

**PUBLICATIONS GRANTS PATENTS
CONFERENCES PRESENTATIONS**

Publications

W. Cai, M. Xu, and R.R. Alfano, "Three-dimensional radiative transfer tomography for turbid media," *IEEE Journal of Selected Topics in Quantum Electronics*, 9, 189 (2003).

A. Katz, A. Alimova, M. Xu, E. Rudolph, M. Shah, H.E. Savage, R. Rosen, S.A. McCormick and R.R. Alfano, "Bacteria size determination by elastic light scattering," *IEEE Journal of Selected Topics in Quantum Electronics*, 9, 277 (2003).

A. Katz, E.F. Kruger, G. Minko, C.H. Liu, R.B. Rosen, and R. R. Alfano, "Detection of glutamate in the eye by Raman spectroscopy," *Journal of Biomedical Optics*, 8, 167 (2003).

T.K. Gayen, A. Katz, H.E. Savage, S.A. McCormick, M. Al-Rubaiee, Y. Budansky, J. Lee, and R.R. Alfano, "Aorta and skin tissues welded by near-infrared Cr^{4+} :YAG laser," *Journal of Lasers in Clinical Medicine and Surgery*, 21, 5 (2003).

W.B. Wang, J.H. Ali, J.H. Vitenson, J.M. Lombardo, and R.R. Alfano, "Spectral polarization imaging of human rectum-membrane-prostate tissues," *IEEE Journal of Selected Topics in Quantum Electronics*, 9, 288 (2003).

M. Xu and R.R. Alfano, "More on patterns in Mie scattering," *Optics Communications*, 226, 1 (2003).

B.L. Yu, A.B. Bykov, T. Qiu, P.P. Ho, R.R. Alfano, and N. Borrelli, "Femtosecond optical Kerr shutter using lead-bismuth-gallium oxide glass," *Optics Communications*, 215, 407 (2003).

I. Zeylikovich and R.R. Alfano "Coherence properties of the supercontinuum source," *Applied Physics B*, 77, 265 (2003).

A. Teke, S. Dogan, F. Yun, M.A. Reshchikov, H. Le, X. Q. Liu, H. Morkoc, S.K. Zhang, W. B. Wang, and R.R. Alfano, "GaN/AlGaIn back-illuminated multiple-quantum-well Schottky barrier ultraviolet photodetectors," *Solid-State Electronics*, 47, 1401 (2003).

A. Teke, S. Dogan, L. He, D. Huang, F. Yun, M. Mikkelsen, H. Morkoc, S.K. Zhang, W.B. Wang, R.R. Alfano, "p-GaN-i-GaN/AlGaIn multiple-quantum-well/n-AlGaIn back-illuminated ultraviolet detectors," *Journal of Electronic Materials*, 32, 307 (2003).

NASA-SHARP Research Program for HS Students at CCNY's Institute for Ultrafast Spectroscopy and Lasers



Dr. Frank Scalzo (center) of NASA's Goddard Space Flight Center at the Goddard Institute for Space Studies, with Riverdale Country School students Tal Arrabami (left) and Richard DiBlasi (right), who conducted research at the IUSL on Cr^{4+} laser crystals.

Four outstanding high school students participated in an eight-week science research program at City College's Institute for Ultrafast Spectroscopy and Lasers (IUSL) that was funded by the National Aeronautics and Space Administration (NASA). The program, which was part of NASA's Summer High School Apprenticeship Research Program (SHARP) and a NASA grant, was co-sponsored by CCNY.

The students were enrolled in an intensive science and engineering research program and were mentored by City College faculty. At the end of the program each student submitted a written research/technical report describing his or her project, as well as an oral presentation summarizing their research.

The students also spent one or two days per week at NASA's Goddard Space Flight Center at the Goddard Institute for Space Studies, Manhattan, where they attended orientation and participated in workshops. They also delivered

presentations about their research to NASA-SHARP students from other college campuses.

City College faculty mentors offered guidance for the students' research projects. They also involved the students in their ongoing research and provided them with a mix of hands-on and theoretical experience. In addition, the mentors offered first-hand knowledge, information and encouragement concerning possible careers in the sciences, engineering, mathematics and technology.

Dr. Robert R. Alfano, Distinguished Professor of Science and Engineering at City College and Director of the IUSL, expressed his appreciation to NASA for its strong support.

Dr. Alfano said: "This wonderful program brings top students to CCNY where they have the opportunity to be mentored by world-renowned research faculty." He stressed that the high school students "served as active participants in ongoing research."

Patent Office Presentation by Dr. Alfano

Distinguished Professor of Science and Engineering Robert R. Alfano, Director City College's IUSL, was invited to make one of the principal presentations at a program organized by the United States Patent and Trademark Office entitled *Forum 2003 – The Progression of Technology, Business and Designs*. The event was held at the Crystal City headquarters of the Patent Office in Arlington, Virginia.

The aim of the forum was to provide information on the latest technology developments and breakthroughs for the patent examining staff of various Technology Centers (TC's). These TC's are responsible for examining patent applications in aeronautics, radio and acoustic wave communications, medical and surgical instruments, manufacturing, and a host of other important areas.

In his hour-long presentation, which was entitled "Optical Biopsy and Imaging for Medical and Non-Medical Applications," Dr. Alfano offered a comprehensive overview of the latest efforts in developing new concepts and devices for photonics applications based on key properties of light: wavelength, polarization and coherence. He described the different components when a burst of light enters a scattering medium: they are ballistic, snake and diffusive light.

He also discussed the advantages of optical biopsy, noting that "it offers rapid, real-time diagnosis, requires no tissue removal and can be performed with endoscopes, needles and fibers." He noted that this technology could potentially detect tumors such as those involving the breast, cervix, gastrointestinal tract, mouth, prostate, liver and kidney. This work has been supported by Mediscience Technology Corporation for over a decade. Dr. Alfano reported on efforts by IUSL researchers to refine optical biomedical imaging so that light can be used to replace mammograms and improve biopsy targeting.

In addition, he reported on progress by IUSL researchers in other areas, including the development of compact diagnostic devices; the detection of corrosion beneath paint through the use of polarized light; and developing laser wireless optical communication through foggy media.

Dr. Alfano has pioneered in inventing novel light sources and developing ultrafast laser spectroscopic techniques. He has conducted extensive, groundbreaking research in ultrafast laser technology and phenomena, condensed matter physics, biomedical optics and non linear optics, holds 85 U.S. and foreign patents for scientific inventions and has published nearly 700 papers in various areas of photonics.

NASA-SHARP Student Research

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Noting that CCNY has one of the largest undergraduate research programs of any college or university in the metropolitan area, he added that "City College is well prepared to extend similar research opportunities to talented high school students."

The following students served as NASA-SHARP research apprentices at the IUSL:

- Tal Avrahami and Richard DiBlasi, both seniors at Riverdale Country School, who conducted joint research projects on "Near Infrared Tunable Solid-State Laser Development"; and "Optical Characterization of Cr-doped Garnet Crystals Produced by Laser Heated Floating Zone Method."
- Galen Leung, a junior at Fort Lee High School, Fort Lee, N.J., who presented "An Evaluation Report for Batteries Working in Pulse-Mode";
- Karina Segal, a junior at Riverdale Country School, who completed a project entitled "Raman Scattering Study of Cr⁴⁺ Doped Crystals for Near Infrared Lasers and Amplifiers".

Tal Avrahami and Richard DiBlasi were mentored by Professors Robert R. Alfano and Vladimir Petricevic, along with Dr. Alexey Bykov, Dr. Vladimir Kartazayev and Mr. Scot Owen.

Mr. Leung's mentors were Dr. Alfano, Mr. Jin Cheng Luo, Dr. Uladzimir Kartazayev, Ms. Sviatlana Kartazayeva, Mr. Xiaohui Ni and Dr. Leming Wang.

Ms. Segal was mentored by Drs. Alfano and Mikhail Sharanov, Ms. Cheng-Hui Liu and Mr. Scot Owen.

The NASA-SHARP program also included several guided field trips, including visits to the Rose Center for Earth and Space at the American Museum of Natural History, the Intrepid Air and Space Museum and the Bronx Zoological Park.

Dr. Frank Scalzo of NASA had overall responsibility for the program. Dr. Sankar Sengupta of Riverdale Country School was the high school coordinator of the CCNY-NASA program.



Above: Ms. Cheng-Hui Liu (left), an IUSL mentor, with Karina Segal of Riverdale Country School, shown working with a Raman spectrometer. Below: Mr. Jing-Cheng Luo (left), an IUSL mentor, and Fort Lee High School student Galen Leung, with testing instrumentation for Mr. Leung's IUSL research project.

