



WHOITechTransfer

FACILITATING THE GLOBAL USE OF OCEAN DERIVED INNOVATION



Woods Hole
Oceanographic
INSTITUTION

ANNUAL
REPORT
2017



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LETTER FROM THE DIRECTOR

DAVID KNAACK, PH.D

DIRECTOR FOR TECHNOLOGY TRANSFER

Commercializing academic innovation promotes basic research.

A fairly sweeping lede, but demonstrably true.

Let me explain. Technology Transfer arose as a formal academic process largely in response to the requirements of the Bayh Dole Law implemented by United States Congress in 1980. The purpose of the law is to produce greater commercial outcomes from federal funding. Specifically to provide a return to the American taxpayer for their generous support to academic research. Ever since, Academic Technology Licensing departments have used this legislation to justify their continuing existence.

Even without a legal imperative though, Basic Research advances significantly due to commercialization of its innovations. The simple reason is that most academic innovations occur in the furtherance

of basic research. They are the tools and processes developed to complete experimentation and to obtain data. Commercializing these tools not only makes them available to other researchers, but also ensures their reliability and continued availability.

Once commercialized, products are manufactured in highly reproducible, quality controlled manufacturing environments. Other innovations, those that are not research tools, often define and enable whole new areas of academic and/or clinical research. These include newly discovered drugs, and many of the internet and digital tools, such as search engines and apps that aid the researcher's efforts in pursuing their scientific interests. All this sounds good, but it's more than that, it's quantifiably real.

For examples, we need to look no further than Woods Hole Oceanographic Institution's own innovations. Four exemplary submersibles developed at Woods Hole include Alvin, Jason, Remus

and the Slocum glider. Each of these vehicles was developed for basic research purposes. Two of them, Remus and the Slocum glider were subsequently commercialized, while Alvin and Jason were not. So how much actual research was performed using these submersibles? One way to answer that question is to look for the number of research publications referencing them. This should be a straightforward test of their impact on basic science.

Figure 1 shows the raw citation data for all four submersibles, as obtained from the Web of Science database. In Figure 2 the data is normalized to the date of first publication and expressed as the cumulative citations tabulated over time for each of the submersibles. Here we see that the act of commercialization appears to have accelerated the scientific impact of a class of innovations by more than ten years.

Although not having non-commercialized products for direct comparison, a look at the citations

for two other WHOI innovations, the green fluorescent protein (59,188) and the limulus amoebocyte assay (6,098), reinforce the notion of commercialization's impact on basic research.

2017 was a 'rebuilding year' for WHOI OTT as we replaced and trained half our staff. While short-handed, our efficiency in seeking out new disclosures was reduced and our greater reliance on outside counsel resulted in increased external patent expenses. At the same time, we observed a drop in royalty revenues due to reduced sales

by Hydroid, our primary licensee. We believe this dip in royalties is temporary as we have continued our growth in licensing activities with the execution of 5 licenses in 2017. Driven by the popularity of the WHOI Imaging Flow Cytobot product (537 citations), McLane Research labs is also showing continued strength in sales growth with their annual royalties crossing the \$100k mark for the first time (Figure 3) in 2017.

These developments, in conjunction with the anticipated sale of a WHOI startup early in 2018, leave

us confident that 2018 will be a great revenue year.

As the following report testifies, we have been seeing more and more fruits of WHOI's investment in technology transfer activities since 2013. To these successes, we can now proudly add the promise of an impact on WHOI's most important of objectives, Basic Research.

Looking forward to a strong 2018 for both WHOI OTT and all of you.

Dave Knaack

Figure 1: Web of Science Citation Data For Four of WHOI's Submersibles: Using a simple search criteria with the name of the submersible and the terms "autonomous" and/or "submersible". Titles were scanned to confirm relevance.

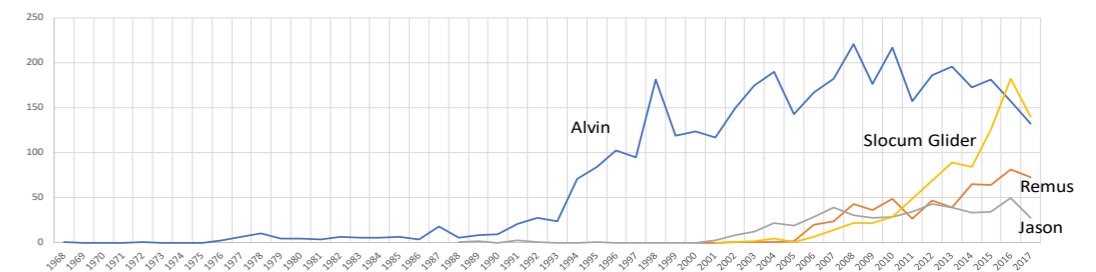


Figure 2: Ten to Fifteen Year Acceleration in Technology Impact

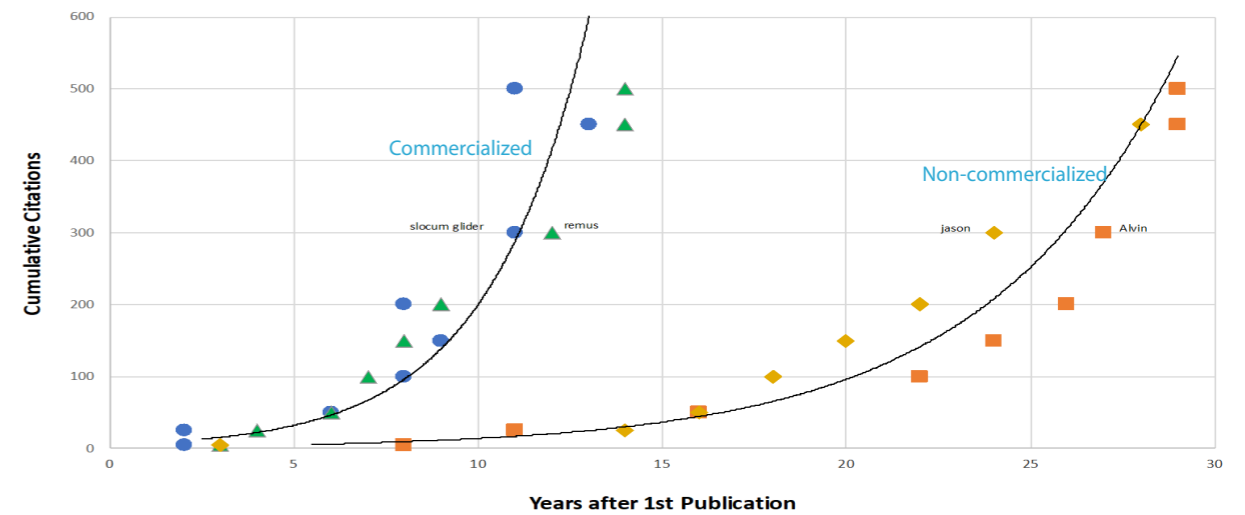
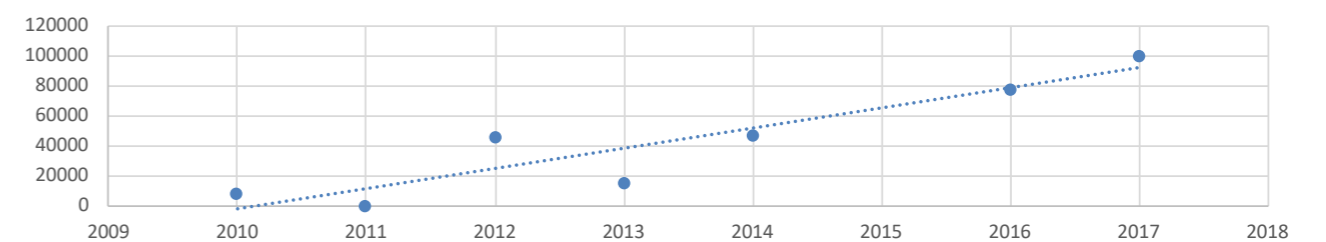


Figure 3: Annual McLane Research Labs Royalties



2017 ISSUED PATENTS

Publication Number 9,758,550	Cobalamin Acquisition Protein and Use Thereof, Inventors: Mak Saito, Erin Bertrand
Publication Number 9,765,120	Cobalamin Acquisition Protein and Use Thereof, Inventors: Mak Saito, Erin Bertrand
Publication Number 9,778,228	Turbine Sensor System for Environmental Impact Monitoring, Inventors: Paul Fucile, Glenn McDonald, Edward Hobart
Publication Number 9,820,967	Method for Reducing Antibiotic Resistance Through Efflux Pump Inhibition, Inventors: Tracy Mincer, Kristen Whalen
Publication Number 9,828,068	Mechanical Tether System for A Submersible Vehicle, Inventors: Robert McCabe, Andrew Bowen, Matthew Heintz

2017 U.S. PATENT FILINGS

Number 15/601,441	Retrieval System For Underwater Objects, Inventors: Jim Partan, Keenan Ball
Number 15/827,681	Systems And Methods For Continuous Measurement Of An Analyte, Inventors: Benjamin Van Mooy, Paul Fucile, Glenn McDonald
Number 15/707,900	System and Method for Autonomous Tracking and Imaging of a Target, Inventors: Amy Kukulya, Tom Austin, Frederic Jaffre
Number 15/613,187	Adduct-Based System And Methods For Analysis And Identification Of Mass Spectrometry Data, Inventors: James Collins, Bethanie Edwards, Helen Fredricks, Benjamin Van Mooy
Number 15/512,893	Continuous Particle Imaging And Classification System, Inventor: Scott Gallager

2017 PROVISIONAL FILINGS

Number 62/537,113	Gradient Sensor, Inventors: Richard Sanger, Paul Fucile, Maurice Tivey
Number 62/572,808	Passive Ballast System and Methods Of Using Same, Inventors: Jeff Kaeli, Robin Littlefield
Number 62/612,520	Submerged Vehicle Localization System and Method, Inventors: Nicholas Rypkema, Erin Fischell, Henrik Schmidt



EVENTS & OUTREACH

As part of our ongoing effort to foster an entrepreneurial culture within WHOI, the Office for Technology Transfer declared last October to be WHOI's first annual Innovation Month. Throughout the month a series of events were held that were designed to raise awareness of resources and opportunities available to WHOI's entrepreneurial community to further the development of their innovations.

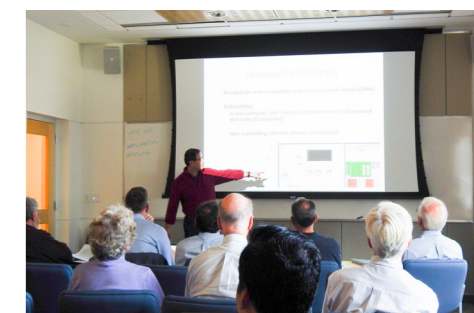
WHOI PITCHATHON

This annual event- now a part of Innovation Month - has grown immensely since it's first year in 2015. 2017's Pitchathon underwent some significant process changes in order to be more beneficial to WHOI Scientists and Engineers applying for Proof of Concept funding. OTT continued to build on its Tech Mentors and Champions program with the introduction of Business Advisors to the Pitchathon application process.



Inventors Teamed-Up with Business Advisors

This year's TRF featured ten qualified Business Advisors, many of which were drawn from our Mentors and Champions community. These Business Advisors were paired with scientists and engineers applying for funding and assisted in everything from market research to evaluating the draft pitch. Each Business Advisor participating was required to attend a training session where WHOI culture was discussed in-depth as well the ins and outs of the Translational Research Fund.



Inventors Made Their Pitch

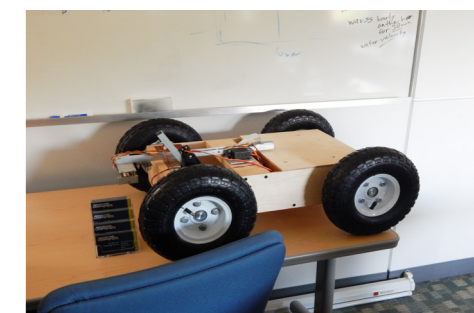
Five applicants competed in this year's Pitchathon with presentations vastly improved in style and content over previous years. The event took place on October 10th at Quissett campus before four volunteer judges. Each pitch consisted of a 10 minute presentation followed by 10-15 minutes of Q&A from the judges.



Three Teams Received Funding

1. Asymmetric Thruster: \$75,000
2. Salient Predictions: \$36,000
3. Chicken Bot Pi: \$18,300

All three teams will receive funding in 2018 to advance their technology. More information on these technologies can be found on the OTT website.





MORE FROM INOVATION MONTH...

2017 Inventor Recognition Event

The Office for Technology Transfer held its 2016 Inventor Recognition Soiree on October 19th. The event celebrates innovation at WHOI with all of the scientists and engineers who participated in the intellectual property process in 2016. It's an opportunity for OTT to recognize WHOI inventors as well as a chance for WHOI innovators to mingle and ask questions of OTT staff. The event recognized, among others, WHOI's most prolific inventors including Norm Farr, Lee Freitag, and Chris Reddy. Also displayed were WHOI's Issued patents for 2016-2017.

Such events are made possible with the support of generous donors.



Dr. Robert Weiss

Dr. Weiss was the founder and the CEO of Physical Sciences Inc. (PSI) from 1972 to the late 2000s. During that time, PSI became a greater than \$50M innovative research organization and was one of the top SBIR winners in the country. The SBIR and STTR program helped PSI commercialize numerous technologies and has served as one of the flagship companies for the program. Dr. Weiss worked with Jerry Bird of Mass Ventures to initiate the START program. The START program selects Massachusetts SBIR winners who have won Phase 2 programs and grants winners up to \$1M of Massachusetts funding to finance a Phase 3 effort.

SBIR Seminar Held for WHOI Innovators

As a part of innovation month, WHOI OTT hosted a Small Business Innovation Research program (SBIR) seminar for WHOI PIs interested in learning more about the program. The seminar had a great turnout from WHOI staff. Our distinguished speaker Dr. Robert F. Weiss shared his tools and tricks of the trade in getting an SBIR proposal successfully funded. Dr. Weiss is now head of Technology Transitions and serves as a strategy consultant for promotion of small business programs.



PAUL FUCILE
Chicken Bot Pi
Received \$18k from WHOI Pitchathon

The Chicken Bot-Pi answers the need for affordable accessory hardware for students and hobbyists by consolidating several student skill level robotic control and sensing interfaces onto a single economical circuit board. In collaboration with MIT's Lemelson Center.



RAYMOND SCHMITT
Salient Predictions
Received \$36k from WHOI Pitchathon

A breakthrough in precipitation forecasting that allows for accurate rainfall prediction 3 weeks to 3 months in advance.



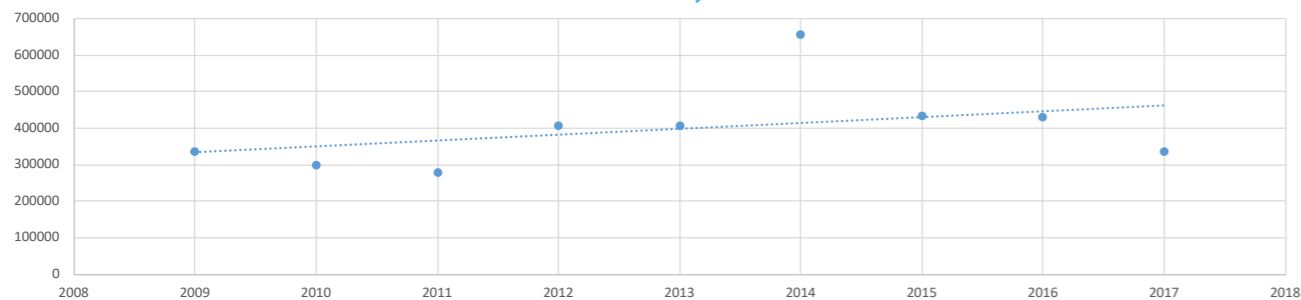
JEFF KAELI
Asymmetric Thruster
Received \$75k from WHOI Pitchathon

An asymmetric propulsion system for automated underwater vehicles (AUVs) that by eliminating the need for fins or rudders for navigation, enables the development of a new platform of mini-AUVs. The system employs a single-bladed propeller, the speed of which can varied within a single revolution over sequential revolutions to generate a turning moment.

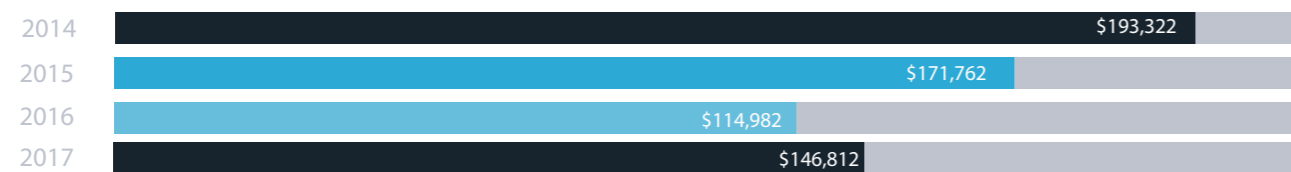
BY THE NUMBERS

EXPENSE & INCOME REPORT

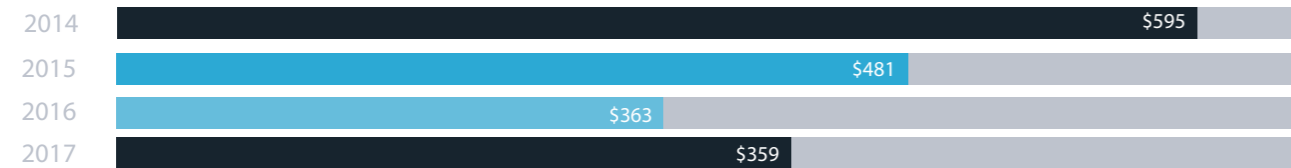
Annual Royalties



Total Active Case Costs



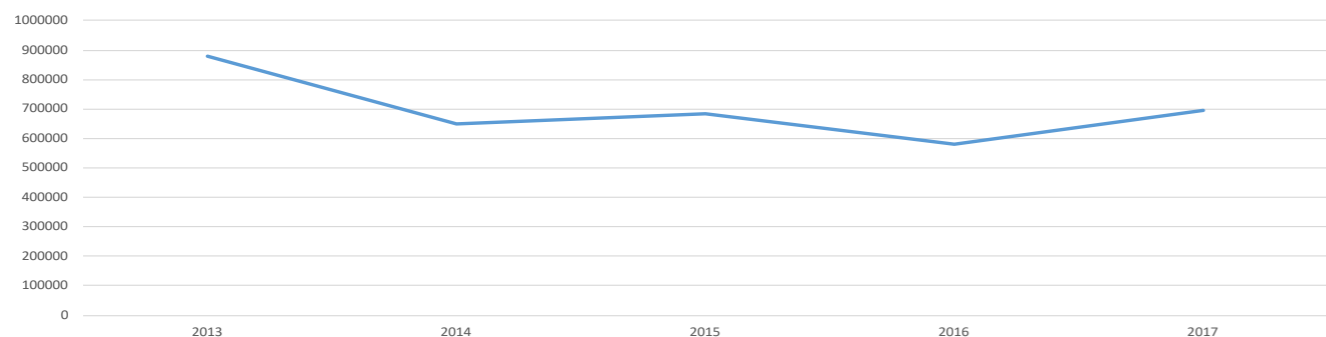
Average Cost Per Pending Case Per Month



Average Cost Per New Filing

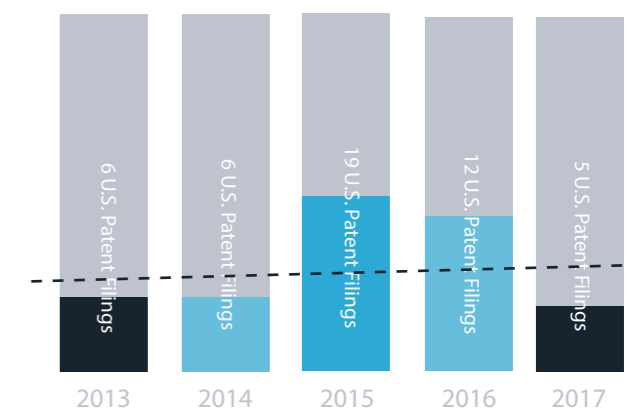
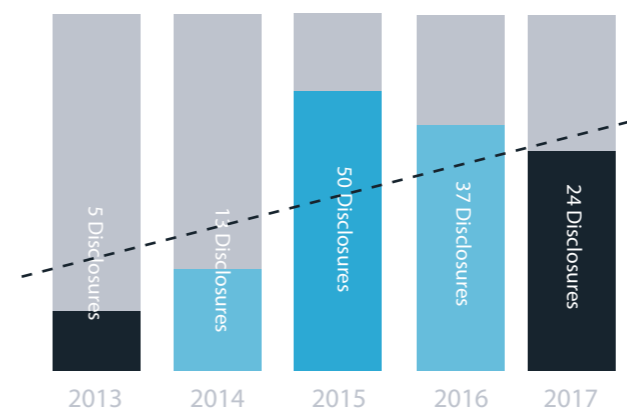


Annual Spending



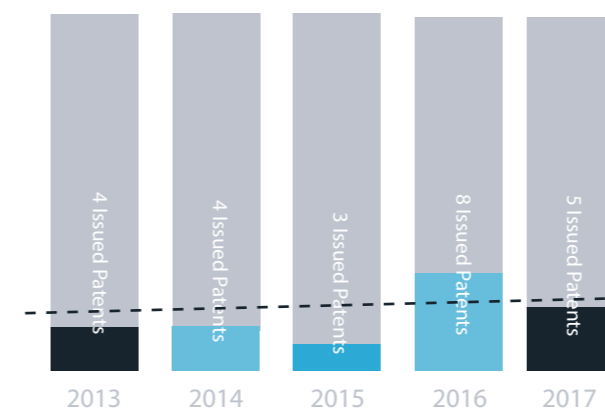
PATENT METRICS

Patent Metrics	2014	2015	2016	2017
Disclosures Received	13	50	37	24
U.S. Patent Filings	6	19	12	5
New Technology Filings	9	9	8	3
Issued Patents	4	3	8	5

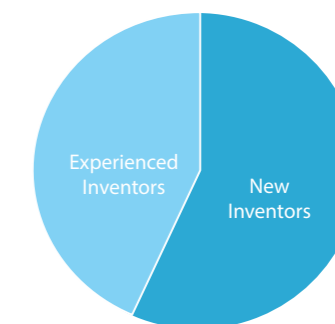


Over the past five years, the Office for Technology Transfer has experienced an overall increase in technology disclosures due in part to increased understanding of OTT services amongst technical and scientific staff as well as OTT's active pursuit of new ideas and technologies within the institution.

OTT is able to save significant money on patent expenses through the use of an in-house Patent Liaison- limiting the use of lawfirms and allowing WHOI to file more patents as shown in 2015 & 2016. In 2017, OTT welcomed & trained a new Patent Liaison and expects to continue saving on attorney costs in the coming year, allowing for more patent filings.



As anticipated, the annual issued rate is inching up due to increased rates of new filings over previous years.



A total of 24 Idea Disclosures were submitted in 2017. Of these 24, 10 were submitted by inventors that have worked with OTT previously and 14 were from new inventors. OTT strives to offer support to WHOI inventors who have filed idea disclosures with us in the past, whether a patent was filed or not- as well as reach out to new staff and departments that may not be aware of the services our office offers or Intellectual Property obligations.

OTT IN THE NEWS

Throughout the year, many OTT technologies were featured in the press. From highlighting the plight of the North Atlantic Right Whale - and WHOI Scientist and Engineer efforts to reduce buoy entanglements and ship collisions - to innovative new marine equipment. Our marketing efforts for both WHOI and WHOI innovators include press releases on new technologies and targeted editorial features in industry publications. A few OTT technologies making waves:



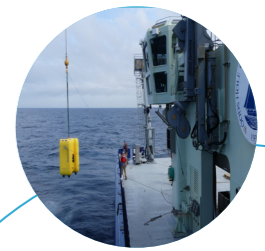
Wave and Tidal Energy Network

[Electromechanical Mooring Stretch Hoses](#)
 Highlighting WHOI startup company EOM, the article discusses advances in stretch hose technology and high-power improvements currently in the works.



International Ocean Systems

[WHOI Compact Winch](#)
 "The most advanced portable winch design in the world, capable of outperforming bulkier predecessors."



New Robot Speeds Sampling of Ocean's Biogeochemistry & Health

"The world's first underwater vehicle designed specifically to collect both biological and chemical samples from the ocean water column successfully completed sea trials off the coast of New England on July 9, 2017."



Oceanus explores the oceans in depth, highlighting the research and researchers at Woods Hole Oceanographic Institution in news, features, and interviews. Many of OTT's most promising technologies were highlighted in the pages of Oceanus Magazine this year.



OCEANUS: WHALE SAFE FISHING GEAR

"More and more whales are becoming snarled in fishing gear, often dying slow, painful deaths. Two Woods Hole Oceanographic Institution (WHOI) engineers have invented a lobster trap device that they say could help whales avert entanglements and, at the same time, might allow currently restricted waters to be safely reopened for lobster fishing..."



OCEANUS: EAVESDROPPING ON WHALES

"WHOI biologist Mark Baumgartner teamed up with New York's Wildlife Conservation Society to deploy a digital acoustic monitoring instrument, or DMON, about 22 miles off Fire Island near busy shipping lanes entering and leaving New York Harbor..."

HOW IT WORKS

Where do the royalties go?

Unless otherwise agreed upon at the licensing phase, all royalty payments are split the same. The largest portion of the royalty payment is given to the inventor(s) - one third. The remainder is split evenly between WHOI, the Department, and the Translational Research Fund. The TRF uses the money from royalties to fund Proof of Concept Research at WHOI throughout the year.

*Lower than department, WHOI, and TRF disbursements due to Hybrid royalty payment arrangements.

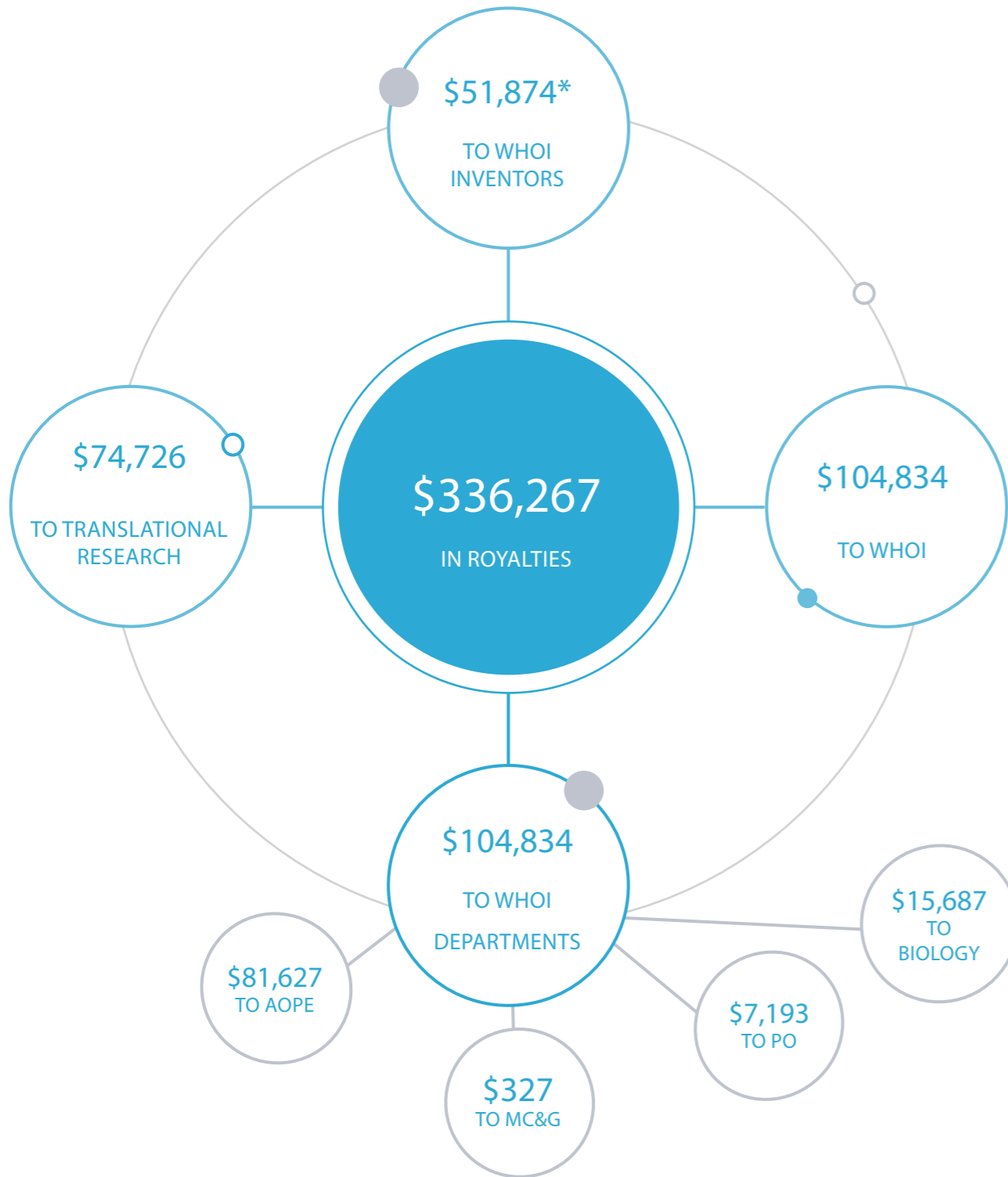




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49 School St.
MS #53
Woods Hole, MA
02543-1050



Telephone
508 289 3447
Fax:
508 289 2019



E-mail:
techtransfer@whoi.edu