Kids' Tech University
at Virginia Tech

January 26, 2013 | Dr. Patricia Dove

"No bones about it: How are shells and skeletons formed from crystals?"

VirginiaTech
Virginia Bioinformatics Institute

Thank you to all of our supporters!

Your generous support helps to make Kids' Tech University possible!

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We would also like to extend our gratitude to our corporate sponsors:

Rackspace &
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Thank you for helping to make Kids' Tech University 2013 a success!

Volunteers

Our volunteers include many members from the Virginia Tech and Blacksburg community

Additional Support is always welcomed. If you would like to help us provide this exciting opportunity for children, please contact:

Dr. Kristy Collins
540-231-1389
kdivitto@vbi.vt.edu

http://kidstechuniversity.vbi.vt.edu/

About the Program

The primary goal of Kids' Tech University (KTU) is to help grow the future workforce in **science, technology, engineering,** and **mathematics** (STEM) by sparking kids' interest in these disciplines.

KTU's curriculum features three parts:

Interactive Sessions
- where children meet scientists and learn about their research

Hands-On Activities
- that give children the opportunity to learn about research projects across the VT campus and beyond

Online Virtual Labs
- which allow continued exploration of science topics at home.
- http://ktu.vbi.vt.edu/

January 26th Agenda

9:45 AM

Parents drop off their children for the **interactive session** in McBryde Hall 100

10:30 - 11:45 AM

Kids enjoy an interactive session led by Dr. Patricia Dove titled **"No bones about it: How are shells and skeletons formed from crystals?"** in McBryde Hall 100

Parents are invited to view the event in a satellite location, over a live video feed, in Torgersen Hall 2150 or 3100

11:45 AM

Parents pickup their children and kids receive a Hokie Passport lunch card containing $6.00 for **lunch** at one of the specified dining halls on campus. After lunch, this card will grant them access into the exhibit area.

Please make sure your child leaves their lanyard with their volunteer.

1:30 - 3:30 PM

The children will be escorted by their parents to the **hands-on portion** of the event, being held in the VCOM Conference Center at the VT Corporate Research Center. There the students will enjoy the experience of interacting with various exhibits from the Virginia Tech community. Parents/guardians are responsible for being with their registered KTU child(ren) during the hands-on activities at the VCOM Conference Center; **only children with their Hokie Passport lunch card will be allowed into the VCOM Conference Center.**

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KTU Kids' Tech University

Real scientists...
Answering real questions at Virginia Tech...
That's the KTU difference.

VirginiaTech
Virginia Bioinformatics Institute

Virginia Bioinformatics Institute
Washington St. (0477)
Blacksburg, Virginia 24061
540/231-2100 Fax: 540/231-2606
www.vbi.vt.edu

January 2013

Kids and Parents of Kids' Tech University

Welcome to the Virginia Tech campus and to Kids' Tech University!

Kids' Tech University, with Interactive Sessions and exciting hands-on events, is designed to create the future workforce in science, technology, engineering, and mathematics by sparking an interest in these fields for you and your child. We are currently in our fifth year of offering the program through the coordination of the Virginia Bioinformatics Institute (VBI), Virginia 4-H and the Roanoke-Blacksburg Technology Council.

Virginia Tech has a strong commitment to connecting national prominence in research and discover to advance quality STEM programs across the Commonwealth. Kids' Tech University is just one example of this commitment.

As the Director of Education & Outreach at VBI, I am pleased to welcome you to such a successful program and hope you and your child leave with great excitement and interest in the disciplines of STEM.

Sincerely,

Dr. Reinhard Laubenbacher
Director, Education and Outreach, VBI
Professor, Department of Mathematics, Virginia Tech

Dr. Patricia Dove

Jan 26, 2013 | Interactive Session

"No bones about it: How are shells and skeletons formed from crystals?"

From beautiful snowflakes to diamonds, crystals are everywhere. Crystals also make up the hard tissues of animals that we know as bones, teeth and shells. We call these 'biominerals'. In this presentation, I will be talking about the many kinds of biominerals that animals (and plants!) make to serve an amazing variety of purposes. The best known biominerals are our bones that enable us to stand and move around. But did you know that biominerals can also become structures that filter light and food? Act as sensors for sight and shadows? Provide a compass?

We will also talk about fossils and how what they tell us about how animals and plants have made biominerals for more than 500 million years. Geobiologists work as modern-day detectives to study evidence from these fossils to learn how their sizes and shapes have changed through ice ages, meteor impacts, and volcanic eruptions.

Most of our discussion, however, will be about crystals. We will see videos of actual crystals growing from atoms and talk about how they are shaped into beautiful patterns.

Dr. Patricia Dove is the C.P. Miles Professor of Science in the Department of Geosciences at Virginia Tech. She heads the Biogeochemistry of Earth Processes research group within the Department of Geosciences, which is part of the College of Science. She and her students conduct careful experiments to shed new light on the chemical processes that enable organisms to develop skeletons. Dr. Dove is a member of the National Academy of Sciences and Fellow of the American Geophysical Union, Geochemical Society, European Union of Geochemists, and Mineralogical Society of America. Her publications have been cited more than 3,500 times, and her research group has received two Best University Research Awards from the U.S. Department of Energy.

Hands-on Exhibits

Computing and Gaming through the Ages

An exhibit of computing through the ages. Come see what gaming looked like in the 70's and 80's! Ever wonder what a "punch card" or a "slide rule" looked like? What did kids in the 70's use to listen to their favorite music? (Hint: There were no MP3 players!) Find out what year the Internet was born. Kids will have a chance to take a sneak peek into Computers Through the Ages: The Evolution of Computing. We will have several dinosaur computers and gaming units on display as well as a PowerPoint presentation highlighting their evolution.

The Techsupport Community at Virginia Tech is a collaborative discussion group, facilitated by a listserv, of Central and Departmental Information Technology faculty and staff.

VT Central and Departmental Information Technology faculty and staff

The Techsupport Community at Virginia Tech is a collaborative discussion group, facilitated by a listserv, of Central and Departmental Information Technology faculty and staff.

Participants:
Joyce Landreth, Assistant Director for Support, Network Infrastructure and Services
Jeff Kidd, Public Relations Manager, CNS
Clark Gaylord, Chief Informations Officer, VTTI
Petie Martin, "The Big Kid", former IT Support for VMRCVM

Take a Chance! Beat the Odds with Probability!

Step right up! Take a chance! See if you can beat the odds with probability. In this hands-on station you'll see three different ways to use hands-on approaches to teaching probability. These techniques are appropriate for grades 4-7 and use game-learning theory and the scientific method. Have fun with math and learn something without even knowing! You could win a prize if you think you can beat the odds.

Carroll County 4-H

Carroll County 4-H is part of the Virginia Cooperative Extension service of Virginia Tech. Sarah Jo H. Jones is the 4-H Agent in Carroll County.

Looking Down is Looking Up: Why do we work with aerial photography?

Geospatial tools, which include geographic information systems (GIS), global positioning systems (GPS), and remote sensing, provide us with a new understanding of the earth. In this activity, participants will use GIS to identify changes on the earth's surface. We will examine aerial photography from two different time periods, and students will explore, estimate, and measure general changes in land use during these two periods. Students will also be exposed to basic remote sensing interpretation skills. Observing these kinds of changes helps us understand how landscape changes influence our local communities and environments. These data provide communities with the necessary information to plan for the future, and mitigate the impacts associated with these changes.

Virginia Geospatial Exension Program, VT Department of Geography

This hands-on activity is being led by faculty from the Department of Geography and the Department of Forest Resources and Environmental Conservation. Tammy Parece, a Ph.D. student, and undergraduate geography students affiliated with the VT Geographic Society are providing support for these activities. This activity is co-sponsored by the Virginia Geospatial Extension Program and VirginiaView.

How Crystals Grow: An Interactive Illustration

Much like we use blocks to build fantastic shapes and structures, nature uses its own building blocks to make the crystals that we see in rocks and in skeletal structures. What better way to demonstrate this wonderful occurrence than with Lego blocks! This exhibit shows a "zoomed-in" view of a growing crystal face that is made of Legos and explains the step-by-step process that occurs as the crystal grows— and how a crystal dissolves! Students can "grow" their own crystals by playing with the different pre-made examples. Come to learn and play with geology on the nanoscale!

Virginia Tech Geosciences, Biogeochemistry of Earth Processes Group

The Biogeochemistry of Earth Processes (bgep) group conducts interdisciplinary research into

the physical basis for biomineral formation and the complex patterns of mineralization that are observed in modern and ancient organisms.

Know Your Roots: Shells, Scales, and Skeletons

Come find out how you are related to a worm! At this exhibit, you will learn how all organisms on earth are connected by the tree of life. Are the wings of flies the same as those of eagles? Have you ever seen a tree eat mosquitos? What are the differences between seashells and dinosaur teeth? Some creatures have shells and others have bones made from very different crystals. Learn all about structures and skeletons we call biominerals, from large bones to microscopic shells!

Department of Geosciences, Biogeochemistry of Earth Processes

The Biogeochemistry of Earth Processes (bgep) group conducts interdisciplinary research into the physical basis for biomineral formation and the complex patterns of mineralization that are observed in modern and ancient organisms.

Ocean Acidification: Dangerous Changes in Earth's Seas

In this activity you will learn about the pH of the ocean and why humans should be concerned that the oceans are becoming more acid. By testing the pH of different liquids, you will learn the concept of acidity and understand why the rising level of carbon dioxide in atmosphere is making the oceans more acid. This may be dangerous for the ocean's inhabitants that make their skeletons of calcium carbonate. Explore how changing environments may affect the production of biominerals worldwide.

Department of Geosciences, Biogeochemistry of Earth Processes Group

The Biogeochemistry of Earth Processes (bgep) group conducts interdisciplinary research into the physical basis for biomineral formation and the complex patterns of mineralization that are observed in modern and ancient environments.

Shelling Out the Shapes: The Incredible World of the Mollusca Phylum

This exhibit demonstrates the amazing diversity of marine creatures from the important phylum— the Mollusca. Explore the wide variety of shapes and colors of calcium carbonate skeletons that are made by many, but not all, of these organisms. The biogeochemistry research group in the Department of Geosciences investigates the biochemical processes that control how biomineralized structures are formed. In this remarkable collection you will experience the many shapes and sizes of mollusks from around the globe!

Department of Geosciences, Biogeochemistry of Earth Processes Group

The Biogeochemistry of Earth Processes (bgep) group conducts interdisciplinary research into the physical basis for biomineral formation and the complex patterns of mineralization that are observed in modern and ancient organisms.

Rock On!

How do we use rocks and minerals in our daily lives? How does a rock fit into the constantly changing geologic cycle of the Earth? Is the rock igneous, metamorphic, or sedimentary? What kinds of minerals are in it? How hard is the rock? Perform geologic tests to find out for yourself.

Science Museum of Western Virginia
STEM Inspired! Outreach Program

Dig It!

Become a paleontology detective! Explore the lives of prehistoric creatures and their habitats by studying both real and replica fossil clues, learning how they were formed and how scientists interpret them.

Science Museum of Western Virginia
STEM Inspired! Outreach Program

Turning and flipping: How to find point symmetry in minerals

Have you ever noticed how ceiling tiles are laid out in repeating patterns, how your body looks the same on both sides or how mineral crystals in museums have complex but beautiful and equal shapes? These are a few simple examples of symmetry in our everyday world! This exhibit shows you how to identify symmetry and the different types of symmetries that are observed in

nature. By building two types of polyhedra and 'decorating' them with different kinds of symmetry, you will learn how to find and identify 'elements of symmetry'. You will also learn the types of symmetry that are in specific molecules and in minerals. Build two types of symmetry elements to take home and learn how these polyhedra also represent how atoms are assembled to form crystals!

Department of Geosciences, Mineralogy and Petrology Group

The Mineralogy and Petrology group conducts interdisciplinary research on mineral formation and high-temperaure igneous and metamorphic rocks and processes.

From magma to mineral: how do crystals form?

How do beautiful mineral crystals form in rocks? Why do some rocks have bigger crystals than others? Why do some mineral crystals look different than others? How do volcanic processes control the size of crystals in rocks? This exhibit features a simple crystal growth experiment using common household materials as a way of showing how crystals grow in rocks both beneath and above the Earth's surface. Rock samples from real volcanoes and magma chambers will be presented to illustrate how crystal size is affected by the amount of time over which magma and lava cool.

Department of Geosciences, Metamorphic Petrology group

The Metamorphic Petrology group studies how rocks transform beneath the Earth's surface in response to changes in temperature and pressure, which reveals information about both the small-scale processes (i.e. chemical zoning in minerals) and large-scale processes (i.e. the formation of mountain belts) that operate on Earth.

When Continents Collide: Building and Destroying Mountain Belts

Mountains take millions of years to form, but what would it be like to watch one grow right before your eyes! What would it look like to slice one in half and look inside? Why are some mountains, like Mt. Everest, so big and others, such as our Appalachians, much smaller? This exhibit features a mountain building table where flat layers of sand and flour are deformed to show the processes of folding and faulting that occurs beneath the surface to form the roots of mountain belts and the erosion that tears them down. Also, you can create your own mini-mountain by deforming layers of play-dough. Come experience the processes that build up and destroy a mountain belt from its deepest roots all the way to the surface!

Virginia Tech Geosciences, Tectonics and Geomorphology Group

Groundwater Flow: Where does it come from? Where does it go?

Using a hands-on water-filled model of the groundwater cycle, kids can explore hydrology concepts like contamination, recharge, and water table. Water flows through this model to show how rain can move into the ground and dissolve rock layers in karst geology. The Shenandoah Valley and New River Valley have a lot of karst geology and features like caves and springs.

The model can also be used to show how contamination on the ground surface can move into groundwater then move through the system in very unpredictable ways. Groundwater pollution can be very hard to fix.

Groundwater supply is another concept we can show using this hands-on model: as wells in an area pump out groundwater, the level can fall below the wellhead of a neighboring well, making it go dry. Many communities in Virginia rely on groundwater for their drinking water supply.

Hands-on Exhibits

The model used for these activities is usually on display for the public at the VT Museum of Geosciences, www.outreach.geos.vt.edu/museum.

Hydrogeosciences Group in the Department of Geosciences

Virginia Tech's Department of Geosciences focuses on **research**, **education**, and **outreach** dealing with the nature of the earth. Our students and faculty investigate earth processes at scales that range from atomic to planetary. The Hydrogeosciences group studies a very important thing: water! Their research covers a wide variety of topics in both physical and chemical hydrogeology, including chemical and contaminant transport, aquifer mechanics, well hydraulics.

American Biosystems' new solutions for agriculture

The cost of feeding farm animals to produce meat, milk and eggs has increased rapidly over the past couple of years. In addition to this pricing pressure, people are now more interested in the quality of their food and the safety of feed additives such as antibiotics and hormones. How can farmers worldwide deal with both of these issues?

Companies like American Biosystems,Inc. provide natural organic alternatives to hormones and antibiotics while helping animals better utilize the valuable feeds they consume. Our products provide three benefits:

1. We improve the value of expensive feed ingredients
2. We replace antibiotic growth promoters in animal feed.
3. We reduce the impact of animal waste on the environment.

Come see how enzymes improve animal feed quality!

American Biosystems,Inc.

Edward Goyette, is a 1978 graduate of the Virginia Tech Biology Department and has been President of American Biosystems,Inc. for the past 20 years. American Biosystems markets microbial enzyme animal feed ingredients in over 20 countries worldwide. Mr. Goyette will demonstrate how enzymes, produced from bacteria work in an actual experiment children and parents can see before their eyes!

Come take a look at the future of animal feeding and how we can produce healthy foods for an expanding world population.

There and back again (and again): The story of sedimentary rocks

Have you ever wondered how sand turns into a rock or how fossils get into a rock? This exhibit will show you the sedimentary portion of the rock cycle. We will have activities that show how sediment (things like sand, silt, clay and shells) forms into rocks, how rocks turn back into sediment and how fossils get into rocks. Various types of sedimentary rocks will be on display.

Department of Geosciences, Sedimentary Geochemistry Group

The Sedimentary Geochemistry group studies the history of the Earth's oceans and atmosphere preserved in sedimentary rocks. We are particularly interested in how changes in the climate and environment affected the history of life on our planet.

"Where in the world am I?"

We will be exploring the world of GIS and Google Earth; youth participants will be able to electronically pinpoint their 'world' address on a projectable map! They will provide information on Google Earth, GIS, and Geo-Caching!

Hosted by Virginia Cooperative Extension Agents, Emily Nester, Tazewell County 4-H and Daniel Collins, Smyth County 4-H.

Hands-on Exhibits

Virus Tracker!

In the Virus Tracker "game", participants are offered the option to participate in a virtual virus spreading exercise in which bar-coded wristbands represent the virus. Each parent/kid band is linked in a computer database to the additional bands they distribute via their barcodes. The parent/kid gives the bands to others at Kids' Tech University (simulating the act of transmitting a virus) and tells the person they are "infected". The newly "infected" person's band is subsequently scanned, and they are given the option to hand out additional bands, thus furthering the transmission of the virtual virus.

Come back to the booth often! You can check in and see how many people you have infected via a "transmission tree".

Virginia Bioinformatics Institute

Virginia Bioinformatics Institute is a research institute dedicated to the study of the biological sciences. By using bioinformatics, which combines transdisciplinary approaches to information technology and biology, researchers at VBI interpret and apply vast amounts of biological data generated from basic research to some of today's key challenges in the biomedical, environmental and agricultural sciences. Work at VBI involves collaboration in diverse disciplines such as mathematics, computer science, biology, plant pathology, biochemistry, systems biology, statistics, economics and synthetic biology.

Funding from National Institute of General Medical Sciences, administered through the MIDAS Network. Grant number: U01 GM070694-09

Robotic Engineering: Building Mobile Robots with LEGO Mindstorm

Visit our booth and build a robot! You can program your creation to do many things! Several different robot building stations will allow you to customize your creation with different sensors and motors. After you finish building your robot masterpiece, we will help you to program their behaviors. You'll see the robot you built in action! We have many different LEGO mindstorm kits and several consoles to program different behaviors. This is a fantastic chance to learn to be a design engineer while also having fun as you build LEGO creations!

Participants:

Nicole Abaid, Assistant Professor, Engineering Science and Mechanics
Alexander Leonessa, Associate Professor, Mechanical Engineering
Warren Ruder, Assistant Professor, Biological Systems Engineering

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Some Assembly Required…

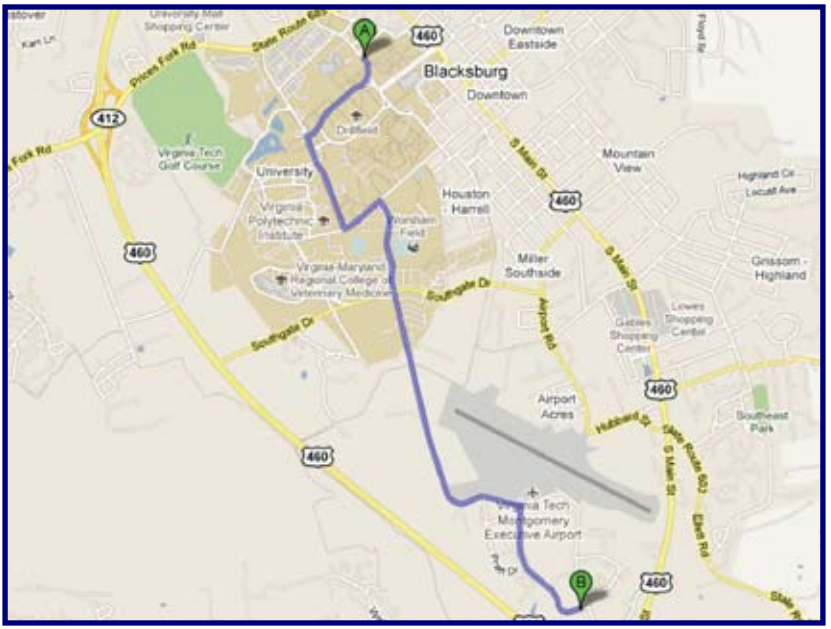
Participants will be taking apart and/or putting together different types of computers (laptops, desktops, servers) in order to learn about the different parts that make up these machines. Volunteers will explain the functions of the various parts and assist the participants in the activities.

Blacksburg Office of Rackspace

Fanatical Support® has made Rackspace the service leader in cloud computing.
We deliver enterprise-level hosting services to businesses of all sizes and kinds around the world. We got started in 1998 and since have grown to serve more than 172,000 customers. Rackspace integrates the industry's best technologies for each customer's specific need and delivers it as a service via the company's commitment to Fanatical Support. Our core products include **Managed Hosting**, **Cloud Hosting** and **Email & Apps**. There are currently over 4,000 Rackers around the world serving our customers. The Blacksburg office of Rackspace is the home of product development for our email and related applications and one of a number of development centers for our cloud products.

Driving Directions

Driving directions from McBryde Hall to the VCOM conference center



FROM GOOGLE MAPS

START FROM
McBryde Hall
Blacksburg, VA 24060

1 - Head southeast on Stanger St toward Drillfield Dr (ABOUT 0.1 MILES)

2 - Slight right at Drillfield Dr (ABOUT 0.2 MILES)

3 - Slight right toward W Campus Dr (ABOUT 381 FEET)

4 - Turn left at W Campus Dr (ABOUT 0.4 MILES)

5 - At the traffic circle, take the 2nd exit onto Washington St SW (ABOUT 0.2 MILES)

6 - Turn right onto Spring Rd (ABOUT 0.4 MILES)

7 - Continue onto Tech Center Dr (ABOUT 1.2 MILES)

8 - Turn right at Kraft Dr (ABOUT 0.6 MILES)

END AT
2280 Kraft Dr
Blacksburg, VA 24060
LATITUDE & LONGITUDE: 37.1989525,-80.405318

Educator Workshops

We are excited to offer Recertification Points in conjunction with the KTU program.

Educators will learn it, teach it, and take it back to the classroom.

Interact with:

- **S**cientists
- **T**echnology Experts
- **E**ngineers
- **M**athematicians

You will engage in an exciting, hands-on teaching experience, and then apply what you learned in a unique, first-hand teaching environment with 3rd-6th graders. You will also be able to participate in ongoing community blogs and network with other teachers and education specialists.

This program is ideal for elementary and middle school teachers, out of school time educators, or others interested in STEM teaching.

January Educator Workshop Information

- **Who:** Teachers of 3rd- 7th grade interested in STEM and Earth Science topics
- **When:** Dates & Times

  Friday, Jan. 25, 2013, 1:00pm - 5:00pm

  Saturday, Jan. 26, 2013, 8:30am - 4:30pm
- **Where:** Campus, Virginia Tech; Meet in McBryde Hall, Room 126
- **Cost:** No cost to participate! 12 recertification points offered. Funding for half-day substitutes available for the first 15 participants to register.

Any educator who has a child enrolled in Kids'Tech University and who is attending the teacher workshop will need to arrange for a chaperone to accompany their child during the program. Children are not permitted to attend the educator workshop (regardless of age).

Please visit
http://kidstechuniversity.vbi.vt.edu/
for further information.

Educator Workshops

January Educator Workshop Description

Virginia 4-H is helping teachers make STEM learning fun and engaging for students through a hands-on, experiential workshop offered as part of Kids' Tech University.

The workshop:

- **provides opportunities to build STEM knowledge and skills in the area of crystal formation and composition**
- **encourages student interest in geoscience-related fields.**
- **explores essential questions: "How are bones and skeletons formed from crystals?" and "How do organic and inorganic crystal structures compare?"**

Workshop leaders will work with graduate students to deliver relevant and interesting science activities using best-practice education strategies:

- **Dr. Kathleen Jamison (4-H Youth Development and Informal Learning Specialist)**
- **Dr. Patricia Dove (Renowned Geosciences Professor)**
- **Dr. Lindsey Kolbus (Professor of Minerology)**
- **Llyn Sharp (Geosciences Outreach Coordinator)**

On Friday, January 25, 1:00-5:00 PM teachers will:

- **receive coaching on the research topic and an introduction to activities during teacher-training session**

On Saturday, January 26, 2013, 8:30-4:30 PM, teachers will:

- **participate with the children and researcher in an interactive discussion**
- **debrief with researcher**
- **practice hands-on learning activities with children and their parents. Geoscience professors/grad students will serve as coaches and mentors at this time.**
- **make activity modifications based on classroom needs**
- **develop plan for classroom application**

As a result of the workshops, students have the opportunity for exposure to current and relevant research. They will benefit from their teacher's ability to connect research back to classroom content standards through intentional programming.

Educator Workshop Contacts

Dr. Kathleen Jamison
4-H Youth Dev. Curriculum & Learning
(540) 231-9411
jamisonk@vt.edu

Katie LaFon
Virginia 4-H State Events Coordinator
kapatter@vt.edu

KTU is a program at Virginia Tech with one primary goal: creating the future workforce in

Science,

Technology,

Engineering,

and **Mathematics**

by sparking kids' interest in these fields.

KTU 2013 Program Dates

Jan 26 | Technology Day
Feb 23 | Science Day
Mar 23 | Engineering Day
Apr 06 | Math Day

Contact

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I am

THE FUTURE OF SCIENCE

We look forward to seeing you in February!

KTU Kids' Tech University

VirginiaTech
Virginia Bioinformatics Institute