



**ARTP**

Applied Research &  
Technology Program

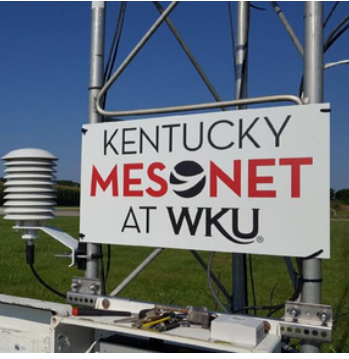
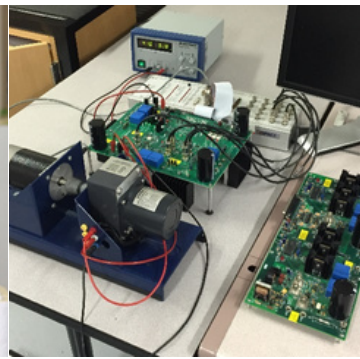
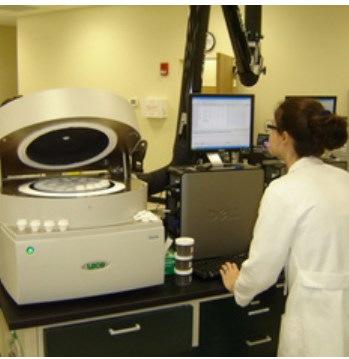
*Powering Applied Research at WKU*



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# DIRECTOR'S WELCOME

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Cathleen Webb  
Director, WKU Applied Research and  
Technology Program  
Associate Dean for Research  
Co-Coordinator, Brewing and Distilling  
Arts and Sciences  
Professor of Chemistry  
Ogden College of Science and  
Engineering

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Welcome to the WKU Applied Research and Technology Program (ARTP). The ARTP consists of 12 scientific and service-oriented Centers and Institutes focused on innovation and collaboration. The Centers and Institutes are designed to meet the research and technical needs of the community, state and nation while providing novel educational opportunities for students through participation in supervised, hands-on applied research. Students are at the heart of the ARTP. We empower students through student-centric applied research. Passionate and creative faculty advisors provide close mentorship of research students sustaining a vibrant academic culture in tune with the needs of our community. We connect students to their future professions through an innovative experience-based education grounded in practice. We support our industrial partners and the development of our regional economy with work-force ready graduates. We embrace complex problems, ask hard questions and discover real solutions. We invite you to explore our website and to look at the exciting work and capabilities of each of the ARTP Centers and Institutes.



Agilent Technologies  
500 Ion Trap LC/MS

Load  Divert

Inject  MS

Valve

Source On

Scanning

Power

Varian 212-LC  
Chromatography Pump

Varian 212-LC  
Chromatography Pump

PN: 3933  
500 LC

APC Gas

APC Heater

Shield Voltage

Drying Gas

# ADVANCED MATERIALS INSTITUTE

The Advanced Materials Institute provides access to advanced scientific instrumentation for characterization of the composition, structure, and properties of materials.

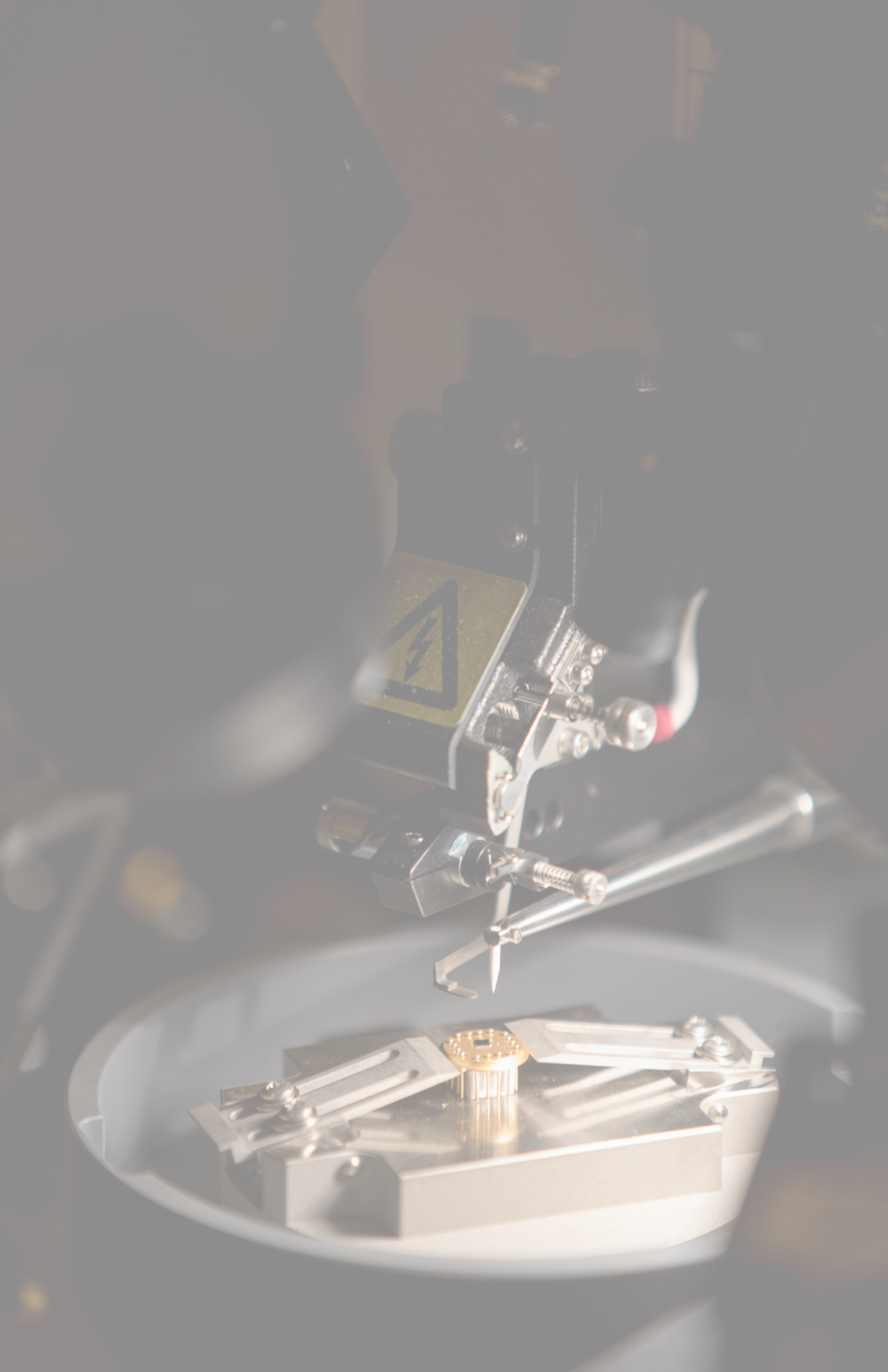
## Goals

- Facilitate and support all the research conducted by the faculty and students at Western Kentucky University.
- To provide scientific support and resources for businesses and industries to solve real world problems.
- Provide access to instrumentation and training to WKU students to increase their knowledge and improve career opportunities

## Core Expertise

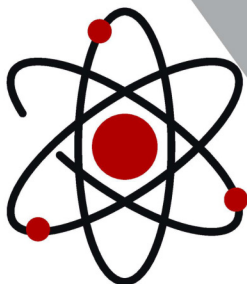
- Ion Chromatography (ALC)
- Atomic Force Microscopy (AFM)
- Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES)
- Liquid Chromatography Mass Spectrometry (LC-MS)
- Gas Chromatography Mass Spectrometry (GC-MS)
- Single Crystal X-Ray Diffraction
- Elemental Analysis
- Bomb Calorimetry
- Thermal Gravimetric Analysis







# APPLIED PHYSICS INSTITUTE



The Applied Physics Institute is a multidisciplinary center performing research and development projects in Materials Science and Advanced Manufacturing, Environmental and Energy Technologies, Information Technology and Nanotechnology. Besides conducting research, it is an efficient teaching facility.

## Goals

- Become the leading Small Business Accelerator in Kentucky.
- Provide resources necessary for development and commercialization of novel products to companies, scholars and inventors.
- Become a center for professional preparation and training of a new class of scientist and engineers, capable of working at the industrial facilities of a new generation.
- Build an academy/industry pipeline, providing employment to WKU graduates.



## Core Expertise

- Materials Science and Advanced Manufacturing
- Renewable Energy Sources, Nanotechnology
- Microfabrication/Microelectronics
- Artificial Intelligence
- Wireless Communication and Information Systems
- Security and Defense
- Novel Methods of Medical Diagnostics



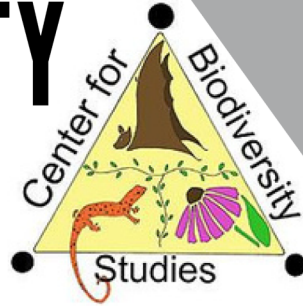
## Core Products/Services

- Microfabrication
- Prototyping, transition from a concept to product
- Design and fabrication of analytical instruments

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# BIODIVERSITY STUDIES



The Biodiversity Center investigates biological diversity at local to global spatial scales, across historical, contemporary, and future temporal scales, and synthesizes and disseminates diversity information to promote appreciation, comprehension, and conservation of biological resources.

## Goals

- Publish more research.
- Present more research at prominent national and international meetings.
- Seek external and internal grants and contracts to support faculty-student research in core areas.
- Emphasize, support, and integrate research, both basic and applied, with undergraduate and graduate students.
- Work to increase the number of Master's and Honors Undergraduate students.



## Core Expertise

- Systematics and Evolution
- Ecology and Conservation
- Human-Wildlife Conflict and Mitigation
- Karst Science



## Student Outcomes

- Successful defenses annually of CBS-funded MS research students and Undergraduate Honors students.
- CBS faculty annually publish research findings in peer-reviewed scientific journals, including several with CBS-funded MS students and Undergraduate students as 1st authors.
- CBS-funded MS students annually obtain acceptance into Ph.D programs and Professional Schools.
- CBS-funded MS students annually secure employment opportunities based on their experiences gained at WKU.



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# Isolation and Characterization of Novel Mycobacterium

## TheloniousMonk Reveals Diversity and Evidence

Melanie B. ... William R. ... Andrew C. ... Robert ... George ...

### Badger

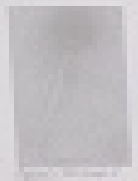
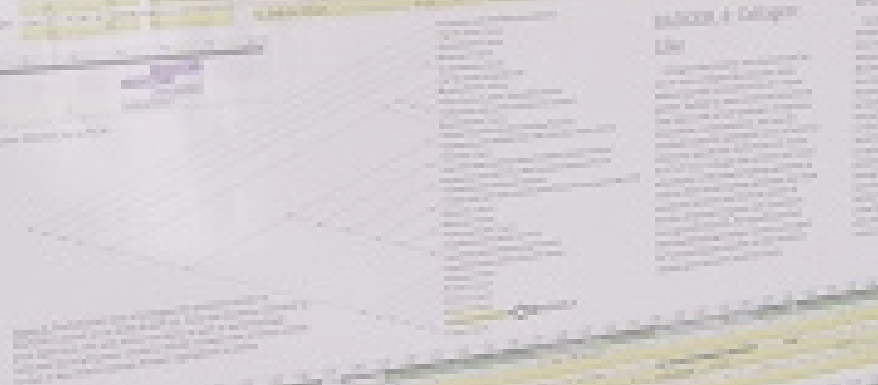


Figure 1. Microscopic images of Badger mycobacteria showing characteristic cording.

Strain	Source	Geographic Location	Year of Isolation	Genetic Characteristics
1	Badger	Wisconsin	2001	...
2	Badger	Wisconsin	2002	...
3	Badger	Wisconsin	2003	...
4	Badger	Wisconsin	2004	...
5	Badger	Wisconsin	2005	...
6	Badger	Wisconsin	2006	...
7	Badger	Wisconsin	2007	...
8	Badger	Wisconsin	2008	...
9	Badger	Wisconsin	2009	...
10	Badger	Wisconsin	2010	...



Strain	Source	Geographic Location	Year of Isolation	Genetic Characteristics
11	TheloniousMonk	Wisconsin	2001	...
12	TheloniousMonk	Wisconsin	2002	...
13	TheloniousMonk	Wisconsin	2003	...
14	TheloniousMonk	Wisconsin	2004	...
15	TheloniousMonk	Wisconsin	2005	...
16	TheloniousMonk	Wisconsin	2006	...
17	TheloniousMonk	Wisconsin	2007	...
18	TheloniousMonk	Wisconsin	2008	...
19	TheloniousMonk	Wisconsin	2009	...
20	TheloniousMonk	Wisconsin	2010	...

### TheloniousMonk



Figure 2. Microscopic images of TheloniousMonk mycobacteria showing characteristic cording.

# BIOINFORMATICS AND INFORMATION SCIENCE CENTER



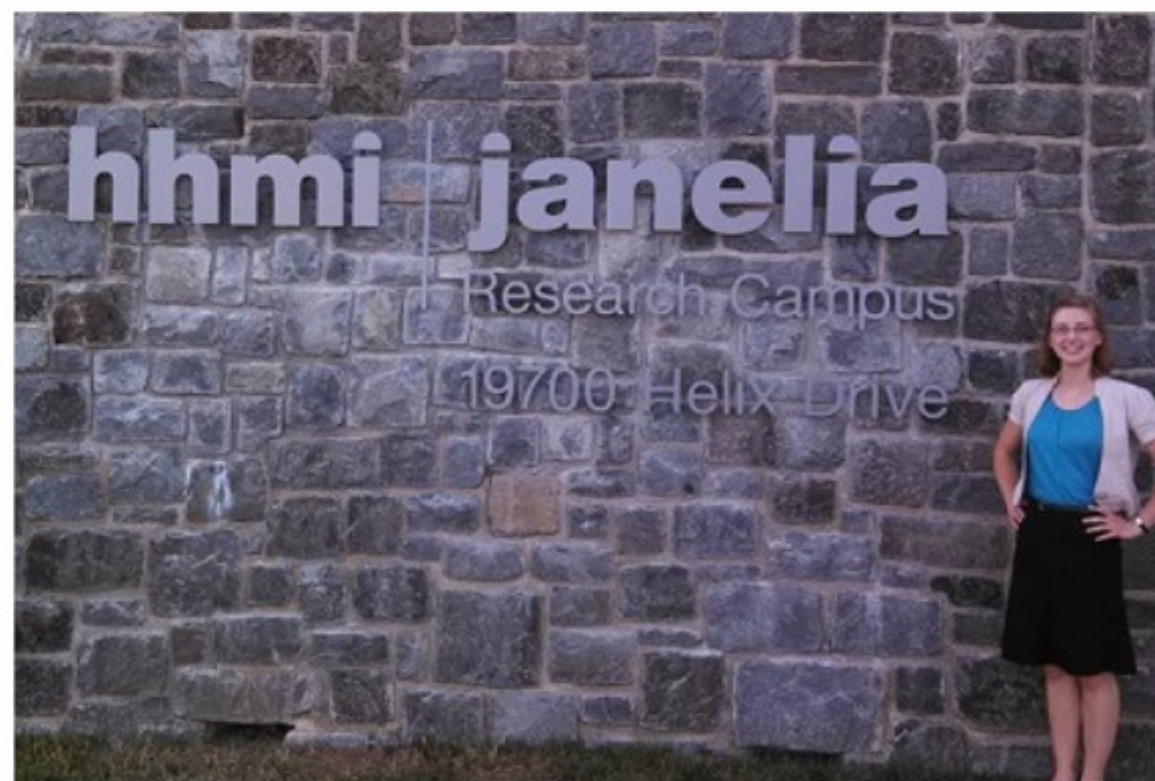
The mission of the Bioinformatics and Information Science Center at WKU is to build and maintain an interdisciplinary community, with student engagement, that will collaboratively propose and solve problems in bioinformatics and information science.

## Goals

- Advance bioinformatics and information science at WKU by bringing together members of the research community.
- Engage students in experiences that combine technical skills, scientific integrity, collaboration, and real-world opportunities.
- Develop a support network for bioinformatics and information research and projects through collaboration and consulting.
- Build a strong interdisciplinary curriculum that will prepare students to compete in an expanding world of information science, enter the informatics workforce, and excel in graduate informatics programs.
- Help members compete for external funding through grants, contracts, and endowments; and to present and publish their results in appropriate venues.

## Core Expertise

- Data Mining
- Fractal Analysis
- Network Analysis
- Signal Processing
- Image Processing
- Operations Research
- Machine Learning
- Artificial Intelligence
- Regression Analysis
- Simulation
- Genomics
- Expression Analysis
- Molecular Kinetics
- Differential Equations



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# BIOTECHNOLOGY CENTER

The Biotechnology Center facilitates hands-on educational opportunities for Biology students and provides technical and educational services for faculty research. This center is a research hub for WKU professors in other departments, as well as Biology faculty, to conduct their research with otherwise inaccessible equipment.

## Goals

- Expand student research and training opportunities.
- Provide support for faculty research.
- Provide or implement new technologies as they become available or needed.
- Develop interdisciplinary activities which utilize biotechnology, including the integration of mathematics, statistics, computer science, and engineering.



## Core Expertise

- TDNA Sequencing
- Real-time PCR
- Quantitative Gel Imaging
- Epifluorescence Microscopy
- Biosafety Level 2 research
- Protein Chemistry
- Tissue Culture



## Student Outcomes (a typical year)

- 25 publications
- 55 presentations
- Grants: QTAG=4 FUSE=10 RCAP=2
- + Involvement and support from external grants

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DIRECTOR:  
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Energy Systems®  
Lab  
2018

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PLC  
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# CENTER FOR ENERGY SYSTEMS

The Center for Energy Systems' provides a multidisciplinary, inviting, and engaging environment in which students develop skills through the successful delivery of industrial projects. With successful projects, the center will advance scientific knowledge and cultivate technological developments for industrial sponsors.

## Goals

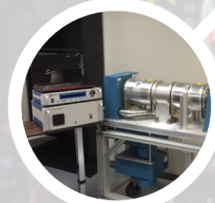
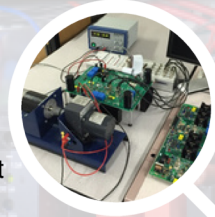
- To take projects from concepts to commercialization by going through robustness, usability, and reliability tests.
- To serve as the research and development arm for industrial companies and complement their internal competencies and capabilities, enabling them to fully focus on their core products and services.
- To become an internationally recognized center of excellence for industrial projects.

## Core Expertise

- New Product Development
- Advanced Test-bed Development
- Real-time Algorithm Development
- System Optimization through Multi-physics Modeling
- Development of Energy-efficient Systems and Products
- Mobile App Development
- Competitive Analysis

## Uniqueness

- Holder of 80+ US and international patents made.
- Certified six sigma black belt engineer.
- Highly qualified full-time researchers ensure product success.



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# CRAWFORD HYDROLOGY LABORATORY

The Crawford Hydrology Laboratory (CHL) provides professional consulting and field and laboratory services regarding groundwater tracing in karst and non-karst areas. This center provides quality supplies and analyses for groundwater traces and conducts full field investigations.

## Projects

- Nationally Leading Laboratory
- Professional Environmental Consults
- Hydrogeological Studies
- Applied Science for Environmental Solutions
- National Park Service Research Partners
- Multi-disciplinary Approaches to Karst Challenges
- Webinars & Field Training
- Informal Environmental Education
- International Research Scholar Exchange Program
- Mammoth Cave Biosphere Region Advisory Council
- US Biosphere Network Working Group
- UNESCO Scientific Programs
- CaveMAB Network Coordination

## Core Services

- Project Design and Consultation
- Laboratory Analysis
- Dye Trace Investigations
- Water Quality Monitoring
- Hydrologic Monitoring



**DIRECTOR:**  
DR. CHRIS GROVES

**ASSISTANT DIRECTOR:**  
LEE ANNE BLEDSOE

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# ENGINEERING CENTER FOR INNOVATION

The purpose of the Engineering Center for Innovation is to work with businesses and industry to facilitate and assist the needs of industry for the betterment of the University and students we serve. We immediately respond to the fast paced business environment to stimulate opportunities and new enterprises.

## Expertise

- App Development
- Smart Device Applications
- Cloud Applications
- Embedded Device Firmware
- Web Application
- Materials Testing
- Load Testing & Analysis
- Structural Inspections
- Circuit Board Design
- Prototyping
- Embedded Systems
- Load Testing & Rating
- Engineering Simulations
- Prototyping Capabilities
- Machining
- Product Design
- Planning
- Web Site Development
- Business Accelerator Coordination

## Core Products/Services

- Materials Testing
- Load Testing
- CAD Services
- FEA Analysis
- Soils Testing
- 3D Printing
- Webpage Design
- The ECI also offers other services through facilities available at WKU. If you have a project that involves a service not listed above, please contact us to see how we may help.



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# HUMAN GEOENVIRONMENTAL STUDIES

The Center for Human GeoEnvironmental Studies (CHNGES) is an interdisciplinary Center of Excellence in the WKU Ogden College of Science and Engineering Applied Research and Technology Program. The Center's focus is at the nexus of climate, water, sustainability, and human-environmental interactions.

## Core Expertise

- GeoEnvironmental issues related to water resources
- Climate change
- Karst environments
- Environmental education and outreach
- Geocognition and eye-tracking
- Sustainability
- Service learning
- International research development

## Core Products/Services

- HydroAnalytical is a water resource and hydrologic studies lab that is EPA certified for drinking water, wastewater, groundwater, stormwater, and industrial sample analysis.
- CHNGES also provides consulting services and contract for environmental education, outreach, and eye-tracking services.
- Hydrologic, mapping, and karst investigations and studies on a project basis.



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# KENTUCKY CLIMATE CENTER

The Kentucky Climate Center provides weather and climate services, conducts research, and provides experience to help students prepare for their career path. The center includes two divisions: the State Climate Office for Kentucky and the Kentucky Mesonet.

## Core Expertise

- Environmental monitoring
- Analysis of meteorological and climatological data
- Meso-scale atmospheric modeling and forecasting
- Expert knowledge of climate-related hazards, with specific focus on drought

## Core Services

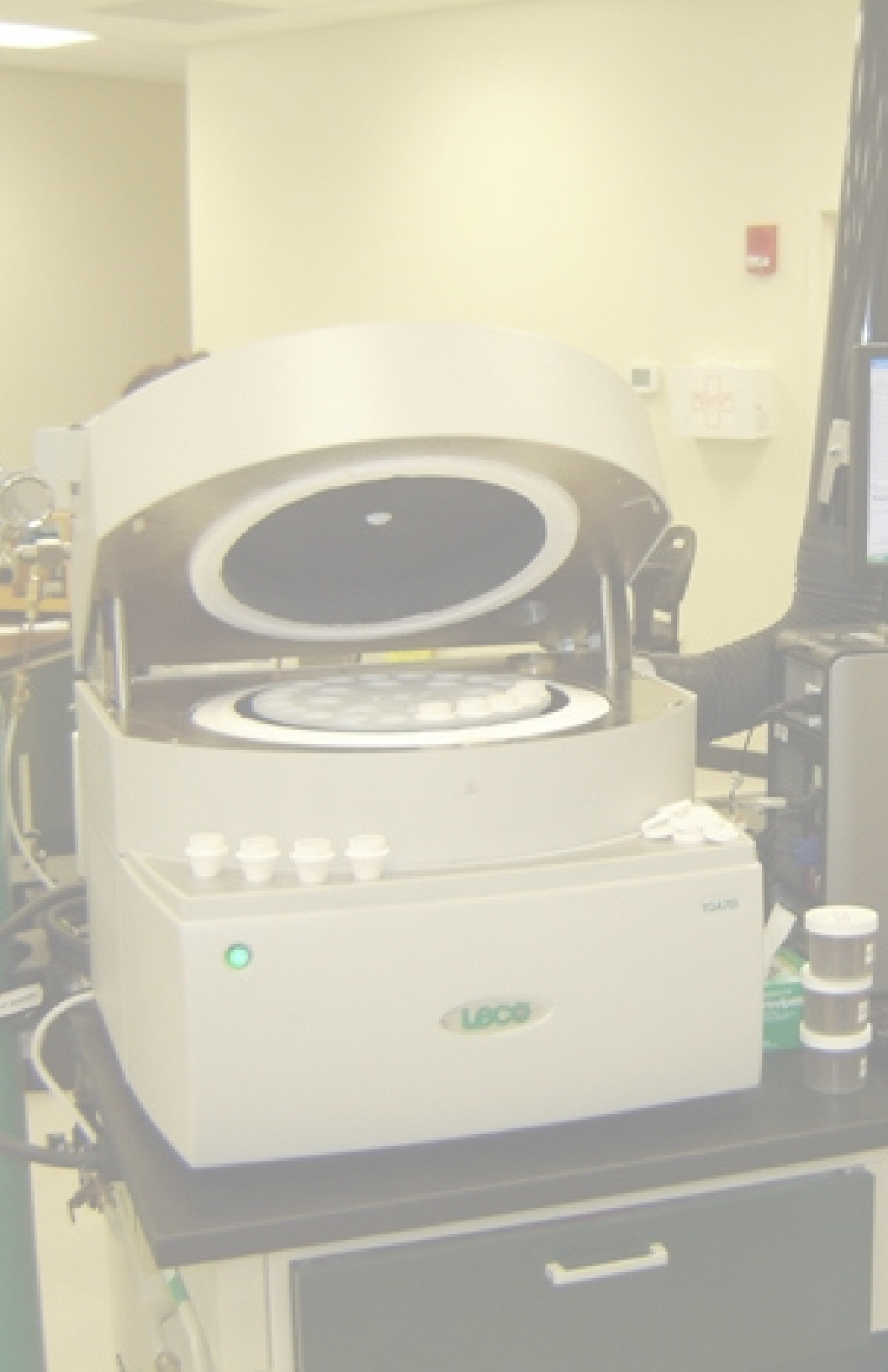
- The State Climate Office of Kentucky, working in conjunction with our federal partners, is a source of climate data and information to serve the needs of state and local agencies, business and industry, and the general public. Climate data and information are available via [www.kyclimate.org](http://www.kyclimate.org) or by contacting the Kentucky Climate Center.
- The Kentucky Mesonet is a statewide infrastructure of automated weather and climate monitoring stations that serve mission-critical needs for state and federal agencies. It is the official source of climatological observations for the Commonwealth of Kentucky. Current statewide weather conditions are publicly available via [www.kymesonet.org](http://www.kymesonet.org). Custom data services and analytics are also offered. Contact the Kentucky Climate Center for more information.



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# THERMAL ANALYSIS LABORATORY

The Thermal Analysis Laboratory provides access to advanced scientific instrumentation for the measurement of the thermal properties of materials in support of the educational, research, and public service missions of WKU.

## Goals

- Conduct third party thermal analysis of samples for local, regional and national businesses and governmental agencies.
- Provide support for faculty and staff research projects.
- Provide graduates and undergraduates with hands-on experience with equipment.

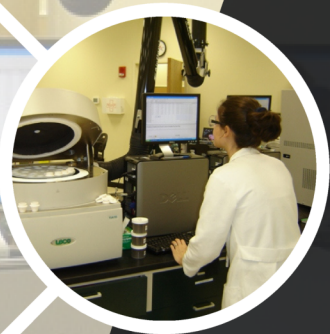
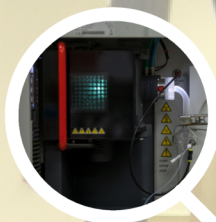
## Core Expertise

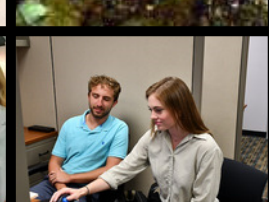
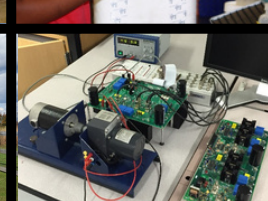
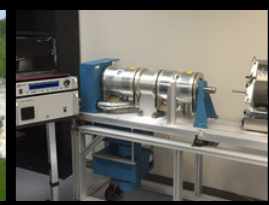
- Thermogravimetric Analysis (TGA)
- Differential Scanning Calorimetry (DSC)
- Evolved Gas Analysis (TGA-MS and TGA-MS/FTIR)
- High-Pressure Thermogravimetric Analysis (HP-TGA)
- Thermomechanical Analysis (TMA)
- Dynamic Mechanical Analysis (DMA)

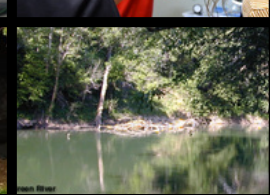
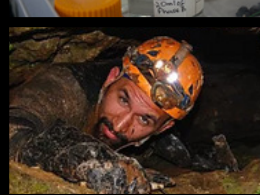
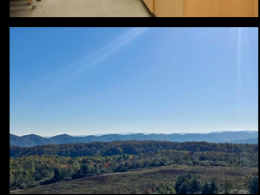
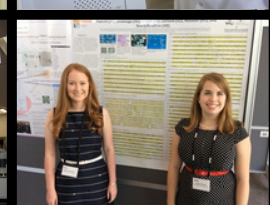
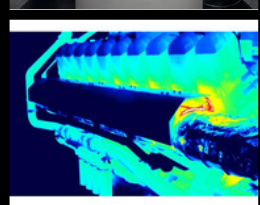
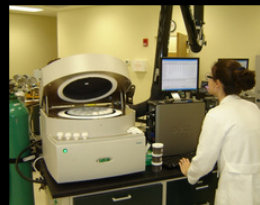
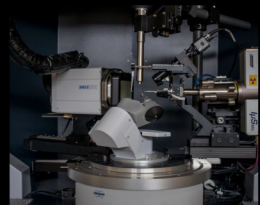
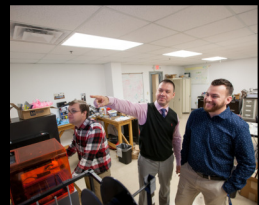
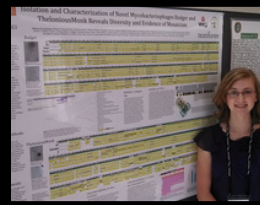
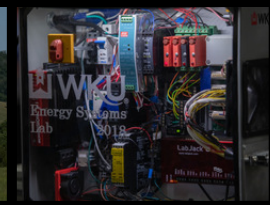
## Core Service

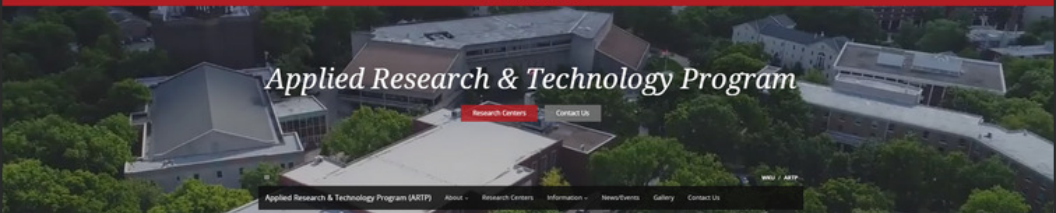
The analysis of the thermal properties of samples is used for:

- New product development
- Quality control
- Troubleshooting









# Applied Research & Technology Program

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Powering Student-Centered Applied Research at WKU



The Applied Research and Technology Program (ARTP) is a multidisciplinary program consisting of 13 scientific and service-oriented Centers and Institutes designed to prepare students for the knowledge-based 21st Century global economy. These Centers meet the research and technical needs of the community, state and nation while providing unique opportunities for undergraduate and graduate students to transition from academia to the workplace or graduate programs through participation in supervised, hands-on applied research and technological projects. Students grow intellectually and professionally through participation in these activities.



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Bowling Green, KY [wku.edu/artp/](http://wku.edu/artp/) Joined August 2017

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*Powering Student Centered Applied Research  
at WKU*





