Our Project: Limiting Medical Risk in Space

On March 7th, Sharmila Watkins, M.D., M.P.H., Element Scientist (Universities Space Research Association; USRA), and Victor Hurst, Ph.D., Research Scientist, visited CAST on behalf of the NASA Johnson Space Center. They were visiting UNMC on a “Tech-Watch” activity for NASA’s Human Research Program (HRP). The goal of the activity is to determine if any developing technologies would be able to close either knowledge of technology gaps that NASA HRP has identified for medical care during exploration missions.

These medical gaps are unique problems that NASA has to solve, and they have challenged innovators all over the nation to find solutions. CAST answered the call, and is developing new surgical devices for potential use in space, which requires special attention to the limitations imposed by zero gravity, the cramped conditions onboard an exploration vehicle, and the incredible distance from outside resources or help.

Ka-Chun Siu, Ph.D., Assistant Professor Physical Therapy Education, Dmitry Oleynikov, M.D., Professor of Surgery, and Chun-Kai Huang, Graduate Research Assistant, created a device (pictured below) that simulates a laparoscopic operation that could be used to train astronauts to operate aboard a spacecraft.

Ben Terry, Ph.D., Assistant Professor, and Matthew Goede, M.D., Assistant Professor of Surgery, proposed two devices: a Ubiquitous & Intuitive Astronaut Biosensing & Augmentation System, and an extrapulmonary ventilator, both of which are used to monitor and save the lives of astronauts in emergency situations.

Jeff Hawks, Ph.D., Research Assistant Professor of Engineering, and James Gigantelli, M.D., Professor, Director of Oculo-Plastic & Orbital Surgery, are working on a non-invasive pressure diagnostics tool which monitors the inside pressure of the eyes of the astronauts, to try to understand causes of the recently identified problem of vision loss experienced by some astronauts during long-term spaceflight.

Picture:
Victor Hurst operates a remote robotic surgery device to simulate a laparoscopic operation.
The High School Alliance (HAS) is a foundation that seeks to give students a head start in the medical field. Omaha students are selected based on merit and their interest in medicine. The students take classes at UNMC from 1:00-3:00 every day in addition to the classes they are enrolled in at their high schools. The UNMC classes transfer into college credit at the University of Nebraska-Omaha, so the HSA serves as a way to give a head start to dedicated students, and also inspires students to follow their dreams of entering the medical field.

In addition to classes, the students are given opportunities to shadow departments and individuals at the hospital. For example, they paid a visit to the CAST labs to see the latest surgical technology where the students received hands-on experience using surgical tools and simulators. This gave the students an opportunity to gain a little experience of what performing a laparoscopic or robotic surgery would be like. After the tour, they were able to meet the surgeons that perform laparoscopic operations and have an informal "Q and A" session to answer any remaining questions the students had.

Pictured: High School Alliance students pose with the da Vinci® robotic surgical system.

New Board of Regents members visit CAST

On January 22, 2013, newly elected members of the Board of Regents paid a visit to CAST to see what new technology and research CAST members were developing and performing.

Benjamin Terry, Ph.D., Assistant Professor, presented his conceptual prototype of a transparent, intuitive gastrointestinal biosensing system. It is a pill-shaped device that travels through your gastrointestinal tract and relays information to the doctor remotely without the use of invasive procedures. It could even be outfitted to be able to detect precursors of disease, actual disease, and even chemical and nutrient levels in the body and send the data back to doctors.

Jeff Hawks, Ph.D., Assistant Professor, presented a Robotic Pleural Catheter Prototype, designed to restore lung function in a collapsed lung. The unit is small enough to be carried into space and can be operated with minimal training.

Jared Ostdiek, Graduate Student at UNL, and Carl Nelson, Ph.D., Associate Professor, demonstrated an Abdominal Lifting Device, which will lift the skin around the abdomen, creating enough room to operate on patients without requiring the use of gas to fill their abdominal cavity.

The presentations concluded with Dmitry Oleynikov, M.D., Professor of Surgery, Director of CAST, giving a demonstration of a robot that is designed to be fully inserted in the abdominal cavity and is capable of remote laparoscopic surgery. Shane Farritor, Ph.D., presented a commercialization plan for the robot with a company called Virtual Incision, founded by himself and Dr. Oleynikov.

Pictured: (left to right) Dmitry Oleynikov, Jim Pillen, Lavon Heidemann, and Hal Daub.

The Board of Regents members discuss a new laparoscopic surgical robot.

Pictured: High School Alliance: A head start for high school students
CAST Moves to Wittson Hall

In late March of 2013, CAST moved from Swanson Hall to a newly renovated area in Wittson Hall. CAST is now located at 3030 Wittson Hall, just off of 42nd street.

The move allowed CAST to consolidate all of its UNMC associates in one location. Marsha Morien and Valarie Warner, who previously had offices external to the rest of CAST, were provided with offices in CAST at the Wittson Hall location.

Several other CAST members received a new cubicle or office, while the CAST Clinical Fellows upgraded to a more central and spacious office.

The move to Wittson Hall was necessitated by the upcoming demolition of Swanson Hall, which will create space for the new Fred and Pamela Buffet Cancer Center. The new cancer center will include a laboratory research tower, an outpatient center, and a hospital with up to 108 beds. Its construction will cost $323 million, making it the largest project ever at the University of Nebraska.

CAST would like to thank everyone who assisted in the move to Wittson Hall, as well as giving special thanks to Kerrie Fraterelli for keeping the move organized, timely, and efficient.

Visit: http://www.unmc.edu/cast/docs/Directions_to_UNMC.pdf or scan the QR code to the left to see the new location on a downloadable map.

Dr. Dasgupta and C-MANTIC make minesweeping robot; showcase ingenuity at SAC Museum

Dr. Raj Dasgupta, CAST Member, Associate Professor at UNO and Director of C-MANTIC, an Omaha based robotic innovation program, have developed the COMRADE (COoperative Multi-Robot Automated DEtection) system, which uses multiple autonomous robots that work collaboratively to detect and detonate landmines in post-conflict areas. These robots are designed to form “teams” that would sweep an area for mines, detonate them, and then reconfigure their operations when new robots either enter or leave the field of operation.

Dr. Raj Dasgupta (right) with the C-MANTIC team displaying a robot created with an Xbox Kinect, a Roomba vacuum and a computer at the Strategic Air and Space Museum. The robot detects and follows people who walk into its field of vision.

This “chasing” robot is an example of repurposing objects into a robot.

To read more about C-MANTIC, visit: http://cmantic.unomaha.edu/
CAST says farewell to 2012-2013 Clinical Fellows

Ajay Ranade, M.D., has moved to Chicago, Illinois after the completion of his CAST Clinical Fellowship. He is going to work at Loretto Hospital, and will practice as a General Surgeon.

“Thank you, CAST, for the opportunity to grow as a surgeon and the time to hone my surgery skills. I will miss everyone, but I am looking forward to starting a career” said Ranade.

Jeremy Parcells, M.D., has also completed his CAST Clinical Fellowship and is moving to Mansfield, Texas. He will practice at Methodist Mansfield Medical Center there as both a General and Bariatric surgeon.

“I would like to thank CAST for the opportunity, to improve my skills as a surgeon, and I am going to put the techniques I learned to good use” said Parcells.

Letter from the Director

We are excited to be in our new location and are eagerly engaged in many continuing and new projects. We are continuing to develop robotic equipment for NASA’s “Surgical Options in Space” cooperative project, and, at their suggestion, we have begun preliminary planning to test these robots in micro-gravity aboard the Flight Opportunity Program’s parabolic flight airplanes.

Additionally, we have received Nebraska Research Initiative funding to pursue inter-campus research with Dr. Raj Dasgupta of UNO and Dr. Carl Nelson of UNL to develop “Novel Methods for Semi-autonomous Robotic Technology for Diagnostic Endoscopy”. This multi-campus collaboration is developing strengths in autonomous robot control software (UNO), mechanical and materials engineering (UNL), and surgery (UNMC) to develop new medical devices and systems.

Congratulations to Dr. Carl Nelson as the Principal Investigator of a NIH (National Institutes of Health) Grant worth $392,149 for his work on the “Multifunction Robotic Tools for Natural Orifice and Single Incision Surgery”. Co-Principal investigators were Dr. Shane Farritor and myself, among others.

Lastly, we want to invite all of you to the open house for our new facilities in Wittson Hall, planned for September (more details to follow). We are glad to be in upgraded facilities to further breakthroughs in surgical technology.

Sincerely,

Dmitry Oleynikov, M.D., F.A.C.S.
Professor of Surgery
Director, Center for Advanced Surgical Technology