Week 5: Brain

Brain-inspired chip could open area of vast neural networks (True North)

[http://www.nanowerk.com/nanotechnology-news/newsid=36828.php](http://www.nanowerk.com/nanotechnology-news/newsid%3D36828.php)

IBM TrueNorth a “Bee Brain” on a SyNAPSE Chip That Uses 70 mW (includes collection of materials e.g. TED talks, etc.)

<http://techenablement.com/ibm-truenorth-is-a-bee-brain-on-a-synapse-chip-that-uses-70-mw/>

Brain in a dish

Tufts

<http://www.eurekalert.org/pub_releases/2014-08/niob-bcf080714.php>

NIH

<http://www.eurekalert.org/pub_releases/2014-08/tu-bmf080614.php>

New York Times

http://www.nytimes.com/2014/08/12/health/scientists-create-3d-model-that-mimics-brain-function.html

Lieber/cyborgs/understanding brain

<http://www.frogheart.ca/?p=14365>

Robo brain project (check out EU’s Robo Earth project too)

<http://www.eurekalert.org/pub_releases/2014-08/cmu-nab082214.php>

http://robobrain.me/#/

brain to brain communication (humans & robots)

<http://www.sciencedaily.com/releases/2014/09/140903105646.htm>

<http://www.eurekalert.org/pub_releases/2014-09/bidm-rdd090314.php>

Brains, prostheses, ethics, etc. (my five-part series)

<http://www.frogheart.ca/?p=13448>

US Bioethics commission (Gray Matters, vol. 1)

<http://bioethics.gov/node/3543>

Vol 2

<http://news.emory.edu/stories/2014/06/er_bioethics_commission_meeting/campus.html>

Brain on a chip 2014 survey (neuromorphic?)

<http://www.frogheart.ca/?p=13001>

'Skin-like' device monitors cardiovascular and skin health (compare to Medtronics chest implant)

<http://www.eurekalert.org/pub_releases/2014-09/nu-dm092414.php>

Closed-loop neuromodulation of spinal sensorimotor circuits controls refined locomotion after complete spinal cord injury (implanted device?) compare to Nicolelis work

<http://stm.sciencemag.org/content/6/255/255ra133>

Fraunhofer implant (spine/walking)

<http://www.frogheart.ca/?p=13448>

Machines learning from cartoons?

<http://www.eurekalert.org/pub_releases/2014-09/vt-ccb092614.php>

The Scientist: bionic eyes

<http://www.the-scientist.com/?articles.view/articleNo/41052/title/The-Bionic-Eye/>

Robot researcher combines nature to nurture ‘superhuman’ navigation

<http://www.news.qut.edu.au/cgi-bin/WebObjects/News.woa/wa/goNewsPage?newsEventID=78859>

http://www.eurekalert.org/pub\_releases/2014-10/quot-rrc100114.php

Underskin

<http://www.fastcodesign.com/3036175/from-the-designers-of-fitbit-a-digital-tattoo-implanted-under-your-skin?partner=rss>

New imaging system (12 x more colour than human eye can perceive)

<http://www.sciencedaily.com/releases/2014/10/141003064457.htm>

Invisibles not wearable for health monitoring

<http://www.fastcoexist.com/3036554/wearables-week/invisibles-not-wearables-will-profoundly-change-healthcare?partner=rss>

Neuroprosthetics (2 articles & 1 article on bionic limbs embargoed ‘til Oct. 8, 2014)

Prosthetic Hands & Arms that “Belong”
In the field of neuroprosthetics, scientists are getting closer to mimicking the intuitive control, freedom of movement, and sense of touch that people with natural limbs often take for granted. Dustin Tyler and colleagues provide the first long-term evidence that the under-the-skin wires and nerve electrodes for a neuroprosthetic hand can last after being subjected to real-world use by two adult male amputees. Both men had surgeries in which three electrodes were implanted around their remaining nerves and connected to a prosthetic hand. Following surgery, the recipients were able to perform everyday tasks for over a year (including strenuous outdoor activities such as chopping wood) without problems, demonstrating the long-term durability of the prosthetic interface. In addition, the researchers also developed a way to improve sensory perception in the prosthetic hands, which they tested in the two participants during monthly visits to the lab. For patients, improving sense of touch appears to be a key part of perceiving the prosthetic hand as a natural extension of the body. During these lab experiments, the research team hooked the participants up to a machine that sent electrical pulses through the prosthetic hand. Unlike most electrical stimulation methods, Tyler and colleagues varied the intensity of the electrical stimulation to excite different neurons with different patterns. (This patterned approach is most similar to what happens in normal hands when touching a table or grabbing a doorknob.) After stimulation, the patients reported feeling like they were grasping objects with their own hand, rather than feeling like they were using an external tool.

In a separate study focused on recreating the freedom of movement of natural limbs, Max Ortiz-Catalan and colleagues show that an artificial arm directly connected to the bone, nerves and muscles of one adult male whose arm was amputated above the elbow functions and feels just a like real arm. The arm is anchored to the bone in the stump by a metal (titanium) rod that acts like an artificial extension of the skeleton. The patient used the osseointegrated arm for daily life and work activities, and even occasionally slept with it for over a year with no problems. This approach appears to work better than the surface (skin) electrodes used in conventional socket prostheses, in which artificial limbs are suspended via a compression socket over the amputee’s stump. These electrodes are limited to muscles closest to the surface of the skin and can be disrupted by environmental conditions such as cold or heat. In contrast, the implanted electrodes are woven under the skin for constant sensory feedback to help stimulate nerves and better control the prosthesis. The results of this study offer evidence that implanted electrodes are a more precise, reliable way to control prosthetic limbs, and that these can finally be used clinically in bone-anchored implants. A related Perspective discusses the findings of both papers.

**Article #4**: "A neural interface provides long-term stable natural touch perception," by D. Tan; M. Schiefer; M. Keith; J.R. Anderson; D.J. Tyler at Louis Stokes Veterans Affairs Medical Center in Cleveland, OH; D. Tan; M. Schiefer; M. Keith; D. J. Tyler at Case Western Reserve University in Cleveland, OH; M. Keith; J. Tyler; D.J. Tyler at MetroHealth Medical Center in Cleveland, OH; R. Anderson at University Hospitals Rainbow Babies & Children's Hospital in Cleveland, OH.

**Contact**: Dustin J. Tyler at dustin.tyler@case.edu (email). To schedule interviews with Dr. Tyler please contact his press office at: Kevin Mayhood at +1-216-368-4442 (phone), or kevin.mayhood@case.edu (email). Bill Lubinger at +1-216-368-4443 (phone), or william.lubinger@case.edu (email).

**DOI Information**: Reporters wishing to link to this paper's abstract on stm.sciencemag.org can use the following URL: <http://stm.sciencemag.org/lookup/doi/10.1126/scitranslmed.3008669>

**News Release**: A related [news release](http://www.eurekalert.org/emb_releases/2014-10/cwru-adf100314.php) is available from Case Western Reserve University in Cleveland, OH.

**Article #6**: "An osseointegrated human-machine gateway for long-term sensory feedback and motor control of artificial limbs," by M. Ortiz Catalan; B. Håkansson at Chalmers University of Technology in Gothenburg, Sweden; M. Ortiz Catalan; R. Brånemark at Sahlgrenska University Hospital in Gothenburg, Sweden.

**Contact**: Max Ortiz Catalan at maxo@chalmers.se (email).

**DOI Information**: Reporters wishing to link to this paper's abstract on stm.sciencemag.org can use the following URL: <http://stm.sciencemag.org/lookup/doi/10.1126/scitranslmed.3008933>

**News Release**: A related [news release](http://www.eurekalert.org/emb_releases/2014-10/cuot-mpa100214.php) is available from Chalmers University of Technology in Gothenburg, Sweden.

**Article #1**: "Bionic Limbs: Clinical Reality and Academic Promises," by D. Farina at University Medical Center Göttingen in Göttingen, Germany; D. Farina at Georg-August University in Göttingen, Germany; O. Aszmann at Medical University of Vienna in Vienna, Austria.

**Contact**: Dario Farina at +49-(0)-551/39-20-100 (phone), or dario.farina@bccn.uni-goettingen.de (email). Dr. Farina is available for interviews in English and Italian.

**DOI Information**: Reporters wishing to link to this paper's abstract on stm.sciencemag.org can use the following URL: <http://stm.sciencemag.org/lookup/doi/10.1126/scitranslmed.3010453>

**Kids' News**: A related [kids' news](http://www.eurekalert.org/features/kids/2014-10/aaft-ph100314.php) story is available.

**Multimedia**: Images and videos are [available](http://www.eurekalert.org/jrnls/scitransmed/pages/ot-10-08-14.html).

David Chalmers and consciousness

<http://blog.ted.com/2014/03/19/the-hard-problem-of-consciousness-david-chalmers-at-ted2014/>

New technique allows scientists to find rare stem cells within bone marrow

<http://www.eurekalert.org/pub_releases/2014-10/miot-nta100614.php>

Radiogenetics (controlling brain cells with radio waves)

<http://newswire.rockefeller.edu/2014/10/07/rockefeller-neurobiology-lab-is-awarded-first-round-brain-initiative-grant/>

Identifying stem cells properly lead to new recipe for bone & cartilage cells

<http://www.eurekalert.org/pub_releases/2014-10/tcob-ert093014.php>

Altering memory (Xenon & PTSD; emotional associations & memories)

<http://www.eurekalert.org/pub_releases/2014-08/mh-xes082214.php>

<http://www.eurekalert.org/pub_releases/2014-08/hhmi-rct082714.php>

Xenon gas reduces brain damage (mice)

<http://www.eurekalert.org/pub_releases/2014-09/icl-xgp090914.php>

Controlling (mouse) memory with light

<http://news.ucdavis.edu/search/news_detail.lasso?id=11053>

The body electric

<http://www.newyorker.com/magazine/2013/11/25/the-body-electric>

Teachers, teaching, & myths about the brain

<http://phys.org/news/2014-10-myths-brain-hampering.html>

http://www.eurekalert.org/pub\_releases/2014-10/uob-mhm101514.php

Cyborg gadget glove (review of children’s book)

<http://www.theguardian.com/science/grrlscientist/2014/oct/16/nick-and-teslas-super-cyborg-gadget-glove-review>

Zombie culture (a book review)

<http://www.slate.com/articles/arts/books/2014/07/mike_carey_s_zombie_novel_the_girl_with_all_the_gifts_reviewed.2.html>

Vancouver company 3D printing human tissue (for drug tests)

<http://blogs.vancouversun.com/2014/10/16/vancouver-company-develops-3-d-printing-of-human-tissue/> (in the Vancouver Sun Oct. 17, 2014 p. C2, business section)

Innovation Boulevard (Vancouver region neuro business, academic, research community

<http://www.straight.com/life/749396/innovation-boulevard-spurs-health-research> (Georgia Straight Oct. 16-23, 2014, p. 15)

Reverse engineering & Brunelleschi

<http://en.wikipedia.org/wiki/Filippo_Brunelleschi>

<http://www.pbs.org/wgbh/nova/ancient/great-cathedral-mystery.html>

<http://ngm.nationalgeographic.com/2014/02/il-duomo/mueller-text> (by Tom Mueller)

<http://www.saylor.org/site/wp-content/uploads/2011/11/ARTH-206-Dome.pdf>