2017

James Adair -Professor of Materials Science and Engineering, Biomedical Engineering and Pharmacology

Adair, who co-founded the biomedical company Keystone Nano as a Penn State spinoff in 2005 to bring cancer treatment to clinical trials, has begun seeing decades of work brought to fruition. Keystone Nano's most advanced product, ceramide nanoliposome, is entering clinical trials at three cancer centers. Through dozens of in vitro and in vivo tests, the nanodrug has been extremely effective at treating several cancers, including liver cancer, which it will be used to treat in phase two of the clinical trials. Several other products developed by Adair are in the preclinical trial stage and could be elevated to clinical trials within the next several years.

Adair's work focuses on increasing the stability of cancer-fighting drugs using nanotechnology or using the science to create drugs that specifically target cancer cells while leaving healthy cells untouched. Through dozens of patents and research, he's proven that the new generation of cancer drugs are possible.

Adair's research has led to $5.1 million in grants for cancer research including $3 million, the largest awarded by the National Cancer Institute.

A nominator called Adair, who has submitted 23 invention disclosures, "one of the most prolific researchers at Penn State."

"Our comprehensive transitional medical teams at Penn State have begun to flip the paradigm from 'kill the cancer, try not to kill the patient' to that offered by nanomedical solutions, 'kill the cancer, do no harm to the patient.'" said Adair. "I never anticipated that I would be an entrepreneur, but I believed that our nanoparticles to deliver drugs in a benign way for the patient was important enough for me to mature from invention through to the implementation in the clinic.

Adri van Duin - Professor of Mechanical and Nuclear Engineering, Chemical Engineering, Engineering Science and Mechanics
Van Duin is nominated for his "pioneering contributions to atomistic-scale simulations of chemical reactions using reactive force fields," said a nominator.

Van Duin has worked in simulations of reactive force fields, embodied in a code known as ReaxFF, which Duin developed. The tool used to model the dynamic process of materials while undergoing a reaction has been applied many areas worldwide including improving energy storage, aircraft materials and compression flows related to combustion.

"ReaxFF is a multidisciplinary tool that will continue to make important contributions in science and technology for decades to come," said a nominator, adding that the adoption of van Duin's model has expanded significantly within the past five years.

Van Duin has published more than 300 peer-reviewed journal articles that have been cited more than 12,800 times, according to Google Scholar.

As director of Penn State's Materials Computation Center, Duin connects modelers with complementary skills together, said a nominator, adding that his work on a major research instrumentation grant led to securing a $1 million hybrid GPU-CPU computing cluster.

"Duin's development of ReaxFF and his leadership in our computational materials community has galvanized numerous research groups and positioned Penn State as a leading institution in that area," said a nominator. "Duin continues to push the tools he has developed to new areas, including a new ability to explicitly represent electron dynamics, and I'm excited to see what new material developments arise from his work."

Frederico Rodriguez Hertz- Professor of Mathematics
Hertz has made fundamental contributions to the mathematical theory of dynamical systems — including solving longstanding problems known since the 1920s — and its applications to various other branches of mathematics, exhibiting "exceptional intuition and great ingenuity," according to a nominator and colleague. Hertz works in two active and interconnected areas of research: dynamics of partially hyperbolic systems and rigidity of higher rank abelian actions.

Another direction of Hertz' research is the rigidity theory, which is an emerging area of dynamics with many applications to algebra and number theory. In this area, Hertz has established himself as a leading expert with many groundbreaking contributions, said a nominator.

"Hertz is one of the best mathematicians of his generation, said a nominator. "He is extremely productive and works on fundamental questions, which already have and will continue to have a strong impact on current and future mathematical research in dynamical systems and beyond."

Another nominator said "his originality as well as a deep understanding of diverse mathematical areas such as geometry, topology, analysis and probability theory allow him to successfully attack problems, which were considered hopeless for a long time."

Christine Keating - Professor of Chemistry

Through her research, Keating has shown how the fundamental molecules of life (proteins, nucleic acids, membranes, etc.) can spontaneously organize into enclosures with many of the properties of living cells. To build on this discovery, Keating shows how these cell mimics can undergo the equivalent of cell division. Keatings cell mimic work was also used to show that subcellular compartmentalization increases catalysis by an RNA enzyme and that phosphorylation of peptides bound to RNA can regulate the formation of non-membrane bound compartments within cells.

These discoveries increase our understanding of how a cell is organized and how processes critical for life depend on subcellular compartmentalization.

"This research on nonliving cell mimics provides new insight into the physical principles that determine the biological functions of living cells, and into one of the most outstanding questions of all science, which is how life began," said a nominator and colleague.

Fundamental insights from Keating's research on artificial cells are defining the possible ways in which the earliest cells (so-called "protocells") could have emerged to replicate genetic materials and the cells themselves. These breakthroughs have led her to attain funding

from NASA and her research group is building on protocell development and maintenance of biological functions.

Nominators describe Keating as “a stellar chemist with unparalleled expertise” who is blazing new trails with “new and exciting dimensions of chemistry.”

Sophie De Schaepdrijver- Professor of History
De Schaepdrijver has “almost single-handedly created an original field of scholarly inquiry within the broader domain of First World War studies and she has done so in ways that have made her scholarship accessible to experts in the field, and, as importantly, to the general public,” said a nominator.

Through a massive volume of works published within the past three years, De Schaepdrijver has told the story of Germany’s occupation of Belgium and how the occupation shaped postwar Europe for decades to come.

“De Schaepdrijver has been instrumental in demonstrating that we cannot fully understand the nature and scope of the Great War unless we understand the experience of life under occupation,” said a nominator. “Her work turns the focus away from trench warfare, about which so many volumes have been published, to the warfare of occupation, where much less has been written, especially in regard to Belgium.”

De Schaepdrijver has dedicated time to telling the story of Gabrielle Petit, an agent of the British executed by the Germans, which a reviewer called “a meticulous and creative social history that uncovers class, family discord, neighborly solidarity and the strength and vulnerabilities of the late Victorian gendered order.”

At age 23, Petit became a British spy, living an extraordinary life during the occupation. Through scattered resources, De Schaepdrijver pieced together Petit’s path to espionage, resistance and ultimate capture and execution in 1916.

Approaching the war from the Belgian perspective allowed De Schaepdrijver to expand on the more widely known British and French narratives and chronicle the atrocities that Belgium experienced as the longest occupied nation during the war.

“Though she brings out that vital analytical point in her study, De Schaepdrijver manages the rare feat of keeping the human face of the war first and foremost in her readers’ minds, never allowing us to forget that the heroism and the horror happened to real people in real time,” said a nominator.

Joshua Smyth-Professor of Biobehavioral Health and Medicine
Smyth is an expert in ecological momentary assessment (EMA), a data collection technique in which individuals are queried at random, multiple times a day, about a range of questions about their well-being. The process, which is commonly used in the field, has become increasingly sophisticated with the advent of smartphones and other technologies.

Smyth is using EMA on a $5.2 million National Institutes of Health (NIH) grant, an ambitious project that harnesses EMA techniques to develop an innovative approach to understanding and directly addressing, though interventions, the mechanisms connecting daily stress to problematic sleep patterns and sedentary behavior, which are risk behaviors for metabolic disease and poor mental health.

His recent book, “Opening Up by Writing it Down,” co-authored with James Pennebaker, was favorably reviewed by The New York Times.

His work using EMA to understand health problems as diverse as stress, eating disorders, sexual abuse, asthma and concussions, according to a nominator, “has pushed the boundaries of behavior medicine research methods.”

“His work is known for its creativity, theoretical clarity, elegant methodology and sophisticated statistical approaches,” said a nominator. “He is one of the rare people who is comfortable and successful in conducting both field and laboratory-based research. Further, he has had an impact in each of the areas in which he contributes.”

Within the past five years, Smyth has been an investigator of 14 NIH grants as well as numerous other grants totaling more than $50 million. He has more than 170 publications and has given seminars at more than 25 institutions worldwide.