

DenTeC@Georgia Tech





DenTeC and Today's Dentist

Longer life spans, a burgeoning world population, and a society that is better educated about the importance of dental care is creating an exponentially growing demand that threatens to overwhelm dentists. DenTeC is working with dentists and the dental industry to meet these demands. The resultant engineering and technical innovations will allow dental professionals to serve more patients and improve the quality of treatment each patient receives.

DenTeC and the Dentist of Tomorrow

Exciting research opportunities attract top-notch engineering students, and DenTeC can provide these opportunities to Georgia Tech engineering students, some of whom pursue advanced degrees in dentistry. These students will be prepared to adopt high-tech treatment and product innovations, as well as work with scientists and researchers on continued advancements. Patients will benefit from enhanced, expanded dental care.

Research in Progress

- **Three-dimensional imaging** – DenTeC researchers have applied aerospace engineering technology—originally used for national defense—to create an individualized “virtual mouth.” By helping dentistry move from two-dimensional to three-dimensional visualization, this technology accurately locates jaw and tooth positions and nerve locations in a three-dimensional image. The diagnostic and clinical information derived from this model is unique and supersedes present day diagnostic resources.

The result? Dentists and craniofacial surgeons can collaboratively design complete treatment plans and test them in advance, enabling more precise fixed and removable prosthetics, as well as orthodontic tools and other dental appliances. Quickly fabricated and accurate, these dental prosthetics reduce patients' time at the doctor's office and offers greater longevity.

- **Visualization techniques relating bone structure to soft tissue** – By showing how bone structure affects soft tissue in three dimensions instead of two, researchers will provide an important tool for craniofacial treatments and aesthetics. This will make studies of treatment technologies and other areas, including psychological perceptions of facial symmetry, possible.

- **Measurement of curing forces in dental products** – Researchers are measuring the curing forces that affect the final shape and size of dental impressions, fillings, and crowns. Software modeling that takes these forces into account in currently used materials may result in more precisely fitted dental products. It may also lead to the development of newer materials or curing processes.

- **Sprayable fillings** – Filling materials that may be sprayed onto a tooth gradually, instead of being packed into a tooth all at once, might avoid the potential misshaping that can result as filling materials cure. This advance would make fillings fit more securely into each tooth, preventing bacteria and food from entering the tooth and causing additional caries or infection.

The Georgia Institute of Technology's Center for Dental Technology—DenTeC@Georgia Tech—demonstrates a unique commitment to dentistry by a world-renowned engineering university. By integrating engineering knowledge and dental science, DenTeC is introducing new products and technologies for dentistry and craniofacial medicine via multidisciplinary research, testing, education, and innovation.

DenTeC works with the dental industry, research and educational centers, and healthcare providers to improve dental healthcare worldwide through new product research, design, testing, and realization. This special integration of engineers, the dental industry, and dentists is expected to lead to significant growth and development within the dental field. More importantly, discoveries, advancements, and products resulting from DenTeC research, testing, and evaluation will be efficient, easy to use, and affordable for physicians and patients alike.

DenTeC and the Dental Industry

Georgia Tech's tradition of working closely with industry provides an excellent foundation for DenTeC research. The university's engineers and research faculty are especially qualified to perform original research and offer unbiased scientific evaluation of dental materials, processes, and engineered products.

The Georgia Tech Research Institute, Georgia Tech's applied research unit, works with more than 200 industrial and government customers at any one time. Georgia Tech researchers also are frequent participants in consortia that perform research for small and large businesses internationally.

Promising Research Possibilities for the Future

- **Enhanced color matching of teeth** – Defense technology developed at GTRI over the last forty years can be developed to help dentists precisely match the hue of a prosthetic tooth to that of existing teeth.
- **Air jets to remove caries** – Knowledge of flow and propulsion can be used to develop an abrasion instrument that removes caries with jets of air—as opposed to a drill—and then shoots a spray of sealant on the affected tooth.
- **Sensors and light spectrums for detection** – Georgia Tech researchers could enhance current oral cancer and caries detection devices by determining which portion of the light spectrum produces the most clear, quick, and efficient images of these conditions.

Potential applications for Georgia Tech technologies that will be harnessed by DenTeC:

- wireless dental offices
- acoustic sterilization of dental equipment
- streamlined, ergonomically designed dental tools
- ergonomically designed chairs for patients
- new materials for dental products
- time-saving automated processes and instrumentation



Research Capabilities

- advanced manufacturing
- Computer Aided Design and Computer-Aided Manufacturing
- cutting and polishing
- ergonomics
- evaluation of technologies
- fluid mechanics
- human factors analysis
- information technologies
- instrumentation
- materials characterization, testing, and analysis
- nanotechnology
- noise control
- photonics
- rapid prototyping and stereolithography
- software and hardware development
- test and evaluation
- two- and three-dimensional dental and craniofacial imaging and modeling
- three-dimensional plus time biomechanical analyses
- visualization technologies

Continuing Education

Initial professional education courses DenTeC offers:

- Clinical Advancement in Dental Materials, Techniques, and Technology in the Fee-for-Service Practice of Restorative Dentistry
- Treatment Acceptance Counseling
- Excellence in Hygiene, Excellence in Restorative Dentistry

Additional course topics:

- Understanding Porcelain and Resin Systems in Dentistry
- Advanced Fixed Prosthodontics and Occlusion
- Role of the Hygienist in Aesthetic Dentistry
- Marketing for Today's Economy
- Implants and Restorative Dentistry
- The Hygienist's Role in Implant Maintenance
- Practice Management Meets Technology
- World Symposium on Composites and Ceramics
- DenTeC World Technology Symposium

Courses are planned for the U.S. West Coast and London. Distance-learning technology also allows participants to tune in from remote locations to courses taught on the Georgia Tech campus. Classes also may be tailored to the needs of organizations requesting them.

Georgia Tech also administers the Royal College of Surgeons Certification Exam for general dental practitioners in the United States and Canada, as well as continuing education classes that practitioners take to prepare for the exam.

An annual technical symposium held at Georgia Tech for university and industry researchers will present recent research developments and discoveries that will benefit dentistry and craniofacial medicine. Additionally, focused, technical workshops will address lasers, three-dimensional imaging, nano-engineered materials, tissue engineering, and other specific technical topics of interest.

Contact Information

To learn more about what Georgia Tech's Dental Technology Center can do for you, visit us at www.gtri.gatech.edu, or contact:

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