

RESEARCH AT HAMPTON UNIVERSITY

2010-11

RESEARCH THAT AFFECTS
your HEALTH *your* COMMUNITY *your* WORLD

ON THE COVER
Hampton University
Proton Therapy Institute
gantry treatment room

INSIDE
The Hampton University
led NASA AIM satellite
mission shows changes in
formation and frequency
of “night-shining” clouds.



CHANGING the Way We LIVE

Hampton University has made extraordinary progress in expanding our research agenda and has evolved into a 21st century university that educates students to harness and utilize the power and potential of technology and cutting edge research. We have made great strides in conducting scientific research and developing technologies that address major health and global issues which affect our society today. Our scientists, professors and students are currently involved in research that will have a direct impact on your health, your community and your world.

From research on cancer imaging to studies that will ease transportation problems, Hampton University is investigating issues that affect us all. We have taken an interdisciplinary approach to the treatment and research of cancer. The University has also established itself as a leader in particle and nuclear physics. Our Center for Atmospheric Sciences is part of a team that is launching satellites that will improve scientists understanding of global warming and hurricanes.

Few other universities of our size can offer comparable research facilities, research partnerships and student and faculty-initiated research projects. I encourage you to learn more about Hampton's research as we seek to answer fundamental questions about diseases, social problems and the universe.



A handwritten signature in black ink that reads "W. R. Harvey".

Dr. William R. Harvey
President, Hampton University

Taking a LEAD in CANCER TREATMENT and RESEARCH

Cancer is one of the leading causes of death for Americans. One out of every three Americans will develop some form of cancer during his or her lifetime. The Hampton Roads region of Virginia leads the nation in prostate cancer deaths. Moreover, African Americans suffer disproportionately from many forms of cancer.

Hampton University has taken a leading role in the research and treatment of this disease. In August 2010, the Hampton University Proton Therapy Institute (HUPTI) opened its doors and began treating patients.

The TREATMENT

Proton therapy is a type of radiation that can precisely target tumors while sparing surrounding tissue, thus causing far fewer side effects than traditional radiation therapy. Currently there are only seven other proton therapy centers operating in the country.

Traditional radiation treatments often destroy healthy tissue, sometimes causing doctors to limit the dose. Proton beams deliver a low dose of therapy as it enters the body and increases as it reaches the cancerous tumor and stops completely.

At 98,000 sq. ft. and a total of five treatment rooms, HUPTI is the only



Patients will spend approximately 30 minutes per day in the gantry treatment room, with the actual beam of protons lasting less than a minute. The course of treatment may last from five to eight weeks, depending on the nature of the cancer.



The Hampton University Proton Therapy Institute, the largest of its kind in the world, opened August 2010 and has begun treating patients.

proton cancer treatment center in Virginia. HUPTI is designed to treat about 2,000 patients per year with prostate, brain, breast, lung, pediatric and other cancers, and is the largest free-standing proton therapy institute in the world. HUPTI is a state-of-the-art research and training facility and will provide proton-specific medical career training at a variety of levels from radiation therapist to MD/PhD. There is an additional beam line dedicated to proton therapy cancer research.

The RESEARCH

The Hampton University physics department, in collaboration with the Eastern Virginia Medical School (EVMS) and the Midwest Proton Radiotherapy Institute (MPRI), is developing BioEclipse, the first biologically optimized treatment planning system for proton therapy cancer treatment.

Proton therapy is widely recognized as the most precise form of cancer

treatment to date, as it can target the tumor directly without harming the surrounding healthy tissue, with little to no side-effects. Precise treatment requires advanced treatment planning software. To identify the best treatment plan for each patient, many physicians currently rely on the Eclipse software product from Varian Medical Systems.

The goal of the project is to develop BioEclipse, a planning system that has all of the features of Eclipse, but also takes into account the biological effects of

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proton therapy. The proposed biological treatment planning approach will facilitate even more precise dose delivery, which should improve the sparing of healthy tissue and increase the likelihood of killing the tumor.

Respiration gating research is also being conducted at HUPTI. Physicists aim to treat lung cancer patients with free breathing using a respiration gating system. The respiration gating system would be installed on PET/CT system and the gantry treatment room so that the proton beam is delivered only to the tumor target corresponding to patient breathing.

Researchers at HUPTI are also working on the development of effective radioprotection methods and materials in proton radiotherapy facilities.

Implementation of ancillary high-end medical technologies in proton radiotherapy delivery suites is underway in

a number of facilities. Sensitive electronics subsystems of these technologies are often prone to radiation damage. The goal of this project is to characterize the secondary radiation fields in proton radiotherapy suites and to develop effective shielding methods and materials for radioprotection and to facilitate the implementation of such technologies in proton radiotherapy environment.

Hampton University will also begin construction of the Biomedical Research Center (BRC) on the university campus. Funded by HU and the National Institutes of Health, the state-of-the-art facility will be an interdisciplinary center for biomedical researchers from both HU and the local region.

The BRC will house the existing HU Center for Advanced Medical Instrumentation. Devices developed by this center have been successfully

used for breast cancer localization and treatment in clinical trials. Other projects include dosimetry for prostate cancer treatments and advanced medical modeling and simulation. The cancer imaging technology clustered within the center will be established to utilize this unique research environment. The Department of Defense recently awarded Hampton University a \$1.3 million grant to improve breast cancer imaging and therapy research, in collaboration with EVMS and the Thomas Jefferson National Accelerator Facility (JLab).

This project aims to advance the technology of radiotherapy procedures in breast conserving therapy, ultimately resulting in a decrease in the number of recurring breast cancer cases and an increase in survival expectancy. The resulting technology, based in part on an HU patent, will allow more women to take advantage of the life-saving partial breast irradiation procedure, in conjunction with breast conserving therapy. It will also facilitate better cosmetic outcomes for all patients treated with this modality. The project will utilize some advanced imaging technologies from JLab as well as clinical facilities and medical expertise at EVMS.

Additionally, the BRC will house researchers in biology, pharmacy and nursing, offering a genuine interdisciplinary center. Research from these departments include pharmacological developments for fighting cancer, biology research linking breast cancer to heavy metals found in cigarettes, and nursing research on behavioral factors affecting cancer patients.



The cyclotron is a particle accelerator that spins protons to two-thirds the speed of light, sending the resulting proton beam through a beam line to 90-ton gantries that sit three stories high. The gantries rotate to allow the beam to be delivered at any angle around the patient.

Hampton University is devoted to finding ways to ease human suffering and save lives. Research is being conducted on common illnesses that plague Americans. The University is dedicated to reducing health disparities of racial and ethnic minorities through research, community programs and partnerships. Minorities experience serious disparities in treatment and outcomes of infant mortality, cancer screening and management, cardiovascular disease, diabetes, HIV infection/AIDS and immunizations.

Childhood OBESITY

Obesity is a serious health concern for children and adolescents. Results from the 2007–2008 National Health and Nutrition Examination Survey (NHANES), using measured heights and weights, indicate that an estimated 17 percent of children and adolescents ages 2–19 years are obese and about 32 percent of children and adolescents today, 25 million kids, are obese or overweight, according to the Centers for Disease Control and Prevention.

Three undergraduate Hampton University nursing majors and HU Professors Vincentia Agbah and Dr. Michelle Penn-Marshall are conducting hands on research in the fight against childhood obesity. Their effort is called the Surry County Obesity Prevention and Exercise (SCOPE) Pilot Program.

Students from first, second, third and fourth grade classes at Surry Elementary School in Surry County, Va. participated in the program for six weeks. Students were given a pedometer, weekly log sheets and asked to record the number of steps they took daily. Height, weight, and waist circumference measurements

were taken weekly at the beginning of students' physical education class.

Students completed a physical activity checklist indicating their types of physical activity, and participated in nutrition education and physical activity lessons during the study. Researchers plan to conduct a focused follow-up study with those students classified as overweight or obese, based on the body mass index (BMI) measurements obtained.

The school's study aligns with First Lady Michelle Obama's push with the "Let's Move" campaign, a nationwide initiative to tackle the challenge of childhood obesity.



Shanel McMillian, Sharee Stowes, Instructor Vincentia Agbah and Linda Klu-Tetevia were part of the SCOPE Pilot program.

SOCIAL SKILLS in Children

The Hampton University Department of Communicative Sciences and Disorders (CSAD) is conducting research that will examine how to best serve children with communication disorders. Faculty members Dorian Lee-Wilkerson, Cheryl Freeman, and Tammy Cook along with students, are researching the growth of the social skills attained and retained by school-age children with moderate-to-severe communication impairments.

This research will generate outcome data that will be used to assess the academic and clinical training provided by the Department of Communicative Sciences and Disorders and will be used to assess the clinical services provided by the Hampton University Speech-Language-Hearing Clinic. It will also contribute data to support evidence-based practice in the field of communicative sciences and disorders. Specifically, the data may be used

by speech-language pathologists to determine whether direct training in social skills benefits children with severe communication impairments, such as those diagnosed with an autism spectrum disorder.

The project is ongoing and began in the summer of 2009 in the Hampton University Speech-Language-Hearing Clinic.



HU Communicative Sciences and Disorders students Kendra White, Alison Maltz, Japera Wilson, Natalie West, Ashley Jones and Laurel Farrell.

HYPERTENSION in African American WOMEN

High blood pressure or hypertension, is a common ailment in the African-American community. According to the Centers for Disease Control and Prevention (CDC), one in three American adults have high blood pressure and two in five African Americans suffer the effects of hypertension. Among African Americans, more women than men have the condition.

Resources, or the lack thereof, and geographic location often determine how hypertension is treated. HU Nursing Associate Professor Dr. Hilda Williamson and retired HU Professor Dr. Esther Condon are researching the use of complementary and alternatives medicine (CAM) for hypertension by African-American women in urban and rural settings.

The study's purpose is "to determine how African-American women who

manage hypertension, incorporate the use of complementary and alternative medicine into the management of hypertension, and what variations in the use of CAM methods they're using, whether they're conventional medicine or alternative methods," Williamson said. "Some research indicates African Americans aren't complying to a conventional medicine education regime." Barriers may include a person's geographic location, because people in rural areas might lack transportation to access medical attention or medications.

The study focuses on women age 18–40 and 50 and older in Surry and Norfolk, Virginia. The use of CAM has become widespread in the United States, both for health maintenance and the treatment of specific health problems.



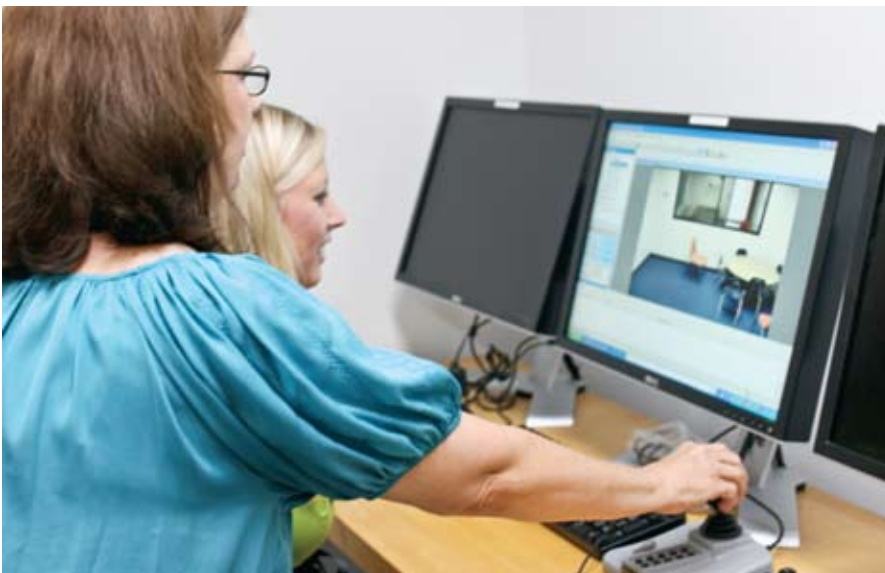
Hampton University Undergraduate Nursing Chairperson Hilda Williamson

As the demographic composition of the United States reflects more African-American women, more gender and culture related information is required to improve their care. Understanding the CAM practices of African-American women in relation to managing chronic hypertension should contribute to improving models of health care delivery that are gender and culture specific.

Direct ACCESS to Physical Therapists

In many jurisdictions, the practice of physical therapy is contingent upon the prescription or referral of a physician, according to the American Physical Therapist Association. This requirement does not recognize the professional training and expertise of the licensed physical therapist nor does it serve the needs of those patients who require physical therapy but must first be seen by a physician.

Hampton University's Department of Physical Therapy professors are conducting research on physical therapy students' attitudes toward direct



Professor Tammy Cook and Natalie West interact in one of the Communicative Science and Disorders labs at HU.

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access to physical therapists. Direct access allows physical therapists the ability to act as primary care providers for individuals with musculoskeletal impairments. Thirty-nine of 50 states allow physical therapy evaluation and treatment without a physician referral.

In this study, S. Christopher Owens, PT, ScD. and other researchers in the department distribute a survey with

nine different statements regarding direct access. Student responses are compared from each year of the curriculum (first, second and third year), hoping to establish a pattern of increasing favorability for direct access throughout the curriculum. Students in Doctorate of Physical Therapy (DPT) programs from eight HBCUs around the country will be surveyed regarding their attitudes toward direct access.

By 2020, physical therapy will be provided by physical therapists who are doctors of physical therapy, recognized by consumers and other health care professionals as the practitioners of choice to whom consumers have direct access for their diagnosis, according to the American Physical Therapy Association (APTA).



Dr. S. Christopher Owens is the principal investigator for the physical therapy research on direct access between physical therapists' and their patients.

Your community is your home. That is why Hampton University is diligently working to improve and make a difference in your community by studying the social issues that surround us.

Alleviating Traffic CONGESTION

As Hampton Roads and other cities across the nation continue to grow, so does the demand for safe transportation and transportation related infrastructure. Hampton University's School of Business is partnering with Departments of Transportation in federal, state and city governments, local transit companies, transportation industries, and regional universities to advance U.S. technology and expertise in transportation through its Eastern Seaboard Intermodal Transportation Applications Center (ESITAC). Supported by the U.S. Department of Transportation, the ESITAC's strategic location in the

Mid-Atlantic allows the center to facilitate businesses throughout the community and provides access to two-thirds of the U.S. population. The ESITAC is working to alleviate the Hampton Roads, Va. area congestion and transportation safety problems as well as make Hampton University a nationally recognized leader in transportation research.

ESITAC is also currently researching acoustic emissions, humanly inaudible sounds generated in structures under stress and in bridges across Virginia. In one study conducted on the Varina-Enon Bridge, acoustic emission sensors, capable of hearing cries from stressed components including those that are



Dr. Devendra Parmar, lead principal investigator, installing acoustic emission sensors on the test cable of the bridge.

difficult to access, have been used on a single stay cable and monitored under conditions of low and high traffic volumes during the summer and winter months. Dr. Devendra Parmar,

The Varina-Enon Bridge on I-295 near Richmond



research professor in the Department of Electrical Engineering, is the lead principal investigator. This study allows engineers to determine if a bridge cable wire has broken or if corrosion or cracking has occurred; it also allows engineers to determine the effects weather has on bridge cables and other components including their surroundings such as concrete enclosures.

Improving EMERGENCY Response TIME

When a crime, accident or emergency does occur, the creation of an information database by Hampton University's Data Conversion and Management Lab (DCML), will allow area firefighters, paramedics and police officers to respond faster and more efficiently to future emergency calls. The research database allows first responders to develop a response plan before arriving at their destination by pulling up maps, building blueprints, electrical diagrams and more, ultimately

saving time and lives. As more area buildings and facilities are added to the DCML database, the project's capabilities continue to expand.

Strengthening MARRIAGES and FAMILIES

The number of married couples age 20–54 in the U.S. has dropped from 78.6 percent in 1970 to 57.2 percent in 2008. Increasingly, more children are born out of wedlock. In 1970, 89.3 percent of children were born to married parents; today it's 60.3 percent.

With marriage in a deep state of decline, Hampton University is addressing this issue head-on with the launch of the National Center on African American Marriage and Parenting (NCAAMP). Committed to transforming marriages, empowering parents and strengthening families, NCAAMP is conducting a comprehensive study on the quality of African-American marriages. The center aims to help determine factors that strengthen and weaken marital

African-American relationships. In 2009, the University also hosted the HU National Summit on Marriage, Parenting and Families. The groundbreaking event explored the declining status of today's marriages and the importance of healthy, effective parenting in the U.S. with 150 of the nation's leading experts.

A vast body of research suggests that the status of a marriage influences a person's well-being at least as much as the status of his or her finances. And while a great deal of focus is spent measuring leading economic indicators, very little interest is taken to measure leading marriage indicators. Partnering with the Institute for American Values, NCAAMP has released the U.S. Marriage Index, which uses specific measurement indicators to track the health of American marriages through the past 40 years and assess areas of improvement for the future. The Marriage Index is the first measurement tool of its kind to identify areas of need and identify what can be done to improve the state of marriage in the U.S.

Discovering the EFFECTS of Violence on Children and WOMEN

Each year, approximately five percent of the nation's population fall victim to a crime. Through her research with local children ages 5–17 residing in violent neighborhoods in Newport News, Va., Endowed Professor of Sociology Dr. Zina McGee is working to discover the linkages between risk factors and



Jeff Kemp, president of Stronger Families; Dr. Linda Malone-Colon, director of NCAAMP; Anne Holton, former first lady of Virginia; and HU President Dr. William R. Harvey at the Hampton University National Summit on Marriage, Parenting and Families.

patterns of coping among youth residing in high stress settings. According to McGee, the majority of current studies emphasize the effects of television violence on youth as opposed to real-life violent events.

Through more than 500 surveys and 100 interviews, McGee's efforts reveal that female children are being exposed to more violence than their male counterparts, yet they tend to internalize their symptoms. Meanwhile young males are much more likely to exhibit forms of delinquency as a means of handling violence rather than discussing the things that frighten them.

McGee is also examining how women cope after being exposed to violence as children and the impact it has on

them and their children as they commit crimes as adults. According to the U.S. Bureau of Justice Statistics, the number of incarcerated mothers rose 131 percent from 1991 to 2007. With this dramatic increase, McGee's research of incarcerated women in Newport News is illuminating the cyclical and generational impact these crimes carry as many imprisoned women's children now turn to lives of crime as well. In a 2003 report on female juvenile offenders, the Virginia Commission on Youth found that 38 percent of all juvenile offenders in Virginia had parents who had previously been incarcerated. McGee and her student researchers are coding data and matching patterns to identify prevention strategies for this growing issue.

African Immigrants' ROLE in the U.S. WORKFORCE

For the past fifteen years, Dr. Charles Amisssah, Assistant Professor of Sociology, has been studying the role of African immigrants in the U.S. labor market. Using data from the U.S. Bureau of the Census and interviews, Amisssah has found some association between African immigrants' level of education and their employment in the professional sector of the nation's workforce. The 2000 Census records indicate that there were 881,000 African-born immigrants in the United States. Of the 685,945, age 25 years or older, 43 percent had at least a bachelor's degree and 8 percent had an associate's degree. In the labor market, about 40 percent of the employed



Dr. Zina McGee and her students conduct research on the effects of violence on women and children in the Behavior Sciences Research Center.



Dr. Charles Amisssah, whose research examines the role of African immigrants in the U.S. labor force, stands at the HU Circle of Nations. The circle's flags represent the home countries of HU's undergraduate students, including several African nations such as Nigeria, Ghana and Zimbabwe. Many of these students will one day enter the U.S. workforce.

Africans were located in the managerial and professional categories, 19 percent in service occupations, and 23 percent in technical, sales, and administrative support. The median income was \$48,300 and the poverty rate 13 percent. Despite their position in the primary labor market, they have not been able to attain as much economic success as one would associate with their level of education.

As a result of his research, Amissah has attained visibility in the discipline. His doctoral dissertation, which was an examination of the socio-economic achievement of African immigrants in the United States, was among the resources for the In Motion: The African American Migration Experience Exhibition at the Schomburg Center, New York Public Library in 2006. In addition, his research publications have been cited by numerous scholars. He has also reviewed grant proposals for the National Science Foundation, two books in the area of delinquency, a book on social problems, a book on introduction to sociology, and

two geography books. He has attended national and international conferences including the Oxford Round Table, 2006, at which he presented a paper, now published in "Investigating Diversity: Race, Ethnicity, and Beyond" (2008), edited by Ho Hon Leung, Raymond Lau, and Sharon Shaw-McEwen. As he moves towards conducting comparative analysis of African-born immigrants' location in the U.S. and European labor markets, Amissah's findings can help us gain further insights into the international role these immigrants play in the local and global workforce.

Minority Teachers in STEM EDUCATION

Hampton University researchers are examining ways to increase the number of minority teachers. Less than two percent of the nation's teachers are African American males.

Increasing the number of STEM teachers

Through a five-year grant from the NSF Robert Noyce Teacher Scholarship Program, Hampton University's Dr. Carolyn Morgan and Dr. Clair Berube are collaborating to ensure more minority students join the ranks of highly qualified science, technology, engineering and mathematics (STEM) teachers. The two will measure the effectiveness in attracting and retaining STEM undergraduates and career-changing professionals into the teaching profession. Through their efforts, HU will increase the number of well qualified, minority STEM teachers in economically disadvantaged public school districts.

Increasing Achievement

Given the current economic climate, Hampton University knows it is crucial that finance-related topics be incorporated into the education process at all levels. In a collaborative effort between the School of Science and School of Liberal Arts, Hampton University is investigating whether the integration of financial applications into college-level calculus courses significantly increases achievement for STEM majors. Led by Dr. Carolyn Morgan and Dr. Anne Pierce, this mixed-method study will provide further evidence that increased academic achievement in calculus is a significant factor in retention of STEM majors. Results of this research will have a broad national impact on the enhancement of calculus reform. In addition, this effort has the potential



Dr. Anne Pierce, Dr. Carolyn Morgan and Dr. Clair Berube are examining ways to increase the number of minority STEM professionals and teachers.

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to increase real-world financial and business decision making among undergraduate STEM students.

Personality Development's Influence on Academic Achievement



Backed by more than 10 years of research with children from elementary school age to college students, Associate Professor of Education Dr. Spencer Baker has found that personality development has a far greater influence on academic achievement well above any socio-economic factors. His findings indicate that of the five factors of personality, conscientiousness or the will to achieve, may be the most adaptable behavior. With further investigation from birth to adulthood, Baker aims to track a person's developmental personality and identify which developmental outcomes are affected by outside factors. By understanding how people

adapt to their surrounding environment, Baker's research may lead to optimizing human development and maximizing conscientiousness so that people can best utilize their natural gifts and talents.

Educating Gifted Children

Dr. Kianga Thomas, is conducting research on high achieving African American students. His research focuses on psychological factors such as self-efficacy, resiliency, and leadership as it promotes academic success. Furthermore, Thomas' research further extends to developing an instrument that will measure gifted teachers' self-efficacy towards teaching gifted children.



Kianga Thomas' research on the education of high achieving African American children aims to identify psychological factors that promote academic success.

Hampton University researchers are working on a variety of projects that help us understand our world. These professors are taking an in-depth look at global change and examining solutions for the sustainability of our planet. They are giving us insight into how we will live our lives in the future.

PRESERVING PLANET Earth

The Bay

For the past decade the health of the Chesapeake Bay has been a focus for Dr. Benjamin Cuker, professor in the HU Department of Marine and Environmental Science. Cuker's study concentrates

on the early-season on-set of depleted oxygen in the deeper waters of the Bay. While evaluating the water quality of the bay, analysis of chlorophyll concentrations is conducted as they have been shown to be markers for algal blooms.

Native Pollinators

As honeybee populations decline due to pesticides, parasites, and disease; native bees such as bumblebees become more

important in pollinating plants that produce food for wildlife and humans. Dr. Barbara J. Abraham and Dr. Barbara G. Shipes, associate professors in the Department of Biological Sciences, are studying the native bees that pollinate wild blueberries in western Virginia. The two-year grant from the U.S. Forest Service Southern Research Station, also funds two HU undergraduate student internships. The project seeks



Dr. Benjamin Cuker, marine and environmental science professor, aboard a research vessel with students on the River.

to determine the floral resources used before, during, and after blueberries bloom by these important pollinators. The study will help forestry personnel and growers recognize floral resources needed to maintain order and conserve these native pollinators.

Energy Efficient Structures

The Department of Architecture focuses on sustainable building and architectural ecology. HU architecture professors Mason Andrews and David Peronet are working along with students and faculty from Old Dominion University on a project for the Solar Decathlon 2011. The U.S. Department of Energy has chosen 20 teams from around the world to compete in the event that will be held on the National Mall in the fall of 2011. The schools form Team Tidewater. The team has focused on the local urban environment to create a marketable and sustainable building that members of the

community can afford. The team plans to create a six-unit multi-family building to be located in Norfolk's Park Place.

Through research the teams have proposed a project called Unit 6 Unplugged. It is an effort toward developing buildings with net-zero energy use for tight urban quarters, something that will help ensure the efficiency of cities in the future.

The energy efficient features include a deep, shaded balcony for three-season comfort that incorporates operable windows and thermal mass so it can convert to a sunspace for use in cold weather, a circulation core that contains mechanical systems such as a water heater and storage tank, a combined heat and power system that distributes water and power to the house, and commercially available photovoltaic and thermal products mounted on the roof and within the core.

LAUNCHING SATELLITES into SPACE

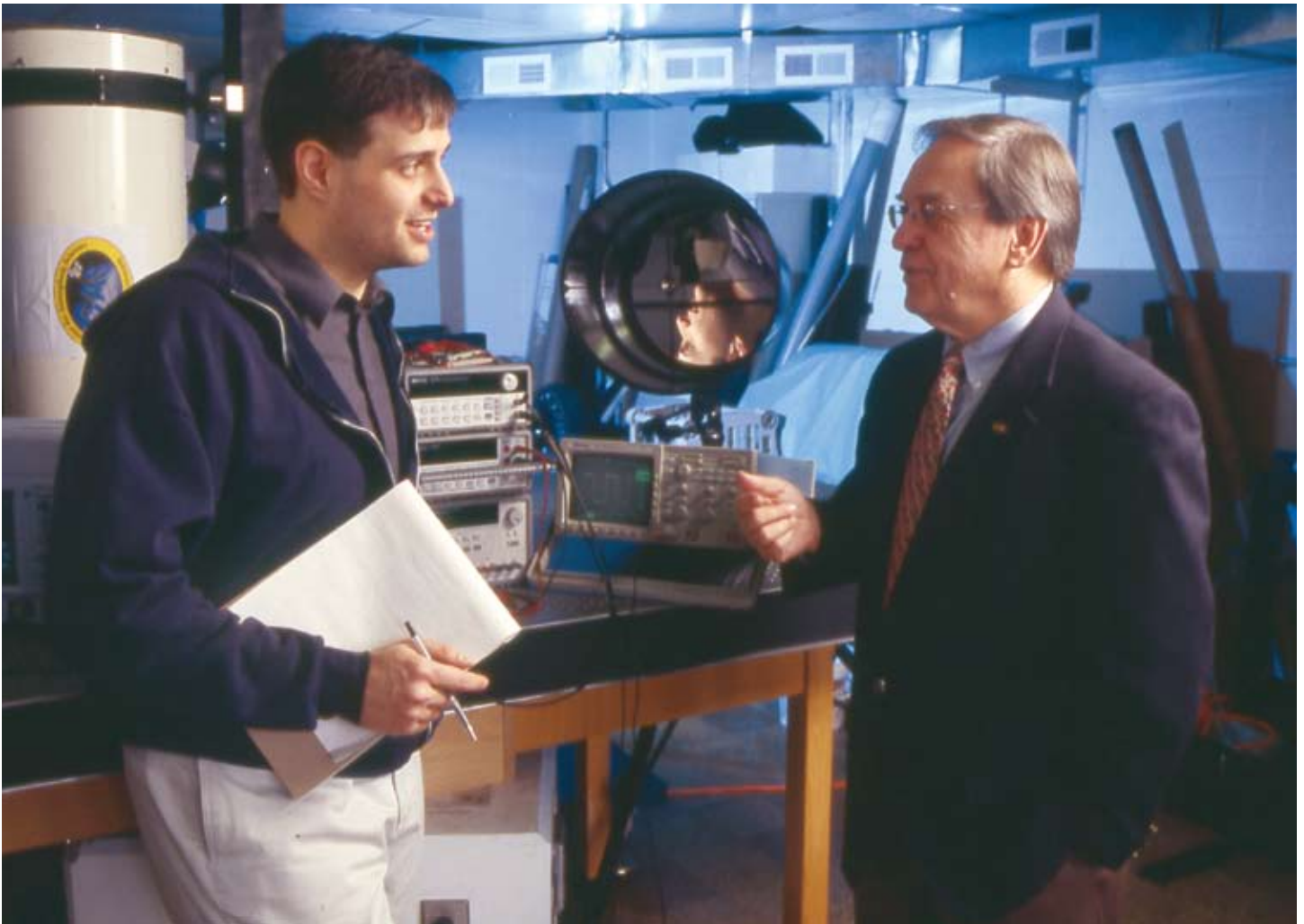
GIFTS

The Hampton University Center for Atmospheric Sciences (CAS) is well aware of the financial and emotional costs of natural disasters. Dr. William L. Smith, research professor at CAS, and other members of the CAS team conduct studies of the Earth's atmosphere. CAS is currently focusing its research on detecting precisely where severe weather will happen before it hits.

Smith is the principal scientific investigator of the Geosynchronous Imaging Fourier Transform Spectrometer (GIFTS), a remote sensing system for



Team Tidewater's Unit Six model



A student researcher joins Dr. M. Patrick McCormick, co-principal investigator for CALIPSO in the observatory.

satellites. The GIFTS satellite, which rotates on a geostationary satellite, measures the changes in atmospheric temperature, water vapor, carbon monoxide, ozone and the wind velocity from the motion of water vapor molecules and clouds. GIFTS will be able to provide researchers with the data needed to forecast a hurricane, including when and where it will land. Currently, 24-hour forecasts concerning a hurricane's landfall can be made within 100 miles. With the help of GIFTS, predictions could be improved by 50 miles. GIFTS will also provide an hour warning for tornado formation. The improvement will save \$50 million per storm and more importantly save lives.

CALIPSO

HU researchers from the Center for Atmospheric Sciences are also part of a team that launched a NASA satellite in April 2006. The Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) project will improve scientists' understanding of the global climate, weather and air quality. Dr. M. Patrick McCormick, co-director of Center for Atmospheric Sciences, is the co-principal investigator for CALIPSO. CALIPSO emits laser light pulses into the atmosphere below the satellite as it orbits Earth and 'paints' a worldwide picture of the vertical extent of clouds and tiny particles, called aerosols. This information is needed to accurately predict future climate and will increase

scientists' knowledge of the Earth's climate. Data from CALIPSO will provide the science community with key parts to the puzzle on how our global climate changes. CALIPSO is a part of a constellation of satellites called the A-train. Together, the satellites are helping scientists attain a better understanding of the Earth's climate system. CALIPSO is currently in its fourth year of orbit.

AIM

NASA launched the Aeronomy of Ice in the Mesosphere (AIM) satellite in April 2007. Dr. James M. Russell III, co-director of the HU Center for Atmospheric Sciences, is the principal investigator for the project. AIM is the first satellite dedicated to the study of noctilucent

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Dr. James M. Russell works with HU graduate students on AIM research.

(NLC) or “night-shining” clouds. Hampton University is the first Historically Black College and University to have total mission responsibility for a NASA satellite mission. Although the baseline mission ended May 31, 2009, NASA has approved extending the satellite program through September 2014.

AIM has provided a global-scale view of the clouds over six complete cloud seasons covering both poles and has documented for the first time the entire complex life cycle of NLCs. The satellite is providing an unprecedented horizontal resolution of three miles by three miles. The clouds are made



Noctilucent Clouds, photo provided by Tom Eklund

of ice crystals formed when water vapor condenses onto dust particles in the brutal cold of this region, at temperatures around minus 210 to minus 235 degrees Fahrenheit. Initial results showed that the clouds appeared more frequently, were extremely variable, changed on a daily and hourly basis, and were observed at lower latitudes than previously measured. One potential and plausible explanation for the changes observed is that temperatures where the clouds form are becoming colder with time due to carbon dioxide build-up resulting from human activities. Carbon dioxide increases near the Earth's surface cause global warming, but at 50 miles altitude, the opposite occurs. Increasing methane in the atmosphere is another possible contributing factor because it reacts with oxygen to form water vapor that is

needed to form the clouds. Both gases have been increasing in the atmosphere since the early 1900s.

Re-Engineering MILITARY Systems

Hampton University is one of three universities nationwide that is helping the U.S. military save valuable time and money by reverse-engineering parts from decades-old military systems. The Data Conversion & Management Laboratory's Virtual Parts and Engineering Research Center has received more than \$7 million in government funding for virtual parts engineering. It has also established a virtual engineering pilot production environment critical to the development of parts that must be reverse-engineered

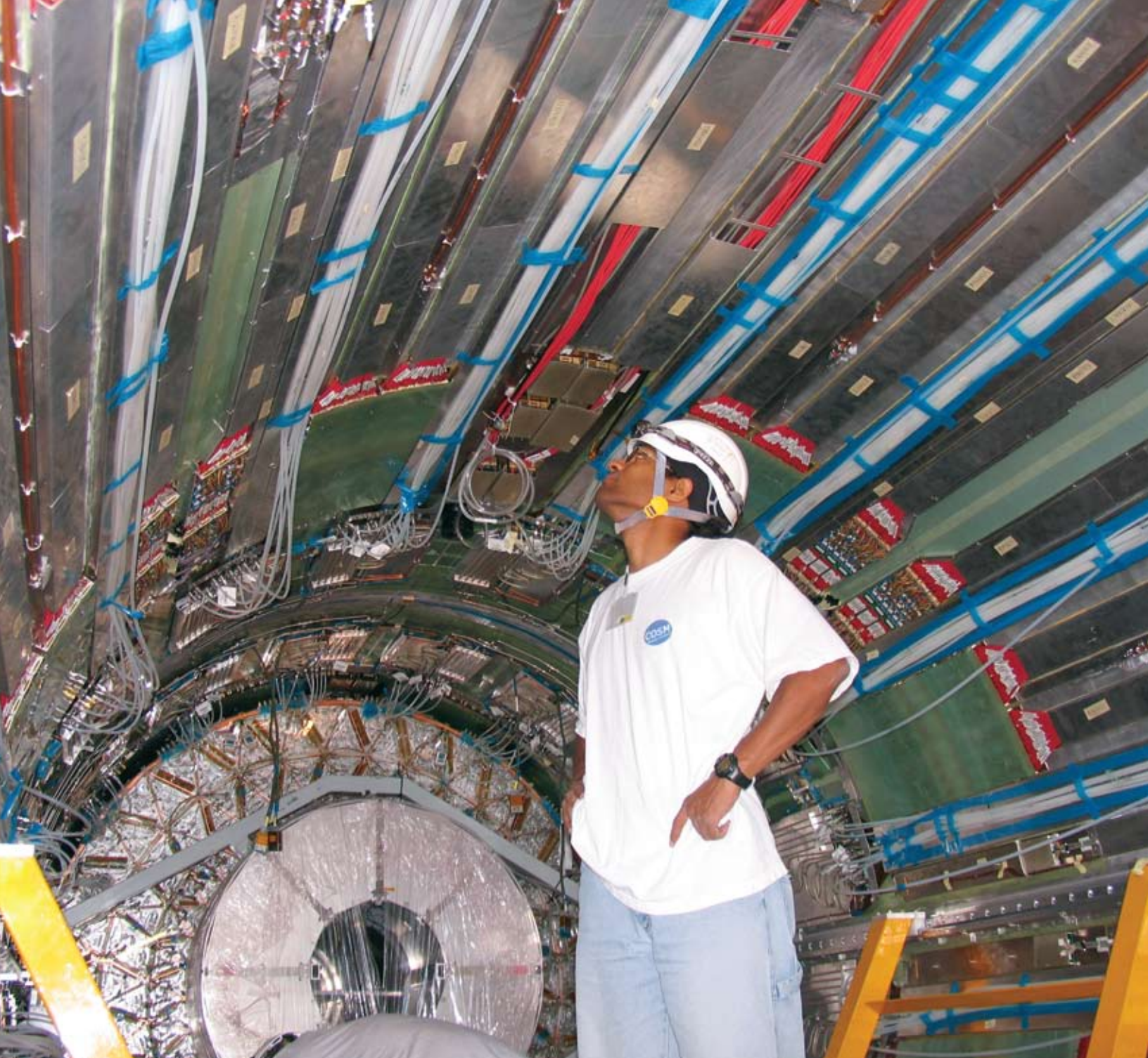
or redesigned when original technical data is incomplete or no longer available.

DISCOVERING the ORIGIN OF THE Universe

Hampton University's Experimental Particle Physics group has already established itself as a world-class leader in particle and nuclear physics research. The group is working on an experiment they helped build in Geneva, Switzerland at the CERN Large Hadron Collider: the ATLAS experiment. They constructed portions of the Barrel Transition Radiation Tracker. This giant apparatus, built and operated by a collaboration of 3,000 scientists and students from 37 nations,



The HU Data Conversion & Management Laboratory's Virtual Parts and Engineering Research Center has received more than \$7 million in government funding for virtual parts engineering.



HU graduate student Alex Harvey, works on the instillation of the ATLAS detector at CERN.

is now in operation. CERN produces the highest energy collisions ever achieved, offering windows into nature in an environment not seen since the beginning of the universe according to the Big Bang theory. The data coming from ATLAS is opening rich areas of exploration and may help explain the origin of the universe and why it is the way we see it today.

The Department of Physics is also constructing particle detectors based on the Gas Electron Multiplier (GEM) technology, to be used in two separate research projects focused on exploring particles, furthering scientists understanding of the laws of physics. The Olympus project at the Deutsches Elektronen Synchrotron (DESY) in Germany and the Time Reversal

Experiment with Kaons (TREK) at J-PARC in Japan are both being led by Dr. Michael Kohl, assistant professor in the Department of Physics.

Kohl was the co-initiator on the Olympus project that now includes 15 institutions and 50 physicists from six different countries. After constructing particle detectors that

will be able to measure the trajectory of a charged particle the Olympus project will be able to explore the nature of electromagnetic interaction and investigate the hypothesis of two-photon exchange. Olympus is being prepared to arrive at DESY in 2012.

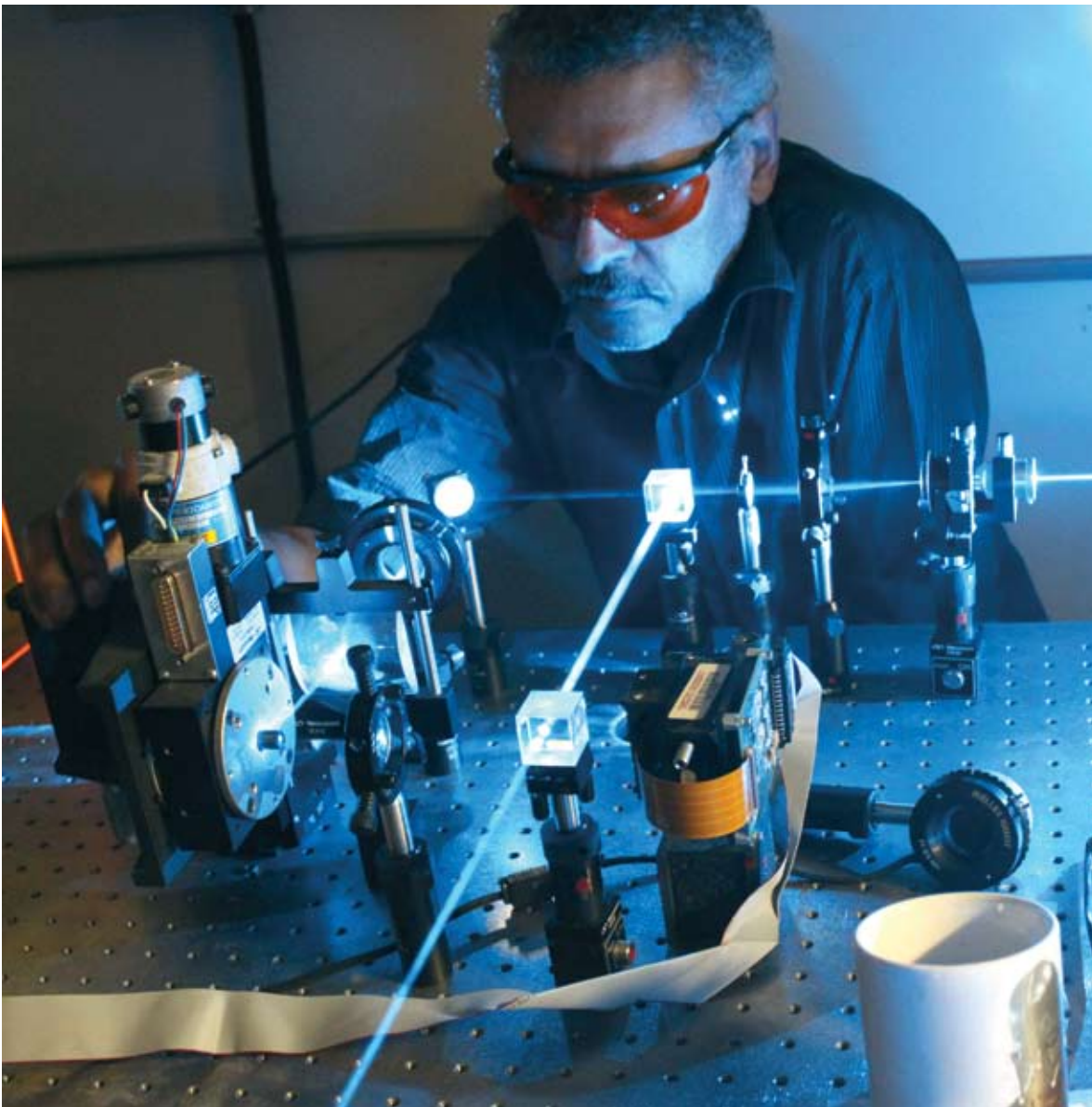
Proton accelerators will again be used to produce kaon particles for the TREK experiment. TREK will study the decay of kaons to search for asymmetries or violations to commonly known physics laws. By examining the observables measured by the TREK experiment Kohl

and other physicists are trying to test the fundamental laws of physics and to find evidence for new physics beyond.

DEVELOPING NEW Data STORAGE

Dr. Doyle Temple has worked for years in the area of photorefractive wave-mixing spectroscopy and holograph data storage. His work has led to a

greater understanding of one of the most commonly used photorefractive materials, Barium Titanate. In April 2005, he received a patent for a “Cylindrical Medium for Storing Holographic Data and Methods and Apparatus for Manipulating Data Using Cylindrical Medium,” a device that stores information in the form of a hologram. The technology has the potential to store 5,000 to 6,000 CD’s worth of information in a volume of material the size of a sugar cube.



Dr. Doyle Temple, the 2010 Outstanding Faculty Awardee from the State Council of Higher Education for Virginia.

Hampton University RESEARCH CENTERS

At Hampton University groundbreaking research is underway in labs across campus, focused on producing technology and innovation that will help drive tomorrow's discoveries. With advancing programs in the sciences, engineering, health, computing, architecture, the community and related areas, Hampton University is committed to educating future leaders. Hampton University is the epicenter of unrivaled health, physics, and engineering research. As such the campus is home to numerous research centers and institutes.

Behavior Sciences Research Center

was founded in 1996 through a grant from the National Institute on Mental Health. The Center is designed to bring together researchers in different disciplines to train students in various careers within the mental health field. Within the center are several research laboratories that include online scoring and data analysis of surveys and tests. The center supports grant writing on a cross-disciplinary effort among the Department of Sociology, Department of Psychology and the College of Education and Continuing Studies.

Center for Advanced Medical Instrumentation (CAMI)

houses the first graduate programs (M.Sc. and Ph.D.) in medical physics in the State of Virginia, and the only ones nationally at an HBCU. Medical physics is a profession where there is a steadily growing demand for trained individuals. Students working in this area are trained for a wide range of careers, from hospital-based medical professionals to high-tech corporate scientists. CAMI researchers are involved in a range of biomedical research activities, from developing in vivo dose measurements for cancer therapy, to the next generation of detectors for



Dr. Cynthia Keppel is the Director of the HU Center for Advanced Medical Instrumentation. The Center houses the only graduate programs (M.Sc. and Ph.D.) in medical physics in Virginia, and the only ones at a historically black college or university.

breast cancer localization, to modeling tumor killing radiation therapy. CAMI researchers hold nine patents in medical technology development, and receive support from both federal agencies and private sector companies.

Center for Aeropropulsion (CAP)

(CAP) was established by the HU School of Engineering and Technology in January 2003. Sponsored by NASA, the mission of CAP is to provide broad-based and cutting edge research and development in aerospace science and technology including aerodynamics, propulsion, aero acoustics, hypersonic engine and vehicle systems, novel sensors

for aerospace applications, and human exploration and development of space.

Center for Atmospheric Sciences (CAS)

was founded in 1996 with three objectives, fundamental research, education at the graduate and undergraduate levels, and outreach to the public, the university, and the K-12 communities. Members of the CAS faculty have been principal and co-principal investigators for a number of NASA satellites including SAGE, SAGE II and III, HALOE, CALIPSO, and AIM. CAS is especially devoted to increasing the participation of minorities in the fields of atmospheric and planetary sciences.

These objectives are now the mission of the Department of Atmospheric and Planetary Sciences, which will maintain CAS as its research center. Dr. James M. Russell and Dr. M. Patrick McCormick are co-directors of the CAS.

Center for Laser Science and Spectroscopy (CLASS)

merges mathematics, physics and atmospheric and planetary science disciplines to foster a better understanding of selected problems at the forefront of science and technology using laser spectroscopy. Specific research thrusts include fluorescent spectroscopy and laser crystal



The AIM mission has been extended by NASA through the end of FY 2012. During this time the instruments will monitor noctilucent clouds to better understand their variability and possible connection to climate change.



HU's Data Conversion and Management Lab foundation is the conversion of legacy data into electronic format, and the current direction is to maximize opportunities in the innovative and productive storage, access and utilization of electronic data.

development, nonlinear spectroscopy of semiconducting nanocrystals, and laser remote sensing. The research thrusts are also prevalent in the education and outreach programs that consist of undergraduate and graduate curricula development, research training and professional development, and K-12 outreach.

Center to Reduce Health Disparities

seeks to narrow the gap in health disparities that currently exists between American citizens of ethnic and racial origins by capitalizing on extending existing partnerships between the HU School of Nursing and other potential new entities. There are three main goals

of the center: (1) to develop nursing partnerships among researchers, faculty, and students at Hampton University that will further health disparities research; (2) to develop and disseminate culturally competent research and interventions related to health disparities among racial/ethnic minorities and underserved populations; and (3) to educate nurses in evidenced-based practice from racial/ethnic minority groups and underserved populations who will pursue research careers. Building on previous research in which culturally appropriate interventions have been designed to promote health and reduce risk of disease in minority populations, the Center focuses on conducting culturally competent research on health promotion and disease prevention.

Data Conversion and Management Lab (DCML)

is a state-of-the-art digital production center that provides a variety of business management services. DCML has been active since 2000; the U.S. Department of Defense funded the lab with a \$1 million grant. DCML focuses on the conversion of legacy data into electronic format. The goal of the DCML is to develop and provide systems that optimize the utility of data within each environment they are charged to assist.

Eastern Seaboard Transportation Center (ESITAC)

was chosen by the Research and Innovative Technology Administration of the U.S.



The HU School of Nursing's National Center for Minority Family Health and the Center to Reduce Health Disparities conduct research on health issues that disproportionately affect people of color.

Department of Transportation to work as a university transportation centers program. ESITAC is housed in the HU School of Business and serves the Hampton Roads area. The center conducts research on transportation problems facing the region. The goal of ESITAC is to advance technology and expertise in transportation in hopes of supporting safe, secure, efficient, and interconnected transportation systems throughout Hampton Roads.

National Center for Minority Family Health, established in 2000, serves as the research arm of the HU School of Nursing and the focal point

for research about people of color. All Historically Black Colleges and Universities (HBCUs) schools of nursing are encouraged to use the Center for Minority Family Health to work on joint projects to insure that the doctoral students have access to research mentors nationally who are working in medically underserved communities with diverse populations. Through the Center for Minority Family Health, doctoral faculty and students acquire, develop, distribute, and hold in repository materials on family health care issues of interest to both lay and professional populations. The scope of the center was expanded in 2006 to broaden the study

of health disparities in diverse cultures and vulnerable racial and ethnic minority populations nationally. Resources to support evidenced-based practice by increasing the number and competencies of nurse educators and researchers at HBCUs who can participate in reducing the shortage of faculty and researchers in nursing is a funding priority.

National Center on African-American Marriage and Parenting (NCAAMP) is led by Dr. Linda Malone-Colon, a leading expert on African-American marriages. NCAAMP's vision is to create a nation



The new state-of-the-art interdisciplinary Hampton University Research Center will house the Skin of Color Research Institute and other university research centers.

where most African American children are born into intact families and raised by their married and biological parents in loving, nurturing and safe homes comprised of loving, peaceful and stable marriages. NCAAMP's purpose is to conduct, archive, synthesize and disseminate scholarly research on African-American marriages, parenting and families. The center aims to significantly increase the number of African-Americans with graduate training in marriages and family and to provide resources to African-Americans on building and sustaining healthy marriages and families. Current research projects at NCAAMP include "Black Clergy and Marriage," "African American Marriage and Wellness," and "Spirituality and the Quality of African-American Marriages." Additionally, NCAAMP is promoting values and behaviors that increase healthy personal development among African American youth and young adults.

Skin of Color Research Institute (HUSCRI)

was established in 2009 by Hampton University President Dr. William R. Harvey and is the first of its kind in the state of Virginia. The Institute will build on research and infrastructure investments made at HU to expand our understanding of skin diseases that disproportionately impact people with skin of color and translate these findings to benefit the community through deeper understanding, better therapies and ultimately healthier people.

HUSCRI will use its dedicated, world-class research resources to conduct research to develop therapies and identify disparities in cutaneous diseases affecting people with skin of color. The Institute will focus on two broad areas: keloids and other fibroproliferative disorders or disorders of pigmentation.

These two areas were chosen because they will have the greatest impact on the skin of color population. HUSCRI will also conduct basic research to address the differences in structure and function, and cutaneous disease processes of skin of color at the molecular level.

Virtual Parts Engineering Research Center (VPERC)

in the HU School of Engineering and Technology is funded by the Army Research Office (ARO) to develop innovative processes for replacing legacy weapons systems to support soldiers in the field. VPERC works with two other universities to build frameworks, tools, and technologies for making weapon systems that are sustainable and maintainable. VPERC uses reverse engineering to reproduce parts when the original equipment manufacturer no longer produces the part needed.



In 2009, The National Center on African-American Marriage and Parenting in conjunction with the Institute for American Values released the Marriage Index: A Proposal to Establish Leading Marriage Indicators.



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