



**International
Forensic Research
Institute**



Forensic Science Research at Florida International University

**Jose Almirall, Professor
Chemistry and Biochemistry and
Director
International Forensic Research Institute**

FIU at the Forefront in Forensic Sciences

A pioneer in the discipline for over 40 years

1974: FIU Criminalistics program founded

- one of the oldest undergraduate forensic programs in FL

1997: International Forensic Research Institute (IFRI) founded

- first academic forensic science center in FL

1998: first to offer an M.S. in Forensic Science in FL – largest in FL

2004: one of the first programs in the US to be accredited by AAFS
(now in third FEPAC/AAFS accreditation cycle)

2005: one of few in the country to offer Ph.D. in Forensic Chemistry

2014: Professional Science Masters in Forensic Science (20 students)

2016: 40+ students in Ph.D. in Forensic Chem/Bio (30 MS, 30 BS)

IFRI now widely recognized as a premier forensic science program

IFRI Strengths

- Faculty, scientific support staff and students
 - Vibrant graduate programs (PhD Forensic Chemistry, PhD in Forensic Biology, MSFS, PSM FS) ~ 80 students
- Research Capacity and Forensic Science Expertise
 - Experienced research faculty with a background in forensic science
 - Over a decade of sustained productivity in forensic science research (> 20 active grants currently)
 - State-of-the-art laboratory/instrumentation facilities
- Leverage existing relationships with government and industry partners

IFRI Core Faculty

- **Prof. Kenneth Furton**, FIU Provost/Executive VP- Canine Olfaction/Analytical Chemistry
- **Prof. Bruce McCord**, Analytical Chemist interested in instrumentation miniaturization and improving chromatography tools for DNA, drugs and explosives analysis.
- **Prof. Dee Mills**, Director of the DNA Facility and Molecular Biologist is interested in human and non-human DNA analysis for forensic purposes and the use of microbial forensics.
- **Prof. Anthony DeCaprio** - Director of Undergraduate Programs and of the Analytical and Forensic Toxicology Facility, Effects of Human Exposure to Drugs, Forensic Toxicology
- **Prof. Jeff Wells** – Forensic Entomology and non-human DNA Analysis
- **Prof. Yi Xiao**, Asst. Prof. of Chemistry, Rapid drug analysis (Aptamer chemistry)
- **Prof. Jose Almirall**, IFRI Director, Department of Chemistry – Trace Evidence Analysis/Materials Characterization and Provenance, Field Detection of Drugs and Explosives
- **Dr. Jeannette Perr**, Director of the PSM in Forensic Science
- **Dr. Kevin McElfresh**, Asst. Director of IFRI – Next Generation/Mixture DNA Analysis
- **Dr. Anamary Tarifa**, Analytical and Forensic Toxicology Laboratory Manager/Instructor
- **Dr. Sarah Jantzi**, Trace Evidence Analysis Facility Laboratory Manager

- **12 other participating faculty throughout the university (+ 6 Visiting Scientists)**

Prof. Yong Cai, Environmental Forensics

Prof. Francisco Fernandez-Lima, Mass Spectrometry

Prof. Fenfei Leng, Forensic Biochemistry

Prof. Ron Fisher, Forensic Psychology

Prof. Piero Gardinali, Environmental Forensics

Prof. Nadja Schreiber Compo, Forensic Psychology

Prof. Konsta Kavallieratos, Nuclear Forensics

Prof. Kalai Mathee, College of Medicine/Biochemistry

IFRI Strengths

- Knowledge creation from basic and applied research
 - Peer-reviewed literature 2015-2016 (**33 pubs**), '14-15 (**30**), '13-14 (**34**), '12-'13 (**27**), '11-'12 (**28**), '10-'11 (**25**) – **177**
- Maintain accredited **undergraduate and graduate** academic programs in forensic science education
Initial accreditation in 2004, reaccredited in 2009 and 2015
- Service to the forensic science community
 - Serve on national and international advisory boards (ie. 4 FIU faculty serve on the NIST OSAC, editorial boards, etc.)
- Close ties to the practitioner community
 - Annual Workshops and symposia in Chem/Bio and Psychology to the practitioner community

Forensic Science Symposium

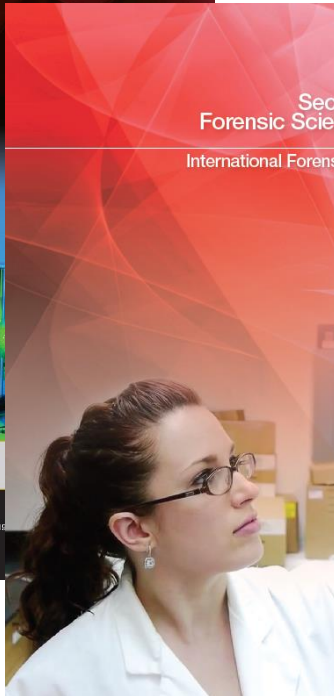
next symposium planned for May 2017

2012



150 attendees
March, 2012

2013



209 attendees
March, 2013

2014



198 attendees
April, 2014

2015



201 attendees
May, 2015

2016



200 attendees, March 2016
Hosted I/UCRC IAB members

Front covers for IFRI Symposium proceedings.

http://ifri.fiu.edu/news/2016/ifri-symposium-proceedings-available/2016_ifri-symposium_program.pdf

Springer article dashboard depicting almost 500 views in 1 year post publication .

Article Usage Dashboard



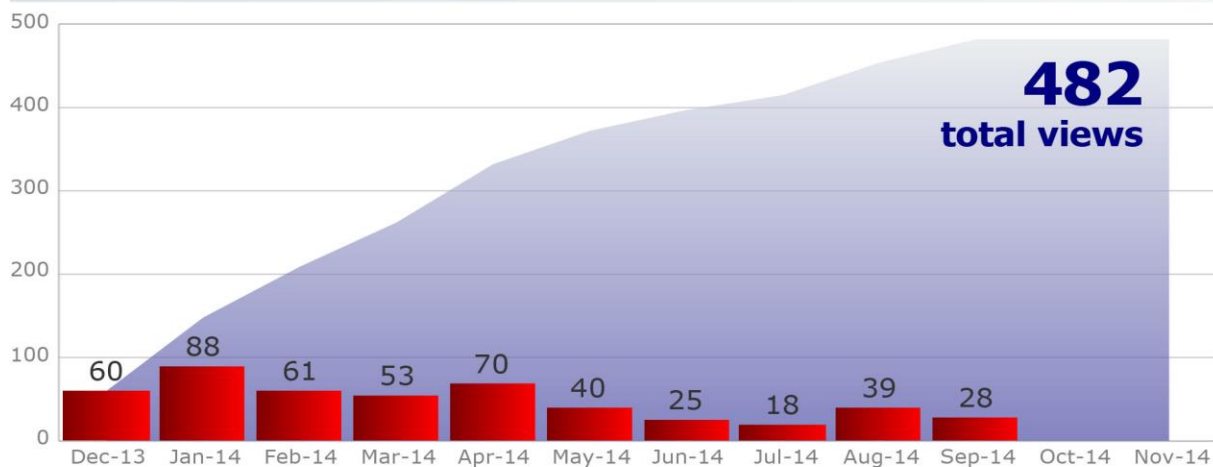
Characterization of toners and inkjets by laser ablation spectrochemical methods and Scanning Electron Microscopy-Energy Dispersive X-ray Spectroscopy

Trejos, T.; Corzo, R.; Subedi, K.; Almirall, J.

Spectrochimica Acta Part B: Atomic Spectroscopy, Volume(s)
92, 05-Dec-2013, Pages 9-22

[View Article](#)

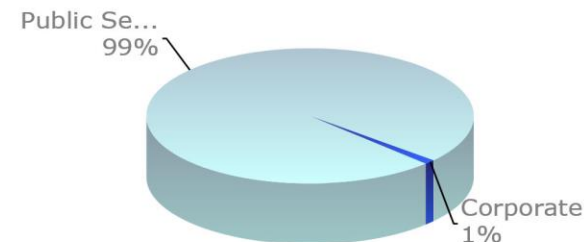
Trend and cumulative views



Views by geography

Top countries	Rank	Views	Pct
United States	1	96	20%
China	2	47	10%
India	3	30	6%
Japan	4	24	5%
Brazil	5	19	4%

Corporate versus Public Sector



Impact

- Designer Drug Database (DeCaprio group)
- SWGDOG (Furton Group)
- Degraded/Rapid DNA Analysis (McCord Group)
- Non-Human DNA Methods (Mills Group)
- Novel Uses of Entomology (Wells Group)
- Standardization of Methods (Almirall Group)
 - EAWG (21 laboratories, 3 ASTM Methods)
 - Glass Interpretation standards (10 labs)
 - Tape Analysis standards (9 labs)

Core Laboratory Facilities

- Analytical/Forensic Toxicology Laboratory
 - State-of-the-art instrumentation with 4 Agilent MS systems valued at \$ 2 M
- Trace Evidence/Materials Analysis
 - State-of-the-art instrumentation in microscopy, materials analysis (LIBS, LA-ICP-MS, uXRF) (\$ 3 M)
- Forensic DNA Laboratory
 - Human/non-human DNA profiling (\$ 1.6 M)

These user facilities are managed by PhD-level staff

Professional Science Master's in Forensic Science

School of Integrated Science and Humanity



Prepare for the next stage of your career in Forensic Science

Gain the skills necessary for a management career in Forensic Science. This unique degree program combines science application with business fundamentals, personnel management and communication skills to give you an edge in today's job market.

What is the Professional Science Master's Degree?

An innovative degree program, the PSM-FS at FIU enables students to pursue advanced training in forensic sciences while developing highly valued business skills, replacing the need for an MBA. The program combines rigorous studies in forensic science with skills-based coursework in management. The PSM-FS requires a final project that is a "real-world" internship in a science-related business or public sector enterprise.

Why should I enroll?

Employers of recent PSM graduates in the biosciences range from large, multinational pharmaceutical companies to newer biotechnology companies. PSM-FS graduates with experience in our nation's private and public crime laboratories will be in demand. Regardless of the employment sector, PSM graduates are finding exciting, well-compensated careers. The PSM-FS at FIU will:

- Emphasize written and verbal skills, leadership, forensic science and business skills
- Be a multidisciplinary/interdisciplinary program
- Include a capstone internship with a project report as opposed to thesis
- Provide connections to potential employers through internships
- Accommodate most working professionals

New PSM in Forensic Science initiative Fall 2014 (flyer)

IFRI External Advisory Board

(expected to interact with new Industry Advisory Board of the IUCRC)

Name	Affiliation
Brad Campbell	Director, Federal Forensic Laboratory located in Miami
Dr. Cecelia Crouse	Director, Palm Beach County Sheriff's Office Forensic Laboratory
Dr. Diane Boland	Director, Miami Dade Medical Examiner, Toxicology Laboratory
Craig Johnson	President and CEO, Field Forensics Inc., Largo, FL
Kevin Lothridge	Executive Director, NFSTC, Largo, FL
Carol Henderson	Director, National Clearinghouse for Science, Technology and the Law and Professor of Law, Stetson University, FL
Claudine Carter-Pereira	Director, Broward Sheriff's Office Forensic Laboratory
Christopher Shinn	Principal, Law Enforcement Memorial High School, Dade County Schools
Stephanie Stoiloff	Senior Bureau Commander, Miami Dade Police Forensic Laboratory
Dr. Michael Wagner	Director, Broward County Forensic Toxicology Laboratory
Agnes Winokur	Associate Director, Federal Laboratory (FIU Alum)

Example FIU Research Projects

FIU Project 1. Materials Characterization using LA-ICP-MS and LIBS

FIU Project 2. Chemical databases to strengthen the interpretation of evidence

FIU Project 3. Portable Mass Spectrometry Database for Drug Analysis

FIU Project 4. Toxicological Screening of Blood Drops for Designer Drugs

FIU Project 5. Air Sampling for Drugs and Explosives Detection

FIU Project 6. Epigenetic methylation for age and body fluid determination

FIU Project 7. Rapid Direct PCR for high-speed genotyping

FIU Project 8. Resolving complex mixtures using next generation sequencing

FIU Project 9. Differential extraction of Rape kits using pressure cycling

FIU Project 10. Paper Microfluidics for Explosives Detection

but.....

we will also want to hear on what's needed!

IUCRC Research Site Proposal

- Research site @ FIU
 - Willing to partner with one or more universities on specific research projects of mutual interest (already have several collaborations)
- Industry participation
 - 7 companies/agencies have expressed interest to become members
 - 3 of these, we already receive funding for research collaborations
 - Several others, in-kind donations (instrumentation/materials/ supplies)
 - 3 other companies have existing licensing agreements with FIU on IP generated by IFRI faculty
 - 2 start-up companies were formed in 2015 by IFRI faculty, one is incubated at FIU and took part in summer 2015 cohort of I-Corps
 - Research interests cover a wide range of forensic science topics
- Government/International Partners
 - Government, National Labs, Government contractor collaborations
 - Forensic laboratory collaborations
 - International
 - Federal, State and local forensic laboratories

IFRI and the IUCRC Center @ FIU

- Collaborate with other forensic science research centers/universities in research of mutual interest
- Expand on existing collaborations with industry
- Transition basic and applied research to commercial tools and products that will be useful to the forensic science community
- Encourage start-ups and entrepreneurial activities (emphasized in the Provost's Strategic Plan for FIU)

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Patents Awarded / Applications

Almirall was awarded a patent (US 8,668,873 B2) for a ***“Method and Apparatus for Extraction, Detection and Characterization of Vapors from Explosives, Taggants in Explosives Controlled Substances and Biohazards”*** and patent (US 9,267,866 B2) entitled ***“Capillary Microextractor of Volatiles”*** in Feb. 23, 2016. Dr. Almirall was also assigned a provisional patent (62/081,217) for a ***“Method for the Detection of Pseudomonas Aeruginosa (PA) Using Volatile Biomarkers”*** in collaboration with a faculty member (Mathee) in the College of Medicine and filed for ***“Cryofocused sampling of volatiles from air using Peltier-assisted Capillary Microextraction”*** .

McCord filed an invention disclosure: ***“Application of alkaline lysis and pressure cycling technology in differential extraction of DNA mixtures”*** and filed for a provisional patent for ***“Paper Microfluidic Devices for Detection of Improvised Explosives”*** (US 14/216,869)

Mills, McCord filed an invention disclosure ***“Gold nanoparticle (AuNP) fungal ID test for the phytopathogen Raffaelea lauricola”***, in April 2016.

Furton was awarded 3 patents (canine olfaction/sampling) in the last three years.

Three companies (**IFS, AirChemistry, and Innovation Detection Concepts**) have been spun-off over the last 3 years at FIU to commercialize IP developed at IFRI.

Alumni Metrics

- Visiting Scientists (20) and Post-docs (15)
- PhD graduates in Forensic Chemistry – 54
- PhD graduates in Forensic Biology - 6
- MSFS graduates since 1998 – 98
- BS in Chemistry and BS in Biology (Forensic Certificate)
- Employed in:
 - Academia (Tenure Track/Research Faculty)
 - West Chester University, West Virginia University, University of Southern Illinois, Ohio University, UT Arlington, University of Amsterdam, Nova Southeastern, Broward College, Miami-Dade College, FIU
 - National Labs/Government research labs
 - NIST, PNNL, Naval Research Lab, Lawrence Berkeley
 - Operational Forensic labs
 - South Korea, FBI, DEA, Army, Secret Service, IC, Several State and Local
 - Industry (support to forensic science labs)
 - Agilent, Perkin Elmer, Morpho Detection, Field Forensics, FLIR Detection

Visiting scientists/Post-docs (2015-2016)

Dr. Natasha Kreitals, a postdoctoral fellow, was hosted in the Almirall group to investigate the commercial viability of CMV, IP developed in the Almirall group. Dr. Kreitals participated as part of the I-Corps program funded by NSF along with PI Almirall and business mentor Digno Caballero. Dr. Almirall also supported **Dr. Anamary Tarifa** during the first half of 2016. **Erica Ferreira Batista**, PhD Student from the Universidade Federal de São Carlos (UFSCar), Brazil was also hosted by the Almirall research group. **Dr. Masataka Sakayanagi**, Yokohama Prefecture forensic laboratory, Japan was hosted in the Almirall laboratory. **Dr. Sigalit Gura** from the Israel Institute for Biological Research (IIBR) in Tel Aviv, joined Dr. Almirall's research group in 2016 for a second sabbatical visit to his group in the last 10 years. **Dr. Sarah Jantzi** is also a Post-doc in the Almirall group.

Dr. Abuzar Kabir is currently being hosted within the Furton research group to develop new sorbent materials for forensic applications. **Dr. Jessica Brown** was also hosted by the Furton group on a travelling fellowship to investigate the detection of land mines. **Dr. Paola Prada** was supported by a grant from the Central Intelligence Agency (CIA) under the supervision of Dr. Kenneth Furton to investigate the ability of birds to detect explosives.

Dr. Carolina Moller is being hosted within the DeCaprio group in forensic toxicology research.

Dr. Wells hosted **Dr. Carlos Augusto Chamoun do Carmo**, a forensic pathologist from Universidade Federal do Rio de Janeiro.

Dr. Gustavo Merola from the University of Verona was hosted by Dr. McCord during the 2015 and Dr. McCord also hosted **Dr. Pero Dimsoski**, a post-doctoral researcher.

Even vice chairs of the NCFS

Thanks for your attention.....

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