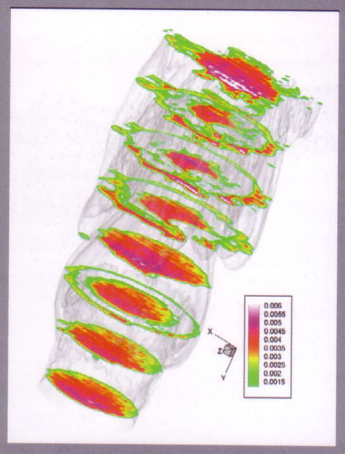
AEROSPACE

Researchers in faculty member Brian Thurow's lab have been developing advanced laser diagnostics suitable for measurements in high-speed and reacting propulsion-related flows. The centerpiece of this development is a home-built, pulse-burst laser system capable of producing high-energy pulses at repetition rates exceeding 1 MHz and wavelengths ranging from 266 to 1064 nanometers. Used in conjunction with a high-speed camera capable of 500,000 frames per second, the laser can be used to take high-speed flow measurements using techniques such as planar laser-induced fluorescence and simple flow visualization.

The instrumentation will be used to study problems related to missiles, airplanes and helicopters. The flow associated with most applications is turbulent and, therefore, inherently 3-D and complex. Thurow's research group is the only one in the world with this 3-D imaging capability.

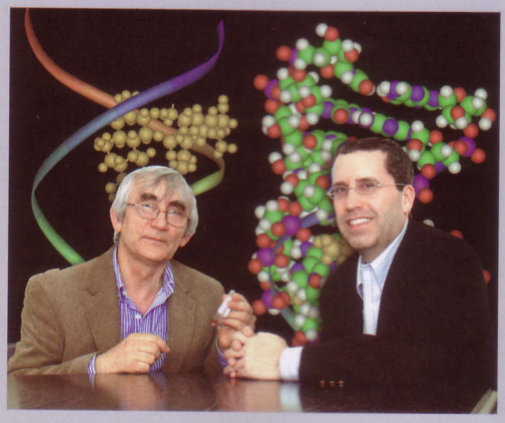


3-D imaging technique used to visualize flow of a turbulent jet.

One of the most significant applications of the system has been for the acquisition of 3-D flow images. For 3-D imaging, a galvanometric scanning mirror is used to scan the high-repetition laser sheet through the flow field with a high-speed camera recording the image at each scan location. A 3-D image can then be reconstructed from the stack of 2-D images. The overall acquisition process can be completed in tens of microseconds.

CHEMICAL

Auburn Engineering researchers Mark Byrne and Jacek Wower (Animal Sciences) have developed a way to control the release of drugs into the body and, as a result, reduce the frequency of doses and side effects from multiple medications. Their work involves harnessing the power of nucleic acids to control the rate, release amount and delivery location of medications throughout the body.



From left: Wower and Byrne

Byrne and Wower, along with doctoral student Siddarth Venkatesh, use tiny RNA molecules called aptamers to control the release of drugs. For each patient, the drug delivery can be set to occur at various rates or under certain conditions, including exposure to an enzyme or reaching a specific temperature. Unlike past studies, this technology is capable of delivering doses of multiple drugs at different rates or a single drug at controllable and extended rates from one medical device.

The research team, which also includes doctoral student Padma Sundaram, is also using gold nanoparticles for targeting specific cells to deliver injectable drugs. The gold nanoparticles are biodegradable or excretable and can be injected directly into the bloodstream along with the medication. The combination could prove to be an important step for providing multiple-drug releasing carriers capable of delivering the right amount of medication at the right time.

CIVIL

As new guidelines have been proposed regarding construction site runoff, erosion and sediment control is quickly becoming a focus within the construction industry. To address these new regulations, the Alabama Department of Transportation has teamed with Auburn's Highway Research Center to develop methods for evaluating erosion and soil control best management practices (BMPs) used at highway construction sites. The current challenge facing the industry includes a lack of scientific understanding on traditional BMPs and the utility of new technologies that are constantly introduced. Therefore, a standard means to evaluate these BMPs using both intermediate- and field-scale testing is needed.

The NCAT facility enables researchers to test erosion and sediment control solutions in a small-scale, real-world environment.

In response to this need, an innovative testing facility has been designed to conduct both intermediate- and field-scale testing under controlled conditions to evaluate current and future erosion and sediment control BMPs. The intermediate-scale experiments are designed to mimic real-world conditions experienced on highway construction sites and are conducted under simulated rainfall. The field-scale facility focuses on testing different ditch check practices as well as drop inlet protection devices with respect to sediment control.

AUBURN engineering

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Mentorship

The link between teacher and student is fundamental to the learning process. This issue explores the ways that Auburn Engineering is reaching out to tomorrow's engineers.

AUBURN UNIVERSITY

Samuel Ginn College of Engineering