PLA plastic.

Since the entire process requires under six hours, the prosthetic sockets can be replaced easily and cheaply as a child amputee quickly grows. By comparison, producing a socket in Uganda today currently involves five to six labour-intensive days and the use of plaster of Paris molds dried in the sun, often resulting in ill-fitting sockets, the discomfort of which discourages their use.

Under the management of Mitch Wilkie, Director of International Programs, and Emily Kere, Senior International Programs Officer, both at **cbm** Canada, the project team will experiment with both plastic materials and techniques for 3D printing the wall of the socket to provide the greatest strength and durability with the least weight and material.

They will also evaluate the potential use of Canadian custom-made 3D printers that may be better purposed for this application in the developing world. Most importantly, the team will incorporate good development principles by ensuring disability inclusion, gender equity and environmental sustainability within the project's scope.

### **\$200 hand prostheses for amputees in Guatemala**

Meanwhile, another \$112,000 CAD grant to the University of Victoria in British Columbia will also exploit the potential of 3D printing, producing fully functional artificial hand prostheses for amputees in Guatemala for just \$200 each, including material and fabrication costs.

The project is based on a prosthesis design developed 15 years ago by innovator Nikolai Dechev, which recently became financially viable with the advent of high-quality, inexpensive 3D printers.

Presently, state-of-the-art, functional artificial hands cost \$12,000 (for basic models) to \$70,000 (for the most technically advanced models). In this work, body-powered (cable-driven) prostheses of similar functionality can now be 3D printed in plastic in 20 hours.

Tests will be conducted next summer at a clinic in Guatemala with a small number of existing artificial hand users before being expanded by the end of 2015 to a larger group of amputees inexperienced with the appliance.

“I thank the Government of Canada for its commitment to innovation and development in global health,” said Dr. Peter A. Singer, Chief Executive Officer of Grand Challenges Canada. “With this support, Grand Challenges Canada is able to identify and nurture bold ideas from talented innovators, making the developing world a healthier and safer place.”

The full list of grantees includes:

- **University of Saskatchewan, Saskatoon, Canada:** Selenium Fortified Table Salt to Treat Arsenic Poisoning in Bangladesh (<http://bit.ly/1ukQOIm>)
- **University of Saskatchewan, Saskatoon, Canada:** Modular Biomaterial Technology for Water Security and Health in Developing Nations (<http://bit.ly/1yPUHFh>)
- **Ryerson University, Toronto, Canada:** Adaptive Design International: constructing a global social network for creating low-cost custom adaptations for children with disabilities (<http://bit.ly/1wy0JLK>)
- **University of Waterloo, Waterloo, Canada:** Delivering Clean Potable Water Using Smart Nano Materials Derived from Sustainable Resources (<http://bit.ly/12tM46L>)
- **University of Victoria, Victoria, Canada:** 3D Printing and Deployment of Upper-Limb Prostheses in Developing Countries (<http://bit.ly/12tM46K>)
- **University of Toronto, Toronto, Canada:** A safe, affordable and re-usable women's personal hygiene kit that empowers women to be the decision-makers regarding menstrual hygiene management, reproduction and the prevention of HIV in low-resource settings (Kenya) (<http://bit.ly/1yPUK3V>)
- **The University of Western Ontario, London, Canada:** Community REcovery Achieved Through Entrepreneurism (CREATE): A new paradigm for recovery from serious mental illness in low-resource settings (Kenya) (<http://bit.ly/1vOPZH5>)
- **PathCore Inc., Toronto, Canada:** Training and Diagnostic Tools for Reducing the Cancer Burden in Nigeria (<http://bit.ly/12tM6LH>)
- **Christian Blind Mission International, Toronto, Canada:** 3D PrintAbility: Leveraging 3D Printing Technology for Prosthetics Production in Developing Countries (Uganda) (<http://bit.ly/1wy0LDu>)
- **ChipCare Corporation, Canada:** Combining a unique diagnostic platform for decentralized blood testing with a two-way communications network for data capture, and the training and supervision of community-level health workers (Kenya) (<http://bit.ly/1ukQLGk>)
- **International Centre for Diarrhoeal Disease Research, Bangladesh:** Evaluation of electronic nose as the point of care test for tuberculosis diagnosis among slum dwellers of Dhaka City, Bangladesh (<http://bit.ly/1vOQ25R>)
- **Vía Cocina – Food Train, Colombia:** Behaviour change solutions to non-communicable disease challenges: empowering low-income Colombians to commercialize and consume healthy products via social enterprise micro franchising (<http://bit.ly/1yPUHFg>)
- **Egerton University, Kenya:** Mycotoxins Under Arrest: Healthy Synergy of Drying and Storage Devices (<http://bit.ly/1yPUK3W>)
- **Impact Capital Advisors Limited, Kenya:** Building a scalable franchise of affordable, safe and stimulating daycares serving vulnerable pre-school children and mothers in Nairobi's slums (<http://bit.ly/1yPUK3X>)



- **Moi University, Kenya:** Development of a Community-Embedded Family Therapy Intervention in Kenya: A faith- and village-based approach (<http://bit.ly/1ukQLGI>)
- **Edon Consultants International Limited, Kenya:** Happy Smiles–Healthy Bones: tackling bone deformation due to high-fluoride water (<http://bit.ly/1wy0LDt>)
- **Dignitas International, Malawi:** Disrupting Vertical Health Systems: Moving to integrated care for HIV and non-communicable diseases (<http://bit.ly/1ukQOlp>)
- **Eco Med LLC, Mongolia:** Immunotherapy of atherosclerosis (<http://bit.ly/1vOPZH7>)
- **African Centre for Innovation and Leadership Development, Nigeria:** E-vouchers for veggies: reducing nutrition-related non-communicable diseases (NCDs) through video games and storytelling to promote behaviour change (<http://bit.ly/1wy0JLL>)
- **The University of Agriculture, Pakistan:** Rhizosphere engineering through biostimulation of Quorum quenching bacteria for controlling bacterial diseases in vegetables (<http://bit.ly/1vOPZH6>)
- **The Education Enrichment Foundation, Pakistan:** Mobile Payment-Enabled Health Insurance (<http://bit.ly/1yPUK3T>)
- **Ifakara Health Institute, Tanzania:** Fighting insect-borne diseases and enriching urban agricultural land by using molasses: a common by-product from sugar factories (<http://bit.ly/1ukQOln>)
- **National Science and Technology Development Agency, Thailand:** Ultrathin, Light-Weight and Disposable Nanofibrous Filters for Tuberculosis Prevention (<http://bit.ly/1wy0Jvx>).

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### **About Grand Challenges Canada**

Grand Challenges Canada is dedicated to supporting Bold Ideas with Big Impact® in global health. We are funded by the Government of Canada; we support innovators in low- and middle-income countries and Canada. The bold ideas we support integrate science and technology, social and business innovation to find sustainable solutions to health challenges – we call this Integrated Innovation®. Grand Challenges Canada focuses on innovator-defined challenges through its Stars in Global Health program and on targeted challenges through its Saving Lives at Birth, Saving Brains and Global Mental Health programs. Grand Challenges Canada works closely with Canada's International Development Research Centre (IDRC), the Canadian Institutes of Health Research (CIHR) and the Department of Foreign Affairs, Trade and Development Canada (DFATD) to catalyze scale, sustainability and impact. We have a determined focus on results, and on saving and improving lives.

[www.grandchallenges.ca](http://www.grandchallenges.ca)



Grand Challenges Canada®  
Grands Défis Canada

**FOR MEDIA ENQUIRIES:**

**LODE ROELS**

Press Officer

Grand Challenges Canada

T. 647.328.2021 / 416.673.6570

[lode.roels@grandchallenges.ca](mailto:lode.roels@grandchallenges.ca)

**TERRY COLLINS**

T. 416.538.8712 / 416.878.8712

[tc@tca.tc](mailto:tc@tca.tc)