The mission of the Forensic and Investigative Sciences Program (FIS) at Indiana University Purdue University Indianapolis is to develop professional, ethical graduates with the highest quality education in the natural, physical, and forensic sciences, law and criminal justice, to successfully prepare students for advanced degrees, employment, and research in forensic science and related fields.
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From the Director . . .

The 2014-2015 academic year has been intense but also highly impactful. The Forensic and Investigative Sciences Program (FIS) continues to strengthen our program within the School of Science as well as nationally. We continue to attract large numbers of prospective students and their families to campus, we educate an ever increasing number of undergraduate and graduate students, and our faculty are becoming nationally and internationally known for their expertise.

If I had to choose one key word for this past year, it would be Achievement. Here are some good examples, the details of which can be found within this annual report:

- Both Dr. Manicke and Dr. Walsh received new research grants from the National Institute of Justice (NIJ). Dr. Picard and Dr. Goodpaster continued their NIJ-sponsored research. The competition for research funding is very high and having all four research-active professors funded at the same time is a testament to the strength of our research programs.
- As the Graduate Coordinator, Dr. Picard facilitated the recruiting, selection, and orientation of our first incoming class of non-thesis M.S. students. Our graduate population has increased over four fold via this new degree program.
- Prof. Gina Londino is excitedly awaiting the publication of her first book this fall. This collaboration is based on her expertise and work in forensic science education. This will be great resource for high school teachers looking to provide an introduction to forensic science.
- Amy Maidi, Program Coordinator, was honored this year by being elected president of the professional advisor organization, JACADA, on campus.
- The FIS Program completed the long process of reaccreditation with the Forensic Education Program Accrediting Commission (FEPAC). Our reviewers were thrilled with our facilities. We are pleased to now be accredited until 2020.
- The School of Science has authorized us to hire a new staff member to coordinate our teaching laboratories and manage our non-major laboratory courses.

I remain very proud of what we have accomplished this year. The FIS Program continues to be successful due to the excellence of our faculty, the determination of our students, and the dedication of our staff. We are also fortunate to receive significant support from Kitty O’Doherty and Beverly Hewitt from the Department of Chemistry and Chemical Biology for which we are very grateful. As always, I am also grateful for our Board of Visitors and Internal Advisory Committee, who are listed below. Their observations and advice are critical to our success.

Ed Littlejohn, Director
Indiana State Department of Toxicology

Michael Medler, Director
Indianapolis Marion County Forensic Services Agency

Carl Sobieralski, DNA Technical Leader
Indiana State Police
Indianapolis Regional Laboratory

Donna Roskowski, South Zone Drug Unit Supervisor
Indiana State Police
Indianapolis Regional Laboratory

Judge Cale J. Bradford
Court of Appeals of Indiana

Major Steve Holland, Commander
Indiana State Police Laboratory Division

Frances Watson,
School of Law

Jeremy Carter
School of Public and Environmental Affairs

Simon Rhodes
Dean, School of Science

George Sandusky
School of Medicine

Greg Smith
Senior Conservation Scientist
Indianapolis Museum of Art

Sonia J. Leerkamp
Attorney at Law

Judge Cale J. Bradford
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School of Public and Environmental Affairs

Simon Rhodes
Dean, School of Science

George Sandusky
School of Medicine

Greg Smith
Senior Conservation Scientist
Indianapolis Museum of Art

Sonia J. Leerkamp
Attorney at Law
TEACHING

As a teacher, I maintained my focus in forensic chemistry via a fall graduate lecture and lab (FIS 51100 and FIS 51101) and a spring undergraduate lecture and lab (FIS 40400 and FIS 40401). I also filled a vacancy in the teaching schedule for the Department of Chemistry and Chemical Biology and covered an analytical chemistry laboratory (CHEM-C 311). I also took that opportunity (of course!) to add a laboratory exercise that included explosives analysis.

RESEARCH

As a research mentor, I am directing my students in three main research projects:

**Explosives Analysis:** Our group remains very interested in the criminal use of explosives and how forensic scientists can play a role in explosive investigations (which also attracts the attention of the media, as shown on the next page). Hence, we are actively developing new analytical methods for extracting and identifying the explosive residues that remain following a blast. This has resulted in a new analytical technique we call “Total Vaporization Solid Phase Microextraction” or TV-SPME. The development and optimization of this method has been ongoing for the last year and made its debut in the journal *Analytical Chemistry*. Dana Bors and Jordan Ash are directly involved with using this method on pipe bomb debris and post-blast debris from high explosives, respectively.

Our lab has developed a novel, analytical technique called Total Vaporization Solid Phase Microextraction (TV-SPME). This process can analyze minute samples of liquid with extreme sensitivity. The process is pictured here.

**Automotive Racing:** We have continued our relationship with two racing organizations: the National Hot Rod Association (NHRA) and the U.S. Auto Club (USAC). Dana Bors and Wil Kranz are the analysts for these projects, and they have been focusing on monitoring the fuel and tires of racers to ensure they comply with the rules. Dana also plays a key role in ensuring that the chemicals used by the NHRA technical staff at races are formulated properly.

**Forensic Entomology:** We have continued our partnership with Dr. Picard’s laboratory. Wil Kranz, Clinton Carrol, and Lindsey VanCleave have made significant progress on discerning the species of a blow fly pupae based upon its chemical profile. There is also evidence that chemical analysis can indicate the age of the pupae, which can be used to help establish a post-mortem interval (PMI) in a homicide investigation.

SERVICE

I am constantly aware that my role as the Director of the FIS Program is made immensely easier through the efforts of Amy Maidi, our Program Coordinator. Together we have continued to refine the FIS curriculum and sought out ways to increase the visibility of the program. I have also initiated an external review process for the FIS Program. This is an important evaluation and planning exercise normally reserved for departments. Ours will take place this coming fall. In my role as an associate professor in the chemistry department, I served and will continue to serve on the unit committee (which decides promotion and tenure cases) and the graduate affairs committee.
“... Shown pictures of the sacks, John Goodpaster, a forensic chemist at Indiana University-Purdue University Indianapolis, said they were clearly marked as ammonium nitrate.

Mixed with fuel oil, the compound forms an explosive that can be 85 percent as powerful as TNT, he said. Twenty pounds of the mix can fill a suicide vest, while 200 pounds can make a car bomb.

A bomb filled with about 45,000 pounds could damage 16 city blocks, Dr. Goodpaster said, adding that there appeared to be at least 55,000 pounds in the pile of sacks waiting to enter the crossing.

“That is a definite concern,” he said. . .”

The Goodpaster group continued its collaboration with the Indiana State Police Bomb Squad. Our current project involves detection of residue from plastic-bonded explosives (pictured here).

We have completed a five-year study of explosive-detecting canines and the extent to which they respond to real vs. simulated explosives. In short, we found there is no substitute for the real thing.
Reflections on the year from Dr. Christine Picard

Four years in and here we are – one more year until I need to be thinking about my tenure dossier. Where did the time go? It’s been an exciting year for the FIS Program, and for the Forensic Biology Track especially with Susan Walsh’s arrival. Already our collaborations have proved fruitful as the Department of Defense Research Instrumentation Program awarded us funds to purchase an Illumina MiSeq instrument, used for high-throughput sequencing.

Teaching continues as usual, only this time I share the undergraduate teaching responsibilities with Susan (she will now be teaching the second portion of the class), and I will be teaching a brand new graduate course in Forensic Biology. I am quite excited about this prospect, as it means 2 things: first is that our graduate program is back up and running again, with 8 students admitted for the Fall 2015. Second, I get to teach an upper level forensic class, where we can spend some time looking into cases in more depth and the encouragement of student thinking! I look forward to this busy, but fulfilling semester.
My research program continues to grow and mature. As I am currently a Co-PI on two National Institute of Justice grants, I have been busy mentoring students associated with each of those projects. One of these projects is wrapping up, we are now in the data analysis/manuscript writing portion of the project. It is always exciting to see a big project to its end. As part of this effort, a high school student, Grace LeFevre, as part of the Indy Project SEED group spent eight weeks in the lab this summer annotating a genome. The data she has generated form the basis of a great manuscript. For my first outing with Project SEED, it was a wonderful experience. The second project is my collaboration with Dr. Goodpaster looking at the effects of biotic and abiotic factors on the analysis of cuticular hydrocarbons for the determination of species and age in blow flies. With multiple colonies, and experiments, we are more than halfway finished with the data collection portion of this research. Outside of these projects, my research lab continues to flourish with three PhD students and a number of undergraduates supporting my overall research theme of linking a genotype to a phenotype (in both humans and flies).

Anne Andere, PhD student in Dr. Picard’s lab, attended the 12th annual Ecological Genomics Symposium hosted by Kansas State University in Kansas City, Mo. and presented a poster entitled "Genetic variation in developmental time studied on the genomic sequences of three geographically distinct populations of the blow fly Cochliomyia macellaria (Diptera: Calliphoridae)."

The Picard Lab represents at the Indiana Academy of Sciences Annual Conference in Indianapolis, IN - all four students with posters!

Kelsie Faulds's (former FIS undergraduate and Picard research associate - now a PhD student at University of Colorado Denver) first author publication comes out!
A Year from the Desk of Gina Londino . . .

Over the past year I was involved with maintaining my teaching responsibilities, overseeing the forensic science teaching laboratories, and providing service to the university through multiple groups. I continue to teach three courses each semester which include concepts in Forensic Science I and II, Forensic Microscopy, and Investigating Forensic Science laboratory. This year I developed a new course for our graduate students, Advanced Forensic Microscopy. It was taught for the first time this spring. As an instructor I am continually changing content in all of my courses and updating assignments. I provided service to the university through two community of practice groups and a distance online education committee.

Course Development

I developed a new course, Advanced Forensic Microscopy (FIS 50600), for our graduate program which will be required of both thesis and non-thesis students. This course is a hands-on microscopy course which examines trace evidence using optical and instrumental microcopy. The inaugural course had three students (two graduate and one undergraduate), but will increase this spring with the launch of our non-thesis graduate program.

I will be teaching a new lecture course this fall that complements the Investigating Forensic Science laboratory course. This is a one credit hour lecture that will precede the laboratory portion of the course, but is not required to participate in the lab. Each course is a stand-alone offering allowing students to take one, two, or three credits of non-major, forensic science fun.

The online course enrollments remain strong. FIS 20500 Concepts of Forensic Science I was full with 79 students during the first summer session. FIS 20600 Concepts of Forensic Science II had its strongest summer enrollment with 25 students in second summer session. My face to face courses are steadily growing with 227 student in the Fall 2014 FIS 20500, and 72 students in the Spring 2015 FIS 20600. In the long term, we would like to offer both on introductory courses, FIS 20500 and 20600, both fall and spring semesters.

Professional Development

I submitted my final review to Taylor and Francis to have a forensic science laboratory manual published. Look for it this fall, Investigating Forensic Science, a Laboratory Manual. I also worked with DataColor’s ChromaCal product. This software calibrates color images taken with a microscope camera to produce a color image that is the same as viewed under the microscope. This technical note was published early this summer.
I remain deeply involved with forensic science education organizations. I am the treasurer for the Council of Forensic Science Educators (COFSE). This is a great way to communicate with other professors on their course content and get laboratory ideas for students as well as share activities for the K-12 community. We are currently developing a workshop for the annual American Academy of Forensic Sciences meeting in February and have prepared a session for the meeting on the future of education in forensic science.

**Community Involvement**

I took on additional responsibilities over the course of the previous academic year. I am the Chair of the Community of Practice on Academic Integrity supported by Gateway to Graduation. Our group has been meeting monthly over the past year and a half to develop documents to better educate students and faculty on the code of conduct policy at IUPUI. We met with the Division of Student Affairs and the new Chancellor of IUPUI, Nasser Paydar, this summer to discuss the implementation of our work on campus.

I am also serving on the iPad Community of Practice, which is a two year commitment. Our group has researched how technology and iPads can be used in the classroom. We have been involved with student surveys on technology and presented a session during the Gateway to Graduation Technology Workshop in May.

**Outreach Activities**

My outreach involvement has remained steady with the Forensic Science Club. The students were involved with National Chemistry Week, Science Olympiad, and put on a Murder Mystery Dinner for IUPUI students. The club was awarded a total of $3000 this past year to host the murder mystery dinner. I also hosted outreach events in the new lab space for a variety of student groups.

**Laboratories**

We continue to grow our laboratory equipment. I was awarded funds to complete the microscopes needed to have 16 students enrolled in both microscopy courses, FIS 30600 and 506000. Next I intend to find a way to fund a comparison stereomicroscope. I was also able to replace our FTIR microscope with support from both the School of Science and FIS. The new instrument will replace an 11 year old infrared microscope that no longer functioned correctly. This will be used to develop laboratory exercises in both the forensic chemistry and microscopy courses at the undergraduate and graduate levels.
What’s Happening With Nick Manicke

The past year was an exciting one in terms of both teaching and research. I welcomed three full-time people into my laboratory this year: one postdoctoral researcher, one chemistry Ph.D. student, and one forensic chemistry masters student. They have all been very productive in the laboratory, and I was pleased to publish several papers as corresponding author. I also taught my first graduate class in the spring. The course covered instrumental analysis of trace evidence and had nine students.

Research
My research program focuses on bioanalytical and forensic chemistry, with a particular focus on the development of novel mass spectrometry related technologies. My research group currently consists of Rachel Potter, a forensic chemistry MS student, Brandon Bills, a chemistry Ph.D. student, and Chengsen Zhang, a postdoctoral researcher, all of whom started in the summer or fall of 2014. Over the last year, I also supervised three undergraduates in my research lab (two FIS forensic chemistry majors and a visiting undergraduate student from Brazil).

In the fall, I learned that my spring 2014 submission to the National Institute of Justice (NIJ) was selected for funding. I am the sole PI on this grant, which began in January 2015. It will run for two years with total support of $273,826. Rachel Potter, a forensic chemistry masters student, will be fully supported on this grant next year.

This summer John Goodpaster and I began moving into a newly renovated research lab on the third floor of the science building. The first instrument was installed in this space in June 2015: a new triple quadrupole mass spectrometer purchased with funds from my NIJ grant.

Service
I served on the search committee for a faculty position in bioanalytical chemistry, which resulted in the hiring of Frederique Deiss. I also served on the technical facilities committee and the undergraduate curriculum committee for the Department of Chemistry and Chemical Biology. In the spring, I took over for Gina Londino as faculty advisor for the Forensic Science Club.

Teaching
I taught FIS 40100/40101 Forensic Chemistry I in the fall. In the spring I taught the second semester of our two semester graduate level forensic chemistry sequence: FIS 51200/51201. This course was cross-listed as Chemistry 69600 – Instrumental Analysis of Trace Evidence. Seven chemistry graduate students took the course along with the forensic chemistry graduate students.
IUPUI chemist earns grant to improve drug screening in forensics

School of Science Press Release

On "CSI," "NCIS" and other popular television shows, mass spectrometers rapidly analyze biological samples and spit out definitive results of complex analyses. But in real life, mass spectrometry findings are less straightforward and slower paced.

IUPUI analytical chemist Nicholas E. Manicke has received a $273,826 award from the U.S. Department of Justice's National Institute of Justice to improve the speed and accuracy of mass spectrometry for detecting drugs and poisons in blood samples.

"Current technology does not meet the demand for rapid, effective and simple drug screening methodologies for forensic toxicology applications," said Manicke, assistant professor of chemistry and chemical biology and a faculty member of the School of Science's Forensic and Investigative Sciences Program at Indiana University-Purdue University Indianapolis.

With the NIJ award, Manicke will proceed with his work to simultaneously advance the quality and throughput rate of mass spectrometry analysis of biosamples, specifically blood samples, to determine cause of death. The participation of an IUPUI graduate student in the project is supported by the grant, and several undergraduates will also be involved.

"Hundreds of common drugs could cause death. Current broad screening and detection methods catch wide swaths but are not ideal," said Manicke. "Unfortunately, the large number of false positives that arise from current screening methods increase the burden for laboratories to do confirmatory tests. Also, their poor sensitivity can mean that drugs at low concentrations may not be detected at all during the initial screen.”

"AIT Laboratories, an Indianapolis-based company specializing in toxicological analyses, will help in the testing of this new approach to drug screening," Manicke said. "AIT Labs will provide real forensic specimens for testing, and the results we obtain will be validated against their standard confirmatory tests."

Before joining the IUPUI faculty in 2013, Manicke and colleagues at Purdue University, where he completed graduate studies and served as a postdoctoral research associate, developed paper spray. A mass spectrometry ionization method, paper spray allows for quantitative and qualitative analysis from complex samples without prior sample purification.

In a study published in June 2014 in the American Chemical Society's peer-reviewed journal Analytical Chemistry, Manicke and colleagues reported on the successful use of paper spray to detect very low concentrations of eight common drugs of abuse in blood samples. This work demonstrated the value of paper spray for rapid investigation of biological samples, allowing for the direct analysis of complex samples without the laborious sample preparation process normally associated with mass spectrometry.

Manicke said that because of its sensitivity and specificity, the paper spray mass spectrometry method has potential use in such diverse fields as biomedical research and clinical testing, homeland security, drug screening and food safety, in addition to forensic science.

"The development of paper spray mass spectrometry, which requires no sample preparation, has been driven primarily by the need for faster and simpler procedures for the analysis of drugs and pharmaceuticals directly from whole blood," he said. "With this support from the National Institute of Justice we hope to develop paper spray mass spectrometry into an effective drug screening tool for applications in forensic toxicology, particularly analysis of postmortem blood samples."
Getting Started at IUPUI from Susan Walsh

My first year at IUPUI was a busy one! Setting up the lab, recruiting new students. The lab is now running smoothly and research is finally underway with some great additions. I have a very adept research technician as part of my grant funding, who has been such a great addition that she will begin her MS in January. My new PhD student is working on a very interesting area of bioinformatics investigating human facial morphology and prediction. My MS student in Biology is busy working on the genetics of hair pigment and its structure through different sequencing techniques, and I have another masters in forensic biology student who will also work in bioinformatics beginning this Fall 2015 semester.

In terms of funding, I have been very lucky that the lab is now supported by both the National Institute of Justice and the Department of Defense, both aiding the lab in our goal of individualized human physical appearance prediction.

Next month, I have been invited to teach a phenotyping workshop, and I am also giving an oral presentation at this year’s ISFG (International Society in Forensic Genetics) Congress in Poland. My technician shall also present our work at the end of the year in Texas at the International Symposium on Human Identification (ISHI).

Teaching was new this year, and Population Genetics was my first official class. I think it went well! Next year involves quite a bit more teaching so working together with Dr. Picard, forensic biology will be completely covered for the students.

In terms of funding, I have received two grants this year, one from the National Institute of Justice ($1.1 million) and one from the Department of Defense (DOD) together with Dr. Picard for $150k for which we will buy a next generation sequencer, making our program one of the few programs to have access to such cutting edge technology.

Thanks to the grant success, I have enjoyed the press that comes with it, and have been consulted by a few media outlets, including the New York Times, which was certainly a privilege to be mentioned amongst such esteemed peers in the field.

In an effort to get our methods out and used by forensic laboratories in Indiana, my technician and I have spoken to the state lab and shall also speak with the county lab next month in an effort to train and/or discuss the potential use of our research in current casework. This, I feel, is an important goal for the lab.

Walsh DNA Phenotyping Laboratory

Welcome to the Walsh Forensic DNA phenotyping Laboratory. We are a forensic genetics laboratory based at Indiana University Purdue University Indianapolis (IUPUI). The laboratory and our research is focused on genes and the biological processes linked to human physical appearance, with a final application in Forensic and Anthropological fields.
IUPUI awarded $1.1 million grant to develop tools to predict physical appearance from DNA (Press Release)
Written by: Cindy Fox Aisen
Susan Walsh, Ph.D., a forensic geneticist in the School of Science at Indiana University-Purdue University Indianapolis, has been awarded a $1.1 million grant from the U.S. Department of Justice's National Institute of Justice to develop and improve "DNA intelligence" tools that may help identify unknown suspects, perpetrators and missing persons.

Walsh's work, formally known as forensic DNA phenotyping, focuses on the prediction of externally visible characteristics such as eye, hair or skin color from genetic material.

Using DNA from biological samples such as blood, Walsh's new "DNA intelligence" tools will help forensic scientists determine physical appearance information. The tools will be especially useful in cases where conventional DNA profiling is non-informative and an investigation cannot move forward.

"Predicting quantitative color -- not just blue or brown but the precise shade or pigment -- in terms of eye, hair or skin color of an unknown individual provides law enforcement, archaeologists and other investigators with information that can help identify a specific person or determine a potential pool of suspects that may or may not be of interest," Walsh said.

"The tools we are developing will be especially useful in cases where conventional DNA profiling does not provide useful information and an investigation stalls because it's the individual's first crime or the first crime where DNA has been found, hence a profile is not in the DNA database. These new tools will help investigators that lack genetic clues."

DNA profiling -- typically used by law enforcement to identify a suspect and by archaeological researchers such as those who identified the remains of Russian Tsar Nicholas and his family -- compares DNA discovered at a crime scene or archaeological find with DNA stored in a reference database. But DNA profiling is not helpful when no reference DNA exists to test a sample against. The new genetic phenotyping tools that Walsh is developing will let the discovered DNA act as a "biological witness that can do the talking."

Walsh is an assistant professor of biology in IUPUI's School of Science. Her appointment to the IUPUI faculty in 2014 followed a year as a post-doctoral associate at the Yale Molecular Anthropology Laboratory at Yale University. Originally from Ireland, Walsh earned her Ph.D. in forensic genetics from Erasmus University in The Netherlands under Manfred Kayser, a pioneer in forensic DNA phenotyping work. She also holds a master's degree in DNA profiling from the University of Central Lancashire in England.

As a doctoral student in 2013, she was awarded the prize for best oral presentation at the 25th Congress of the International Society for Forensic Genetics in Melbourne, Australia, for her presentation “Predicting skin color from DNA using a model based approach.” She has also been invited to present her work at the next international conference in 2015 in Krakow, Poland.

Walsh is a co-author of a much-discussed study published in December 2014 in the journal Nature Communications. The study confirmed that bones found in 2012 in Leicester, England, are indeed those of King Richard III, who died on the battlefield in 1485. She is a co-developer of HiirisPlex, a forensic DNA phenotyping test used to analyze 11 genes known to contribute to hair and eye color, that was used to predict the king's hair and eye color from ancient bones.

"Our work funded by the National Institute of Justice will be conducted with contributions from undergraduate and graduate students at IUPUI as well as collaborators in the Netherlands, Ireland and Greece," Walsh said. She is a faculty member of the School of Science's highly respected Forensic and Investigative Sciences Program.

THE IRISH TIMES
Mountain Top View of the Year from Amy Maidi

This academic year has been a busy but truly enjoyable one. I started off the year by hosting the FEPAC reviewers on campus to complete our self-study for our first REaccreditation. I felt so much responsibility to our program and students to ensure we remained accredited and reflected the highest standard of forensic science education. The long process of collaboratively completing an enormous application and hosting the visitors was all worth it. We are now fully accredited for another five years. It was gratifying to hear the reviewers say after their student focus group that the students love our program.

I was thrilled to facilitate our new professional workshops, FIS 49600 Professional Issues in Forensic Science. These are short, one credit hours workshops taught by professionals in the field. This year we offered:

- Drugs of Abuse
- Blood Spatter
- Fingerprinting
- Crime Scene Investigation
- Crime Scene Photography

We were fortunate to get amazing professionals to teach the students, and the students loved them. Here are some of their comments:

“This class was incredible. One of the best I have taken so far. I would like to see a "part 2" with some of the more complex cases we did not get time to see. It allowed you to see the real world side of forensics.”

“I love that I am learning from someone in the field instead of just professors. He definitely knows his material. He gives job related examples and makes us think critically. If I was given the chance to I definitely take another class from him.”

“This is an awesome course for Forensic Chemistry majors. It should be a required course due to the depth of detail covered in what drugs are seen by forensic chemists. I recommend this class to all those that are trying to go into this field to take it if it is offered again.”

“My favorite class that I have taken at IUPUI. This class has solidified what I want to do with my life.”

Picture of Herb Blitzer’s Crime Scene Photography class
Professionally, I had a great time attending and volunteering at the NACADA regional advising conference hosted here in Indianapolis this year. It was a great opportunity to get new ideas and learn about best practices in advising going on all over the Midwest and Canada. I have also been involved in the professional advising organization on campus, JACADA, since its inception. I have served as the Chair of the Campus Affairs committee for about six years. This spring I was very honored to be elected president. I am looking forward to my two year term and what that can mean for advisors on the IUPUI campus.

I enjoyed teaching the capstone class again this year. Helping students prepare for their next major step in life is a highlight of my job. One of the students in capstone this year had stopped out of school for a few years to support a family member. She did graduate this May. She came back to tell me how thankful she was for the interviewing skills we worked on in class. She shared with me that she felt sure she would not have gotten her new job in a forensic lab without the interviewing practice. I am proud of the capstone class—it is a true collaboration between everyone in the program! We all provide our strengths to help bridge the gap for students by requiring development of career skills, review of basic forensic knowledge, research on forensic science topics, and presentation of research. I worked with Gina Londino this year to create a poster on the “Evolution of the Capstone Experience for the Millennial Student” which she presented at Great Lakes Teaching and Learning Conference. It was great to reflect on the changes I have made in the class over the last three years, as well as the impact those changes have had in student lives.

Some of our amazing FIS students (both majors and minors) in a courtroom experience for FIS 41500 Forensic Science and the Law taught by Hon. Cale Bradford.

Best part of my year—seeing our students graduate!!!
Student Demographic Profile (Fall 2014)

- Undergraduate (121)
- Graduate (3)
- Full Time (111)
- Part Time (13)
- Male (22)
- Female (102)
- Freshman (31)
- Sophomore (26)
- Junior (23)
- Senior (41)
- Under 18 (4)
- 18 to 20 (71)
- 21 to 22 (29)
- 23 to 24 (9)
- 25 to 32 (6)
- 33 to 59 (5)
Student Demographic Profile (Fall 2014)

Where are the out of state students from?

- California
- Florida
- Hawaii
- Illinois
- Michigan
- Ohio
- Texas
- Washington
- United Arab Emirates
- Portugal

Total Students Pursuing FIS BS at IUPUI Fall 2014
Undergraduate Student Academic Profile (Fall 2014)

The FIS Program is well represented on:

- The School of Science (SOS) Dean’s Honor List which requires a minimum 3.5 term gpa
- The Science Scholar’s List which requires completion of at least 26 credits and 3.75 cumulative gpa

**Fall Term GPA**

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<tr>
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**Spring Term GPA**

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<td>A, A-</td>
<td>28%</td>
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<tr>
<td>C+, C, C-</td>
<td>31%</td>
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<tr>
<td>B+, B, B-</td>
<td>30%</td>
</tr>
<tr>
<td>Less than C-</td>
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The FIS Program is well represented on:

- The School of Science (SOS) Dean’s Honor List which requires a minimum 3.5 term gpa
- The Science Scholar’s List which requires completion of at least 26 credits and 3.75 cumulative gpa
FIS Trends

FIS Undergraduate Students

<table>
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University College Students Intending to Become FIS Majors

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<td>2009</td>
<td>100</td>
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<tr>
<td>2010</td>
<td>72</td>
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<td>2011</td>
<td>79</td>
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<tr>
<td>2012</td>
<td>76</td>
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<tr>
<td>2013</td>
<td>53</td>
</tr>
<tr>
<td>2014</td>
<td>52</td>
</tr>
</tbody>
</table>
Where do FIS students go after graduation?

Below is a sampling of places our undergraduate students have gotten employment.

- Agilent Technologies
- AIT Laboratories
- Anheuser Busch Brewery (Missouri)
- Belize National Forensic Science Service (Belize)
- Bismarck Crime Laboratory (North Dakota)
- Buchi Laboratory Equipment (North Carolina)
- Carrollton Police Department (Kentucky)
- Colorcon
- Covance Laboratories
- Deaconess Health System
- Drug Enforcement Administration (DEA, Maryland)
- Dupage County Forensic Science Center (Illinois)
- Eli Lilly and Company
- Florida Department of Law Enforcement (Florida)
- Fort Wayne Police Department
- Heritage Crystal Clean
- Indiana Blood Center
- Indiana State Department of Toxicology
- Indiana State Police Forensic Laboratory
- Indianapolis-Marion County Forensic Services Agency
- IU Simon Cancer Center
- Lancaster Laboratories
- Marion County Coroner’s Office
- Miami Valley Regional Crime Laboratory (Ohio)
- Mid America Clinical Laboratories
- Pepsico
- Quintiles Laboratories
- Raabe Company (Wisconsin)
- Roche Diagnostics
- Sacramento County District Attorney’s Office (California)
- Southern Illinois University Edwardsville
- St. Charles County Sheriff's Department (Missouri)
- St. Vincent Health
- Strand Analytical Laboratories
- United States Drug Testing Laboratory (Illinois)
- United Water
- University of Miami Miller School of Medicine (Florida)
- Van Nuys Medical Science Center

Below is a sampling of places our undergraduate students have attended graduate school.

- Drexel University: Physician's Assistant School
- Indiana University Medical School
- Indiana University: Law School
- IUPUI: MS in Forensic Science
- Marion University School of Osteopathy
- Michigan State University
- University of Colorado Denver: Ph.D. in Biology
- University of Tennessee: Ph.D. in Chemistry

Below is a sampling of places our graduate students have gotten employment.

- Aria Diagnostics
- Butler University
- Colorado Bureau of Investigation
- Denver State Police
- Eli Lilly and Company
- Ideal Innovations, Inc. (Afghanistan)
- Indiana State Department of Health
- Indiana State Police Forensic Laboratory
- Microbac Laboratory Services
- Ocean Optics, (Florida)
- State of Colorado Biology Laboratory
- Sun King Brewery
- Texas Department of Public Safety
Publications by FIS Faculty

Dr. Nick Manicke


Dr. Christine Picard

Prof. Gina Londino

Dr. Susan Walsh


Dr. John Goodpaster


Honorable Cale Bradford
Presentations by FIS Faculty


Presentations by FIS Faculty


J.V. Goodpaster, “Debunking the Myths Surrounding Detection of Explosives by Canines,” Curtin University, Perth, Australia, September 2014.

# Undergraduate Student Research

Below is a sampling of research experiences undergraduate FIS students engaged in this year.

<table>
<thead>
<tr>
<th>Student</th>
<th>Mentor</th>
<th>Research Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jessica Espino</td>
<td>Dr. Lisa Jones</td>
<td>Expression of GCamP2 for In Cell FPOP</td>
</tr>
<tr>
<td>Hannah Caito</td>
<td>Dr. Christine Picard</td>
<td>Optimization of Population Genetic Methods for <em>Hermetia illucens</em>, the Black Soldier Fly</td>
</tr>
<tr>
<td>Angela Salamone</td>
<td>Dr. Christine Picard</td>
<td>Optimization of Population Genetic Methods for <em>Hermetia illucens</em>, the Black Soldier Fly</td>
</tr>
<tr>
<td>Sarah Mehling</td>
<td>Prof. Gina Londino</td>
<td>ChromaCal Project</td>
</tr>
<tr>
<td>Adrienne Kelly</td>
<td>Prof. Gina Londino</td>
<td>Advanced Microscopy Laboratory Exercises</td>
</tr>
<tr>
<td>Shannon Cook</td>
<td>Dr. George Sandusky</td>
<td>DNA/RNA Degradation Rate in Long Term Fixed Museum Specimens</td>
</tr>
<tr>
<td>Kristen Clark</td>
<td>Dr. Nick Manicke</td>
<td>Chemical Imaging of Fingermarks</td>
</tr>
<tr>
<td>Jessica Bosse</td>
<td>Dr. Nick Manicke</td>
<td>Analysis of Marijuana Metabolites in Urine</td>
</tr>
<tr>
<td>Clinton Carroll</td>
<td>Dr. John Goodpaster</td>
<td>Total-Vaporization Solid-Phase Microextraction in the Analysis of Blowfly Pupae</td>
</tr>
<tr>
<td>Heather Krueger</td>
<td>Dr. John Goodpaster</td>
<td>Determination of Hydrogen Sulfide as a Signaling Molecule in Stem Cells (collaboration with IUSM)</td>
</tr>
<tr>
<td>Lindsey VanCleave</td>
<td>Dr. John Goodpaster</td>
<td>Total-Vaporization Solid-Phase Microextraction in the Analysis of Blowfly Pupae</td>
</tr>
<tr>
<td>Katherine Haskell</td>
<td>Dr. Janna Hilligoss through Life Health Sciences Internship Program (LHSI)</td>
<td>Experimental Testing of Drug to Determine Efficacy of Suppression of TTR Gene Stopping Progression of Familial Amyloidosis Polyneuropathy.</td>
</tr>
<tr>
<td>Max Jacobsen</td>
<td>Dr. George Sandusky (LHSI)</td>
<td>Whole Slide Image Analysis Quantification Using Aperio Digital Imaging in a Lung Cancer Mouse Model</td>
</tr>
<tr>
<td>Charishma Kasipathi</td>
<td>Dr. Imranul Alam (LHSI)</td>
<td>Osteocyte-specific Overexpression of Human WNT16 Increases Both Cortical and Trabecular Bone Mass and Improves Bone Strength in Mice</td>
</tr>
</tbody>
</table>
## Graduate Student Research Being Done with FIS Faculty

<table>
<thead>
<tr>
<th><strong>Student</strong></th>
<th><strong>Mentor</strong></th>
<th><strong>Research Focus</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rachel Potter</td>
<td>Dr. Nick Manicke</td>
<td>Development of drug screening methods for forensic toxicology</td>
</tr>
<tr>
<td>Brandon Bills</td>
<td>Dr. Nick Manicke</td>
<td>Toxicology</td>
</tr>
<tr>
<td>Dana Bors</td>
<td>Dr. John Goodpaster</td>
<td>Determining the spatial distribution of explosive residues on post blast debris</td>
</tr>
<tr>
<td>William Kranz</td>
<td>Dr. John Goodpaster</td>
<td>Identification of blow fly pupae based upon lipid profiling</td>
</tr>
<tr>
<td>Jordan Ash</td>
<td>Dr. John Goodpaster</td>
<td>Trace analysis of nitrate ester explosives</td>
</tr>
<tr>
<td>Gina Dembinski</td>
<td>Dr. Christine Picard</td>
<td>Applying single nucleotide polymorphism (SNP) analyses of human DNA to predict externally visible characteristics</td>
</tr>
<tr>
<td>Anne Andere</td>
<td>Dr. Christine Picard</td>
<td>The computational side of genetics and molecular biology in Forensic Entomology</td>
</tr>
<tr>
<td>Charity Owings</td>
<td>Dr. Christine Picard</td>
<td>The molecular and ecological characterization of beetles and mites associated with terrestrial vertebrate decomposition</td>
</tr>
<tr>
<td>Abeer Mohsen Salam</td>
<td>Dr. Christine Picard</td>
<td>Identification of some forensically important blow flies from Egypt using partial sequencing of the mitochondrial COI gene</td>
</tr>
<tr>
<td>Ryan Eller</td>
<td>Dr. Susan Walsh</td>
<td>Facial parameter predictions and program development</td>
</tr>
<tr>
<td>Charanya Muralidharan</td>
<td>Dr. Susan Walsh</td>
<td>Hair color sequencing, RNA sequencing on beard facial hair</td>
</tr>
</tbody>
</table>

Rachel Potter, FIS graduate student, in the new lab
Sarah Lewis

I spent the summer interning with the DEA branch in Chicago where I worked alongside three fingerprinting specialists. One of my major projects was working on a validation for the product Lumicyano, a one-step fluorescent superglue. Lumicyano is used on multiple substrates that are commonly brought in as evidence to the DEA, cling wrap, plastic ziplock bags, food saver bags, and aluminum foil. When I wasn’t fuming and photographing test materials, I was working side by side with the specialists, helping prep and fume evidence, applying Rhodamine 6G dye, and taking photographs.

Having the chance to be a fingerprint intern at the DEA has been a once in a lifetime chance. I came into this experience with no practical knowledge, and I will leave with skills I never thought I could have. I jumped on every opportunity to learn a new skill or trick, whether it was writing up reports, learning the different ways to treat cardboard vs. ziplocks, or even the tricks to comparing prints using a computer or a magnifying glass. The forensic scientists were full of helpful information and many times I would just walk into the lounge and end up discussing DNA verse fingerprinting or different paths a forensic career could take. This internship has cemented my determination and increased my drive to work as a forensic analyst, and maybe even get certified as a fingerprint specialist!

Erica Miller

This summer my main project at the Drug Enforcement Administration (DEA) was Quantitative Method Validation. With this project I was responsible for the solution preparation, data collection, and data evaluation. Data collection included gaining valuable experience on both GC-FID and HPLC instrumentation. I was responsible for setting up my own methods, sequences, as well as processing all the final data, and organizing it in a spreadsheet to ensure it passed the laboratories policies. Through all this, I have learned by spending valuable time on different GC-FID instruments and learning the interfaces of each one.

Along with this project, I was assigned others including Reference Material Verification, which allowed me to gain experience on both the IR -ATR and GC/MS in order to compare current data with past data to ensure samples had not degraded over time.

This internship with the DEA was something beyond imaginable. The experience I gained this summer was beyond anything one could learn from just being in a classroom setting. The experience I gained this summer will last me a lifetime.
Alissa Partyka

I spent the summer interning with the Lake County Sheriff’s Department. I had the opportunity to spend time in various units of the department such as: aviation, marine, crime lab, special victims unit, detective’s bureau, jail, and many others. This experience allowed me to see how each unit in the department works together to solve crimes or prevent them from happening. I spent time learning about each department and their main goals and focuses. Each week I changed units and met new people where I would observe something completely different than I had already seen. I was able to go in the Lake County Sheriff’s helicopter to do a routine patrol which covered all of Lake County. I also spent multiple days in the crime lab where I saw “The Wall” which is a wall of photographs of some of the worst crime scenes in the county and observed the processes and procedures of evidence handling and testing. This internship encompassed much more than I expected, and it really allowed me to be in the field to see how each unit operates in the air, water, and on land for the greater goals of the whole department.
This summer, I interned at the Evansville Police Crime Scene Unit (CSU). I experienced many interesting and intriguing things. I accompanied officers on three runs, saw an autopsy, dusted for fingerprints, helped the Sergeant lead a class for children at a local school, and labeled evidence for storage in a current case. Of the three runs, two were domestic violence, with the other being a suicide. Officers in the Crime Scene Unit have been very willing to teach me everything about what being a CSU Detective involves. I spoke with and learned from Officer Lincoln, video analyst, Officer Gentry, fingerprint analyst, Officer Walker, a detective, Officer Vonderscher, a detective, and Officer VanCleave, my contact and Sergeant of the CSU. I am grateful for all the work they put in to allow me to have such an educating and positive experience.

Jeffery Kinkade

This summer I spent my time interning at the Marion County Coroner’s Office. My experience has really opened my eyes to all aspects of death investigation. I learned about all of the steps involved in a coroner’s case, from being on the scene, attending an autopsy, working with family members, and getting a death certificate signed. My role as an intern consisted mainly of answering phones and doing greensheet investigations. Greensheets are when either the doctor refuses to sign a death certificate or something was incorrect on a signed death certificate. When this happens, we investigate the individual completely, including information on their past medical and social histories, any medication they may be taking, and their terminal episode.

As interns, we were also given the opportunity to work in pathology, assisting in the daily duties of an autopsy, and going on scene runs. Scene runs allowed us to ride along with a deputy coroner and investigate a death from beginning to end. Over the span of the summer, each of the interns were also working on an individual project. I was researching all of the homeless deaths from 2012-2015 and compiling data such as the cause/manner of death, what the decedent was wearing, and what the temperatures were like at their time of death. I feel like this internship has shown me an in-depth, behind-the-scenes look at what occurs at a coroner’s office on a daily basis.

Allison Hodgin
Hannah Caito

IUPUI internship program inspires future STEM educators

News Release from the School of Science

Solving some of the world’s greatest fairy tale mysteries may just be the next breakthrough for young forensic investigators in Indianapolis. Did the big bad wolf actually blow down the three little pigs’ houses? Is Cinderella really the owner of the glass slipper?

Hannah Caito, a senior forensics and biology student at the School of Science at Indiana University-Purdue University Indianapolis, uses forensic science to make mysteries like these come to life for visitors of all ages at the Children’s Museum of Indianapolis.

As one of eight science undergraduate students involved in the STEM Summer Internship, Caito works in the SciencePort about the interactive biotechnology learning center of the Children’s Museum creating hands-on exhibits that spark and nurture children’s interest in science. Growing up with seven siblings, Caito is a natural around children, but says she hadn’t seriously considered a career in K-12 STEM education until this internship.

“We had one family that worked together solving the fairy tale forensic mysteries for about an hour and a half,” she said. “Even the parents thought it was really cool and helped out. Finding creative ways like this to teach children about forensics so that they’ll learn and actually understand what’s going on has been really fulfilling.”

With STEM occupations growing at a rate that is three times faster than non-STEM careers, STEM educators are vital for teaching and inspiring future generations of scientists and innovators. Developing current students’ passion for STEM education is an important step that Kim Nguyen, the director of operations in the Urban Center for the Advancement of STEM Education (UCASE) at IUPUI, prides the Center’s STEM Summer Internship in accomplishing.

“We have distinguished mentors that help the interns to see teaching is really an important job and how rewarding of a career it can be,” Nguyen said. “Children and interns alike learn from lesson plans that reflect the real world, showing interdisciplinary relationships across all STEM fields.”

The STEM internship engages current undergraduate science, technology, engineering and mathematics (STEM) students in “educationally purposeful activities that allow them the opportunities to examine their interest in and disposition for teaching science in middle or high schools.”

During the internship, students early in their undergraduate careers are paired with STEM education mentors at locations such as the Indianapolis Zoo Education Center, the Clinical and Translational Sciences Institute and the IUPUI Bepko Learning Center.

IUPUI School of Science Dean Simon Rhodes commends the STEM Summer Internship for developing the interests and skills of undergraduate students in STEM education: “This excellent program supports the development of our students towards being STEM teachers, a career goal that is so important to the future of our state.”
Lindsey Church

This summer I participated in an internship with the Indiana State Police Forensic Laboratory in Indianapolis. I worked on one project during my internship. The project was looking at the success rates of performing latent print analysis before DNA analysis and vice versa. To do this, I looked at cases that involved dual exams (latent print and DNA analysis) from the past five years. I tabulated different types of data such as if a viable print was obtained, if a DNA profile was generated, what print processes were done on the items, etc. The goal of this project was to determine the best method of doing dual exams on different types of evidence items. Aside from working on my projects, I had the opportunity to watch analysts perform analysis on different forms of evidence, travel to a regional lab, and watch expert testimony in the court system. My overall experience with the Indiana State Police Forensic Laboratory was fantastic, and I am very thankful for the opportunity.

Dana Yenko

This summer I participated in an internship with the Washington State Patrol in Tacoma, Washington. During the course of my internship, I did several projects in the trace evidence area including creating reference spectra of fibers using IR, creating reference samples of glass and paint, and calibrating a Glass Refractive Index Measurement (GRIM) system. Part of my internship involved shadowing DNA analysts during their work as well as watching one analyst testify in court.

Dana is a dual major between FIS and the Criminal Justice Program in the School of Public and Environmental Affairs. This internship builds upon her experience last year when she participated in a study abroad experience about security development in the Balkans.
Community Involvement

Dr. Christine Picard acted as a mentor for Anne Ullyot, a Park Tudor high school student, who was completing a Global Scholars project. She spent the summer working in Dr. Picard’s lab.

Grace LeFevre joined Dr. Christine Picard’s lab for the summer as a Project SEED student, currently homeschooled in Indianapolis. She worked on the annotation of development genes in *Cochliomyia macellaria*.

Dr. John Goodpaster presented to Bloomington High School North “Chemistry as a Forensic Science, and “CSI: Fact of Fiction?” to Pike High School in Indianapolis.

Prof. Gina Londino presented at Brooks Elementary School for Math and Science Night.
Forensic Science Club

The Forensic Science Club was very involved on campus this year. They had teams in the inaugural Golden Googles event, the Academic Bowl, and the IUPUI Regatta. They also sponsored a Fall Festival event as well as the traditional Spring Murder Mystery Dinner with a Scooby Doo theme for the whole campus. Off campus they provided hands-on activities for National Chemistry Week at the Children’s Museum and Celebrate Science Indiana event at the State Fair Grounds. They also toured AIT Laboratory and adopted a family at Christmas time.
Student Awards

Forensic and Investigative Sciences Awards

• Outstanding Research Award: Shannon L. Cook, Forensic and Investigative Sciences; Angela F. Salamone, Forensic and Investigative Sciences

• Academic Achievement Award: Jessica M. Bosse, Forensic and Investigative Sciences & Chemistry

• Student Leadership Award: Alissa Flores, Forensic and Investigative Sciences

Congratulations to the 2015 Top 100 Students!

Dana Yenko
Bremerton, WA
Junior
The J. Edgar Hoover Foundation Scholarships

Since the founding of The J.Edgar Hoover Foundation, over three and one half million dollars have been distributed for scholarships, grants for education, as well as legal and professional law enforcement training.

Scholarships and grants are provided to selected college and university students pursuing undergraduate and graduate degrees. These scholarships are presented based on a combination of merit and need, including individuals who may not have an opportunity for higher education. Many recipients are pursuing degrees in law and law enforcement related studies. The J. Edgar Hoover Foundation has awarded many scholarships to the sons and daughters of special agents of the FBI, as well as state and local law enforcement officers.

Each year, a Scientific Scholarship in the amount of $25,000 is awarded to a deserving candidate. This award is conferred based on a candidate’s interest in pursuing a forensic science related career in law enforcement.

The Foundation’s Board of Directors solicits candidates for the Scientific Scholarship from colleges and universities with accredited forensic science programs. The candidates are then reviewed during the annual meeting of the Foundation’s Board where the selection of a deserving recipient is made. The Scientific Scholarship program has been in effect since 2001 and to date over $250,000 has been awarded.

Description taken from The J. Edgan Hoover Foundation website at http://jedgarhooverfoundation.org/scholarships.asp.

Congratulations, Gina Dembinski, Winner of The J. Edgar Hoover Foundation Scholarship!!!
Hats designed by FIS grads!!!

Congratulations FIS Class of 2015!!!

ABOUT TIME

IUPUI
2015

CRIME SCENE

DNA

Thanks Mom

forensic
2015

science

NOW BOTH THIS CYLINDER AND I ARE GRADUATED!

IUPUI 2015
2015 Graduation
Funding

**Dr. John Goodpaster**


*John Goodpaster (PI)* and *Christine Picard (co-PI)*, “Species and Age Determination of Blow Fly Pupae Based upon Headspace Analysis,” National Institute of Justice, 1/14-12/15, $197,491.


**Prof. Gina Londino**

*Gina Londino*, School of Science Technology Grant, $30,000 for an Infrared microscope.

*Gina Londino*, School of Science Technology Grant, $10,000 for seven light microscopes.

**Dr. Nick Manicke**


**Dr. Christine Picard**

*Christine Picard (PI)* and *Susan Walsh (Co-PI)*, School of Science Technology Fund, $50,049.

*Christine Picard (PI)*, OVCR EMPOWER Grant, $5000.

*Christine Picard (PI)*, Purdue Research Foundation International Travel Grant, $760.

*Christine Picard (PI)*, Purdue Research Foundation Summer Faculty Grant, $10,400.

Aaron M. Tarone (PI) and *Christine Picard (PI on the subcontract)*, “Genomic Tools to Reduce Error in PMI Estimates Derived from Entomological Evidence,” National Institute of Justice, 1/13-12/15, $496,661 ($183,397 to Christine Picard).

**Dr. Susan Walsh**


*Susan Walsh (PI)*, “Improving the Prediction of Human Quantitative Pigmentation Traits such as Eye, Hair and Skin Color Using a Worldwide Representation Panel of US and European Individuals,” National Institute of Justice (NIJ), 1/15-12/31/17, $1,123,403.00.

**Total funding for the FIS Program exceeded $1.7 million dollars!**