INNOVATION & INTELLECTUAL PROPERTY
In 2007, Portland State University created a technology transfer office. That office, Innovation & Intellectual Property (IIP), has for six years employed the tools of intellectual property to facilitate PSU research, encourage the external use of research innovations, and increase the impact of both by partnering with companies and other external agencies and, when appropriate, by seeking the commercialization of those innovations. Put simply, IIP strives to make connections within and beyond the university in support of PSU’s vision to let knowledge serve the city.

At this time we’d like to celebrate PSU’s achievements in this area, and share some examples of the real-world impact PSU innovations have had. Each of the profiles in this book describes a PSU project and its impact outside of the university. Together these stories show a range and diversity of innovation that reflects PSU’s own unique research strengths. As these and many more projects pass through our office, it is our privilege to work with the faculty, staff, and students driving these innovations.

Let me be clear about where the credit is due: these are faculty and student ideas, created with the help of funded research. PSU innovators and creators provide the fuel for the impact demonstrated in these pages. Likewise, it is our external partners—companies, start-ups, and community agencies—who are the engines for these impacts and in turn provide much of the know-how and energy to make these projects successful.

IIP does everything we can to facilitate the fuel getting to the engine. We are aided by a growing entrepreneurial ecosystem in Portland and the culture of innovation developing at PSU, and by incredible faculty who want to increase the impact of their work. I encourage you to keep an eye out for more stories like these - we expect the next six years and beyond to be even more spectacular.

-Joe Janda
Director, Innovation & Intellectual Property
Working with us begins with a conversation about faculty research. Sometimes we seek out researchers with interesting projects, and sometimes researchers find us with questions. We love learning about and discussing faculty projects, and exploring the question, “What can the tool of intellectual property do for you?” It begins with a discussion, which leads to a disclosure.

The disclosure document (painless, we promise) will define exactly what research asset(s) we are working with, and may serve as the basis for a number of further documents and legal determinations.

IP (Intellectual Property) can accrue around projects in the form of patents or copyrights. We’ll work with the research team to obtain the appropriate protection for the project.

As the research project proceeds, we’ll help put a plan in place to grow the IP and the project together to position them both for partnerships.

Lastly, we use the IP around the project to foster research collaborations, form start-up companies, gain commercialization partners, and give control over how innovation is used.

Invention Disclosures:
- 97 Disclosures in 6 Years
- Disclosures from 20 Departments

Patents:
- 56 Provisional Applications Filed
- 26 Patents Issued
- 46% Provisional Applications become Issued Patents

Licenses:
- 15 Exclusive Licenses Signed
- 85 Non-Exclusive Licenses Signed
- 26 Technologies Licensed

Cumulative numbers
Portland is home to a vibrant entrepreneurial ecosystem. From high-tech to pharmaceutical industries and everything in between, dedicated entrepreneurs, innovators, and investors are shaping the social, environmental, and economic future of the Metropolitan region and the world beyond.

Innovation & Intellectual Property has the privilege of engaging our community to commercialize technologies developed at PSU. In the six years since IIP opened its doors, we have helped entrepreneurially-spirited PSU innovators and their companies turn their intellectual property into real-world impact.

**SWEETSense**

In 2012, SWEETSense, Inc. was launched to integrate data acquisition technology to support a more sustainable environment while continuing to innovate new and exciting technology with a focus on socially-redeeming values.

**ELEX Biotech**

Founded in 2012, ELEX Biotech, LLC designs and develops small molecule pharmaceutical drugs for management of cardiovascular and related diseases. The initial product focuses on ventricular arrhythmia, a major cause of death in the United States and worldwide.

**Hawthorne Materials**

Hawthorne Materials Corp. was founded in 2012 and develops state of the art x-ray contrast agents for use in the medical field.

**APDM**

Founded in 2007, APDM’s mission is to develop the highest quality and fully featured technologies for monitoring human movement with wearable sensors.

**DesignMedix**

Founded in 2006, DesignMedix, Inc. develops drugs to address the large medical need caused by the rapid rise in drug resistance in diseases like malaria.

**Virtual Device Technologies**

Virtual Device Technologies, LLC enables effective, inexpensive, and convenient virtual prototyping for developers of software and electronic devices. The company was founded in 2012.

**Pacific Nanoscience**

Pacific Nanoscience, Inc. develops new tools for early diagnosis of cardiovascular disease. The company was founded in 2011.
The Learner Web is a web-based software learning support system for adults who have specific learning goals such as improving language skills or digital literacy, earning a GED, transitioning into higher education, and many more.

Developed at Portland State University by Dr. Steve Reder to facilitate adult learning, the Learner Web provides adult learners step-by-step learning plans to help them achieve their educational goals and connect them to learning resources in their local communities and online.

Learning plans are developed by the Learner Web’s content development partners: Portland State University, the Minnesota Literacy Council, and Pro-Literacy among others. The Learner Web is available to learners via distinct portals customized to the needs of individual organizations. The Learner Web is an example of how Innovation & Intellectual Property can employ the licensing of copyrighted material to promote the sustainability and increase the impact of PSU innovations.

To date, 26 organizations have licensed the use of the Learner Web, leading to 47 license agreements since the software went online in 2008. Today the Learner Web network of partners and content developers extends from Oregon to Massachusetts and has helped some 25,000 adult learners achieve their educational goals.

As organizations continue to partner with the Learner Web, this innovative software will reach more adult learners endeavoring to overcome the educational inequality that leads to poverty, poor health, and the inability to advance in the workplace.

Reclaiming Futures is a national initiative headquartered at Portland State University that unites communities to help justice-system involved teens overcome substance abuse, mental health disorders and crime.

Originally funded by the Robert Wood Johnson Foundation (RWJF), over 11 years, 37 communities in 18 states have helped thousands of at-risk youths overcome substance abuse, receive mental health care, stay out of the juvenile justice system and become healthy, productive members of their communities by implementing the Reclaiming Futures model.

The Reclaiming Futures model combines the capabilities of juvenile justice systems with positive community engagement and youth-appropriate substance abuse and mental health treatment. This multi-tiered approach provides youth the support they need to change their lives for the better.

Innovation & Intellectual Property has helped Reclaiming Futures maintain a sustainable standard among users and practitioners through the implementation of trademark licensing and will continue to work with Reclaiming Futures as more communities implement the model and accompanying tool kit.

In New Hampshire, California, Oregon, Texas, Alaska and Oklahoma, Reclaiming Futures has partnered with government agencies and community organizations like the Boys and Girls Club, substance abuse support groups, child and family service centers and local law enforcement to ensure youths with substance abuse and mental health conditions entering the juvenile justice system receive immediate and long-term care in order to help them successfully reenter their communities.

Reclaiming Futures has shown that treating at-risk youths reduces recidivism and encourages active participation in their rehabilitation in order to make positive changes in their lives.

“Justice-system involved teens with substance abuse and mental health disorders often do not receive the treatment they need. Drug and alcohol problems are robbing our youth of their futures, and we’re on the front lines with communities trying to make a difference, trying to save young people’s lives.”

- Susan Richardson, National Executive Director, Reclaiming Futures

“The Learner Web is a partnership between educators, communities, those interested in a better society, and those who want to learn and improve their lives. As a group we have a shared mission, a shared commitment to using technology to promote educational equity and social justice, not just here at PSU, but across the US and in other countries.”

- Dr. Steve Reder, Professor of Applied Linguistics
The Oregon Biodiversity Information Center (ORBIC) at Portland State University prioritizes the conservation of Oregon’s biodiversity by maintaining the State’s most comprehensive database of occurrences of threatened, endangered, and rare species of plants and animals, as well as a catalog of Oregon’s wetlands, riparian, and terrestrial ecosystems.

A division of the Institute for Natural Resources, ORBIC records and maps instances of at-risk species in Oregon. The ORBIC database offers precise, dynamic wildlife and plant information to support biodiversity conservation and informed decision-making on the individual, industrial, state, and federal levels. And as a member of NatureServe, ORBIC is connected with wider regional, national, and international efforts to track species and distribute conservation information.

Innovation & Intellectual Property helps ORBIC meet its priorities by facilitating the licensing for use of records kept in the ORBIC database to agencies such as the US Forest Service, FEMA, the Bonneville Power Administration, and the Oregon Department of Fish & Wildlife.

Because conserving Oregon’s rich biodiversity is a mission all Oregonians can participate in, almost all of the information contained in the ORBIC database is free and available online. By visiting ORBIC online anyone can access a wide range of information detailing wildlife species in Oregon, make a request for specific information and learn about what it means for a species to be classified rare, endangered, or threatened.

Oregon Biodiversity Information Center

Elex Biotech LLC designs and develops drugs to treat heart failure and ventricular arrhythmias.

Heart failure is the condition in which the heart cannot circulate enough blood to support the body’s needs. Associated with heart failure, arrhythmias originating in the ventricles claim nearly 400,000 lives a year in the US, costing roughly $34.4 billion, according to the American Heart Association (AHA). The AHA projects these numbers will increase 25 percent by 2030.

Elex Biotech draws on proprietary compounds and methods developed at Portland State University by company cofounders Dr. Jonathan Abramson and Dr. Robert Strongin. Elex Biotech has been awarded a Small Business Technology Transfer grant from the National Institutes of Health to further pursue the development, evaluation and testing of compounds that should prove to be significantly more potent than those currently available.

Innovation & Intellectual Property proudly supports Elex Biotech and will continue to do so by maintaining the intellectual property portfolio around the their breakthrough innovations, and by working with Drs. Strongin and Abramson and company Managing Partner Dr. Sandra Shotwell as the company continues to innovate and grow.

A successful treatment for cardiovascular diseases such as ventricular arrhythmias and heart failure will affect millions of people a year—not just those suffering from these diseases, but their families, friends, coworkers, and caregivers. Such a treatment will save hundreds of thousands of lives, billions of dollars a year, and help drive down the cost of healthcare while improving quality of life for patients here in the US and around the world.

Elex Biotech

Oregon Biodiversity Information Center
VIRTUAL DEVICE TECHNOLOGIES

Virtual Device Technologies, LLC (VDT) is a high-tech start-up company offering customers advanced virtual prototypes of their products using computer-aided design and engineering software developed by Dr. Fei Xie at Portland State University.

Designing and developing new products is not easy. Many new devices, from smartphones to microprocessors, are products of information technology. Developing devices that out-power and out-perform their predecessors is becoming increasingly difficult, time-consuming, and expensive. For every new device, prototypes are built, not just of the device itself, but of its constituent components—the hardware and software that enable the device to function. VDT offers companies the time and money-saving advantages of building and testing virtual prototypes.

VDT was founded in 2012 by Portland State University Professor Dr. Fei Xie and his partners. Innovation & Intellectual Property licensed the proprietary technology developed by Dr. Xie to VDT and helped the company with an investment through the University Venture Development Fund.

VDT’s flagship product, the AVP Studio, allows users to systematically analyze the systems being developed to localize flaws before physical devices become available.

The cost of developing new products in both capital and human resources has skyrocketed in the past few years. The services offered by VDT have the potential to drastically cut those costs and reduce the time it takes for new products to come to market. The companies developing medical devices and other equipment that improve quality of life, companies writing the software that connects us to the world, and companies creating defense systems are each equally suited to benefit from the team at VDT and their AVP studio.

“The mission is to revolutionize hardware and software co-development flows, significantly reducing product time-to-market for devices and systems.”

-Dr. Fei Xie, Co-founder, Virtual Device Technologies, LLC

THE GREEN MODULAR CLASSROOM

The Green Modular Classroom (GMC) is an economically, environmentally, and socially sustainable solution to the problems posed by some portable classrooms.

The portable classrooms in which many students attend class are poorly lit, improperly ventilated, energy inefficient, constructed with toxic materials, and generally not well-suited to learning. The GMC is a rethought and redesigned modular classroom that is the product of the collaborative efforts of architecture professors Margarette Leite and Sergio Palleroni, Blazer Industries, Oregon Solutions, and many more.

A better learning environment, the GMC is well-lit by natural light; its energy-efficient heating, air conditioning and ventilation systems are designed to maintain classroom comfort year round, and the GMC is easy to transport from one location to the next as needed. A prototype of the GMC serves as a functioning classroom and test center for researchers studying the effectiveness of its design at a school in Chehalis, Washington. Another was unveiled at the Greenbuild conference and expo in San Francisco where it was well received.

As a member of a Portland State University team working to bring better classrooms to students, Innovation & Intellectual Property supported efforts to clear the rights of the GMC’s design package and crafted an exclusive license of that design that met the needs of the parties involved.

In a time when classrooms designed for a decade of use are still in service up to five decades later, parents and educators both need to ask if there is a healthier, sustainable alternative available. The Green Modular Classroom is just that.

“We’re trying to see if we can create dignified spaces that are healthy, clean and deserving of being public buildings.”

-Sergio Palleroni, from “Portable Dangers,” The Portland Tribune, Sep 29, 2011
Hawthorne Materials Corp. develops bismuth-based x-ray contrast agents using innovations from Portland State University Professor of Chemistry, Dr. Andrea Goforth.

Bismuth-based x-ray contrast agents image better and brighter than any other agent currently used in the medical field. Hawthorne Materials Corp. wants to bring this technology into hospitals and offices.

The surgical sponge is healthcare’s most widely used tool. However, every year, these seemingly harmless sponges cost hospitals millions and force patients back into operating rooms. According to Russell Watt, co-founder of Hawthorne Materials Corp., every year sponges account for roughly two-thirds of all objects retained in the body after surgery. To prevent this, many surgical sponges are ‘tagged’ with radiopaque materials. Current contrast agents, however, can be difficult to identify on an x-ray.

The chemical properties of the materials Hawthorne Materials Corp. uses to develop radiopaque tags create a much starker contrast than other materials, making it more visible on an x-ray. The radiopaque tags as designed by Hawthorne Materials Corp. could help healthcare professionals improve the quality and decrease the cost of healthcare over time.

Innovation & Intellectual Property has worked with Hawthorne Materials Corp. to craft an exclusive licensing agreement, define markets, procure funding, and provide the general encouragement and support start-up companies need to get off the ground.

Keep an eye open for Hawthorne Materials Corp. as they continue to make strides towards a cost-effective solution to an ongoing problem. The radiopaque tags they are developing have the potential not only to make a significant difference in peoples’ lives, but to save them as well.

For SWEETSense, Inc. having a positive impact on the world involves facilitating the sustainable implementation of global health programs.

SWEETSense provides NGOs, humanitarian aid organizations, and industry data logging technologies in the form of remote monitoring sensors. Their product line includes sensors for monitoring air and water quality, energy efficiency in buildings, and a high efficiency stove. Accompanying this line of products is a state of the art data service platform accessible from any web browser anywhere in the world.

Developed by engineering professor Evan Thomas, the SWEETSense technology has been deployed by Mercy Corps, the Lemelson Foundation, Bridges to Prosperity, Del Agua, and the Gates Foundation. In countries like Rwanda, the SWEETSense technology has been used to monitor the effectiveness of high efficiency cook stoves and water filtration units.

Innovation & Intellectual Property has supported SWEETSense since the company’s inception, administering and maintaining the intellectual property portfolio associated with Dr. Thomas’s innovations, crafting a joint intellectual property relationship with various parties and providing University Venture Development funds, licensure, and general encouragement to all involved.

Information collected by SWEETSense technology could mean villagers in Africa have access to clean water; it could help avert a health crisis in Southeast Asia. Here in the US it could help companies testing green technologies. These are but a few of the applications of the SWEETSense technology that could have positive effects here and around the world.

“Social Entrepreneurship can help address some of the ongoing challenges in global health programs. Through linking the market feedback mechanisms with global health, social entrepreneurs are able to evaluate the effectiveness of their products and programs. SWEETSense is designed to do this both as a product and a company.”

- Dr. Evan Thomas, Co-founder, SWEETSense, Inc

“Working with technology developed at Portland State University has been a really positive and encouraging experience. Innovation & Intellectual Property has helped us open doors and expand our network.”

-Russell Watt, Co-founder, Hawthorne Materials Corp.
NEW DIAGNOSTICS

Boulder Diagnostics, Inc., in collaboration with Portland State University, is developing a new family of diagnostic tests for detecting homocysteine and related compounds using innovative technologies developed by PSU chemistry professor Rob Strongin and his team, the Strongin Group.

Recent scientific studies indicated that elevated levels of homocysteine may be associated with several disease states including cardiovascular disease. Though the science connecting homocysteine to such conditions is still inconclusive, a simple, inexpensive method for screening levels of this biomarker could help patients and healthcare providers make more informed decisions regarding testing for conditions such as cardiovascular disease, kidney disease, and congestive heart failure.

Working with Dr. Strongin, Innovation & Intellectual Property secured IP rights to the innovations that led to these advances in homocysteine detection and facilitated the licensure of the intellectual property to Boulder Diagnostics. And along with Boulder Diagnostics, Innovation & Intellectual Property is overseeing the management of that intellectual property as these innovations move from lab to market.

If in the future further studies show homocysteine to be a reliable biomarker for conditions such as cardiovascular disease, Alzheimer’s, or neural tube defects, the diagnostic tests developed by Dr. Strongin could play a major role in helping healthcare providers detect these conditions in their earliest stages. Such innovations could save lives and help bring down the cost of healthcare here in the US and in countries around the world.

“it’s really important to make sensors and indicators for diseases that don’t depend on enzymes and biological materials. There are too many places in the world without the resources to deliver such diagnostic tests.”

-Dr. Robert Strongin, Professor of Organic Chemistry

PACIFIC NANOSCIENCE

Using innovations pioneered by former electrical and computer engineering professor Shalini Prasad, Pacific Nanoscience, Inc. has developed the Nanomonitor, a device to measure troponin, a complex of proteins cited as a marker for cardiovascular disease.

According to the World Health Organization, an estimated 17.3 million people died from cardiovascular disease in 2008. Many of these deaths could have been prevented. Innovations in science and technology like those in the Nanomonitor could soon help healthcare providers determine a patient’s risk of having a cardiac event before the event takes place.

“With the Nanomonitor as designed by Pacific Nanoscience, we have the potential to greatly enhance outcomes for cardiac patients.”

-Brenda Edin, Partner, The Baker Group

For years, Innovation & Intellectual Property supported Pacific Nanoscience by maintaining the intellectual property portfolio containing the innovations that made the Nanomonitor possible while searching for commercial partners interested in taking the technology to market. Now, thanks to the combined efforts of Innovation & Intellectual Property and partner The Baker Group, LLP, Pacific Nanoscience plans to develop the Nanomonitor into a cost-effective tool that could eventually help healthcare providers save millions of lives a year.

The early detection of cardiovascular disease can save lives, unnecessary pain and heartache, and billions of dollars a year while lowering the cost of healthcare and improving quality of life in general. With the Nanomonitor, early detection will be a simple, inexpensive screening away. Because of the efforts of the Baker Group, LLP, Pacific Nanoscience, and Innovation & Intellectual Property, this life-saving technology will soon be in the hands of healthcare providers in clinics, hospitals, and emergency rooms around the world.

"With the nanomonitor as designed by pacific nanoscience, we have the potential to greatly enhance outcomes for cardiac patients.”

-Brenda Edin, Partner, The Baker Group
SuSoS AG doesn’t make plastics, metals, ceramics, or glass: they improve these materials by making surface-level modifications at the nanoscale using technology developed at Portland State University by former physics professor Dr. Mingdi Yan.

Working to overcome challenges in materials science, Dr. Yan developed what could be described as a ‘molecular glue’ capable of binding polymer, paint, or adhesive to the surface of semiconductors, metal oxide, or metal at the nanoscale. With this novel binding agent, companies like SuSoS AG can now easily affix nanoscale polymers to the surface of materials to alter their properties and functions.

In 2008, Innovation & Intellectual Property facilitated the non-exclusive licensing of the intellectual property around Dr. Yan’s novel technology to a company that manufactures high-performance interface solutions, specializing in the fields of surface modification and characterization: SuSoS AG. Using the nanoscale coupling agents developed by Dr. Yan, SuSoS AG provides surface coatings that promote or decrease adhesion, add anti-fogging agents, protect against corrosion, repel dirt, and add bacteria-resistant surface layers.

The coatings developed by SuSoS AG can be applied to engines or gears to increase lubricity, to the hulls of ships to reduce drag and increase fuel efficiency, and to rivers, rebar, and other construction materials to protect against corrosion and oxidation. SuSoS AG can also apply bacteria-resistant coatings to the surfaces of materials in hospitals, restaurants, and other public spaces, which could improve public health conditions in places where harmful germs and bacteria are easily spread.

“Using this technology, SuSoS AG has developed 67 unique products. The advantage of this technology is how general it is. It works well with many technologically important materials.”

-Dr. Mingdi Yan, Former Professor of Chemistry

SUSOS AG

UNIVERSITY VENTURE DEVELOPMENT FUND

The University Venture Development Fund provides Portland State University the opportunity to accept gifts from individuals and organizations that wish to support research and commercialization activities at the University.

Donors receive a significant tax credit from the State of Oregon.

Innovation & Intellectual Property uses UVD funds to facilitate the commercialization of University research and development and to support projects and innovations with the potential for making a positive impact here in Portland and beyond. Several funded projects you may read about in this booklet include: SweetSense, Inc., Hawthorne Materials Corp., Pacific Nanoscience, Inc., and Virtual Device Technologies, LLC.

The largest university in Oregon, Portland State University is a driving economic force in the region. Donations to the UVD support both innovation and continuing economic growth.