Drs. Oleynikov and Farritor win IDEA Award for extending expertise beyond University boundaries to enrich a broader community

Dmitry Oleynikov, M.D., and his collaborator Shane Farritor, Ph.D., of the University of Nebraska-Lincoln, received the University of Nebraska’s Innovation, Development and Engagement (IDEA) Award. Dr. Oleynikov, the Joseph and Richard Still Endowed Professor of Surgery, director of CAST and the Center for Minimally Invasive Surgery, is one of UNMC’s most internationally recognized scientists.

“I am motivated in my clinical research to create new discoveries and solve new problems in surgery. I have always felt that progress could not be had without learning from our history and improving our future,” Dr. Oleynikov said.

In collaboration with Dr. Farritor, Dr. Oleynikov has led a team that combines the experience of surgical practice with the exceptional problem-solving skills of the engineering profession. The results have been a radical departure from existing surgical technology: the surgical robotic device they have developed is miniature, mobile, remotely controlled and fits entirely inside the abdominal cavity.

The Oleynikov and Farritor partnership has resulted in multiple patents and technology commercialization and is widely recognized as a model for cross-campus collaboration. It is for extending their academic expertise beyond the boundaries of the university in ways that have enriched the broader community that they were jointly acknowledged.

“My life’s goal is to transform surgery to be safer, more patient friendly and to improve the outcomes from surgical operations that we perform today,” Dr. Oleynikov said. “I innovate not because I want to but because I am presented with patient need and I feel I have to do something to help solve these surgical problems.”
Meet the 2014-2015 MIS Fellows

**Dr. Jennifer Jolley** comes to CAST from Chicago IL, where she completed her residency at Rush University Medical Center/Cook County Hospital. She is originally from Kansas City, MO. She attended Bradley University in Peoria, IL for her undergraduate studies and the University of Missouri Columbia for medical school. Dr. Jolley enjoys outdoor activities in her free time, including bicycling and basketball. Prior to attending medical school, Dr. Jolley played professional basketball in France for three years.

**Dr. Tammy Kindel** is from Dayton, OH. She obtained her undergraduate degree from Wilmington College, OH, and her medical degree from Ohio State. She completed residency at Northwestern Memorial Hospital in Chicago. Her special interests are in bariatric surgery and the hormonal mechanisms of weight loss control. After her fellowship, she wishes to continue research in this area in addition to her surgical practice. Dr. Kindal enjoys spending her free time with her husband, son, and their 130 lb Great Pyrenees, Toby.

Researchers in CAST and at the University of Nebraska-Lincoln have been working with the U.S. Army’s Joint Warfighter Medical Research Program since 2008 and recently received a $1.4 million grant to continue robotic telesurgery work. Dmitry Oleynikov, M.D, Director of CAST, is the principal investigator of the grant and Shane Farrior, Ph.D, UNL Professor of Mechanical and materials Engineering, is co-investigator. This grant focuses on the development of miniature robotic technology to enable surgeons to perform surgeries remotely. “The Army is very interested in delivering care to injured warfighters and other personnel in remote areas.” said Dr. Oleynikov. “Right now the biggest thing that they have in their basket is to get the soldier out of the battlefield on a helicopter where they can get care within one hour. The idea behind the robots is to begin lifesaving measures on soldiers who can’t be transported immediately.” These mini robots can be inserted into the patient and be controlled by a surgeon in a different location. It would transmit live video images so surgeons could identify the trauma and serve as a ‘remote first responder’. The surgery would be done via a tiny incision, through the mouth, or another natural orifice, by surgeons far away. This type of technology not only has application in a military environment, but it could one day be applied to rural and underserved areas where medical facilities aren’t immediately available. “With the grant, we’ll continue the successful work we’ve been doing,” Dr. Oleynikov said. “I think the grant and working with the Department of Defense is important. We’re doing some very exciting work as expertise in this surgery isn’t all that common.”
Dr. Oleynikov and his CAST colleague, Nathan Bills, Ph.D, edited and contributed chapters to “Robotic Surgery for the General Surgeon”, a new textbook that was released earlier this year. The book focuses on the surgical applications of the daVinci Surgical Robot, the only FDA-approved robot for general surgery. From start to finish, this project took two years. Dr. Oleynikov created a list of chapters and he and Dr. Bills contacted national and international leaders in the field to contribute. The goal was to provide the general surgeon with information to perform robotic surgery by combining the science behind each procedure with the established methods for using the technology. The book captures a revolution in approaches to surgery. “The book distills the state of the art for every specific kind of surgery, with information from a world expert in that particular surgery.” Dr. Bills said. “We’re moving from open and laparoscopic surgery now to robotic surgery, and how the robot is used - both properly and sometimes not so properly - is going to define the technology in many ways. So I’m hoping that this book, with chapters from some of the brightest and most inventive experts in the field today and likely into tomorrow, will guide those individuals who are starting to do this kind of surgery, use this type of technology.” said Dr. Oleynikov.

This past June, CAST members Dr. Shane Farrior, Professor at UNL and surgical resident Dr. Anton Simorov, along with UNL graduate students Eric Markvicka, Thomas Frederick, Kearney Lackas, tested two different surgical robots onboard a parabolic aircraft. This specialized aircraft, which flies in an alternating pattern of ascent and free-fall, creates a short period of zero gravity in each cycle. This means that the experiments on board run in approximately 20-second increments, after which they must pause, and then restart on the next free-fall. Each test has four different participants, with everyone working in a very small, cramped space. Even scientists don’t get leg room on airplanes!

Nathan Bills, Project Coordinator at CAST, explains: “The general objective of this flight test was to validate the effectiveness of miniature surgical robots in a microgravity environment. These robots have been developed over the past several years under NASA and other funding. They are able to be inserted into the abdominal cavity and are designed for tele-operation using a laparoscopic surgery paradigm. Operators perform brief, simulated surgical subtasks during each period of microgravity, and the performance is scored using established criteria (percent completion, completion time, number of dropped objects, etc.). The scores are used to quantify and correlate the effects of the robot parameter choices on task effectiveness.”

These tests have offered insight into how the robots are able to function in zero gravity, giving invaluable feedback to the development of surgical robotic tools for use in space, and potentially on other planets that have more or less gravity than we have on Earth.
Over 100 visitors from UNO, UNL, and UNMC came to the new CAST facilities on November 22, 2013 to celebrate CAST’s move from Swanson Hall to its new home in Wittson Hall. At the Open House, CAST members demonstrated new and developing technologies to the guests. The visitors were able to try laparoscopic training tools, which gave them a glance into the process of an actual operation. Additionally, there were many CAST members in attendance to answer questions and show off their latest research.

Dr. Carl Nelson, Associate Professor of Mechanical and Materials Engineering at UNL, demonstrated a robot which can explore remote locations autonomously. Dr. Ka-Chun Siu, Assistant Professor Physical Therapy Education, and Chun-Kai Huang, Graduate Research Assistant, demonstrated a Laparoscopic Surgery Simulator, used for the training of both Residents and Fellows.

Dr. Shane Farritor, Professor at UNL, gave a presentation and brought a poster outlining the parabolic flight experiments that are used to test miniature surgical robots in a zero gravity environment.

Dr. Raj Dasgupta, Associate Professor at UNO, brought a robot capable of locating landmines, and another autonomous robot that was able to detect people and follow them about the room.

Dr. Ben Terry, Assistant Professor at UNL, demonstrated an artificial intestine, and how a semi-autonomous robot would navigate in an actual intestine.

Dr. Carl Tadaki, then an MIS Advanced Laparoscopic Fellow, demonstrated the FLS (Fundamentals of Laparoscopic Surgery) trainer, which gives surgeons-in-training the ability to practice their laparoscopic skills outside of the operating room in a virtual environment.

In addition to all of the presentations, there were also videos demonstrations of many of these tools in action.

We would like to thank everyone who came to our Open House, and also give a special thanks to all of the CAST members who demonstrated or presented. Thanks to all for your continued support!
We are happy that so many of you came and shared with us at our open house in November. We were able to complete a test package for NASA’s “Surgical Options in Space” cooperative project, and, at their suggestion, we were able to complete parabolic flights to test the mini surgical robots in microgravity with the Flight Opportunity Program.

We are glad to announce that we have received an additional $1.4 million in funding from the Department of Defense Telemedicine and Advanced Technology Research Center to pursue robotic telesurgery research. This enables us to continue our work to make advanced surgical technology available to those in far forward deployments and in civilian contexts where an expert surgeon is not present. In addition, we have received University of Nebraska research funding for several projects to pursue inter-campus research with Dr. Raj Dasgupta of UNO; Drs. Jeff Hawks, Carl Nelson, and Ben Terry of UNL; and with Drs. James Gigantelli, Vishal Kothari, and William Thorell of UNMC. These multi-campus collaborations enable us to continue to develop strengths in autonomous robot control software (UNO), mechanical and materials engineering (UNL), and surgery (UNMC) to develop new medical devices and systems. Dr. Carl Nelson received an NIH (National Institutes of Health) Grant worth $392,149 for “Multifunction Robotic Tools for Natural Orifice and Single Incision Surgery” with CAST collaborators.

We are excited to announce that Drs. Oleynikov and Do’s proposal to establish a Center of Excellence to Expand Comparative Effectiveness Research in Nebraska was chosen by Central Administration for funding. Our initial kick-off meeting was well attended and we are inviting speakers for a seminar series. A recruitment package to recruit a physician leader to serve as Director of the Center is being readied.

Sincerely,

Dmitry Oleynikov, M.D., F.A.C.S., Professor of Surgery