

# NanoNews-Now

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## Interview on the UCSD Center of Cancer Nanotechnology Excellence, AKA NanoTUMOR Center

**Sadik Esener**, Principal Investigator at UCSD Center for Cancer Nanotechnology Excellence (CCNE)

**NN: Please talk about the UCSD Center of Cancer Nanotechnology Excellence (AKA NanoTUMOR Center); how it came to be; its goals; and current status.**

Esener: There was a considerable amount of ongoing work in various aspects of nanotechnology at different locations at the UCSD campus as well as our partner institutions. The NanoTUMORCenter has enabled us to bring researchers from various disciplines -such as chemists, physicists, engineers, biologist and oncologist - together with the aim of applying nanotechnology towards the understanding, treatment and monitoring of cancer. The center now supports more than 35 co-investigators. We now have a central laboratory dedicated to cancer nanotechnology at the Moores Cancer Center with satellite laboratories distributed at the UCSD campus including the CalIT2 building and at our partner institutions.

**NN: The National Cancer Institute (NCI) awarded UCSD \$3.9 million for the first year of a five-year, \$20 million cancer-nanotechnology platform partnership. In general, how will the \$3.9 million be allocated?**

Esener: The \$3.9 million per year funding is distributed among six projects and the related core facilities. Each project is developing a different aspect of cancer nanotechnology that will create platforms for more powerful and selective cancer therapy when integrated together. Each project will work to advance our tools for earlier detection of cancer, and our understanding of the progress of the disease.

**NN: Which institutions are participating in the NTC? What expertise do they bring?**

Esener: In addition to UCSD, our partner institutions include UCSB, which is well known for its capabilities in nanotechnology, and Burnham Institute, where different types of targeting peptides have been developed and tested. In addition, investigators from UC-Riverside and UC-IrNanoBioNexus bring certain specific expertise to the program while NanoBioNexus manages our educational activities.

**NN: In general what types of research projects are planned over the five years of the program and what are their goals?**

Esener: One focus of the UCSD effort will be to develop smart hierarchical delivery platforms about the size of a red blood cell. These "mother ships" would move through the body and target specific tumor cells or the blood vessels that feed them. After arriving at their destinations, the mother ships would release their payload nanoparticles, which could be designed to help image tumors, enter cells and perform measurements, and deliver therapies. Chemists at UCSD, together with materials scientists at the University of California, Santa Barbara nanofabrication facility, will synthesize nanoparticles that will be coated with "biolinkers," molecules developed at the Burnham Institute to make the particles attach to specific types of tumor cells.

**NN: On April 4, 2006, NanoBioNexus announced that they will head the educational component of the NanoTUMOR Center. Why is an Educational Core needed?**

NanoBioNexus: The National Cancer Institute requested that each of the eight Centers of Cancer and Nanotechnology Excellence (CCNE) create community outreach and internal educational programs in nanotechnology and cancer. Nanotechnology is so new that scientists and physicians as well as the general public have a thirst to learn more. Certainly, they are curious about how nanotechnology can help people with cancer. Finally, we want to replace the misinformation that creates anxiety with the facts so that the full benefits of nanotechnology are realized. Thus, the job of the Educational Core is to plan and execute the corresponding programs

**NN: Who are the intended "users" of the educational materials?**

NanoBioNexus: We want to target the general public because everyone, directly or indirectly, is affected by cancer. We also want to establish close ties to local health care providers and research professional so that they are aware of new discoveries and potential therapeutics. Finally, we shall catalyze education, communication and cooperation within the NTC by our efforts.

**NN: Why was NanoBioNexus chosen by the NanoTUMOR Center to Implement the Educational Core?**

NanoBioNexus: NBN has an expertise in teaching the public, including scientists, about both nanotechnology and biotechnology. This combination of educational expertise in the nanotech/biotech space and in teaching both the general public as well as scientists is unusual.

**NN: What are the goals of the educational efforts?**

NanoBioNexus: Our goals are tailored to audiences: For the general public, we want to provide realistic information about the emerging field of nanotechnology and its current and potential beneficial impacts upon cancer diagnosis and treatment. For the professionals of the community, we need to provide relevant and realistic technical information in an attractive format. For the members of the NTC, our goals are not only to provide technical information about nanotechnology and cancer but also to facilitate the research of the NTC through enhanced communication and networking.

**NN: What types of projects will NanoBioNexus undertake?**

NanoBioNexus: Our projects are tailored to the specific audience and critical for success. For the general public we will create a website full of useful information on nanotechnology and cancer, provide a calendar of local events on these important subjects and encourage local media to produce timely and factual content. Our website will also contain more technical information for health care providers and professionals in the nanotech/biotech space. NanoBioNexus also seeks to establish personal ties to all professionals. We plan to visit local hospitals to lecture on cancer and nanotechnology in a way that is relevant for health care providers. Likewise, many of our seminars, which focus on research in nanotechnology and cancer, will be open to interested professionals.

We have an extensive list of projects specifically for the NTC. We shall plan and host multiple seminars, the staple of communication in the scientific community. We will add occasional workshops, intensive daylong meetings designed for extensive discussion, development and coordination. Then there is the private website of the NTC, which will have multiple tools for

education and communication. The tools include recordings of seminars for later reference, FAQ's, calendar of events, a moderated forum, an annotated bibliography, etc.

We look forward to the full implementation of these and other projects, which will occur over the next few years. We are very excited about the opportunity to expose all to this exciting research and its vast potential to treat cancer.

**NN: To date, what are the most promising nanoplatforms for cancer diagnostics and treatment? How do they work?**

Esener: It is far too early to even attempt to answer this question. However, it is well accepted today that drug delivery via nanotechnology offers great potential and has significant advantages over more conventional techniques. The advantages include:

- Highly selective targeted delivery via blood vessels to specific desired locations using, for example, peptides developed at Burnham Institute for targeting
- Reduce undesired side effects
- Reduce drug quantities while increasing effectiveness by delivering the treatment right to the tumor
- Delivery of multiple drugs regardless of their pharmacokinetic compatibility

**NN: Looking out 10 years, what are your hopes regarding medical diagnostics and treatments stemming from our understanding of the nanoscale?**

Esener: Our hope in general is to be able to reduce suffering and death caused by cancer and to significantly improve the quality of life for cancer patients and their families. More specifically, we hope to develop platforms that can detect cancer at its earliest stage. We hope to be able to monitor and treat residual cancerous cells after treatment and be able to provide treatment with high specificity and efficiency eliminating side effects and the need to perform open surgery to remove tumors.

## **Sadik Esener, Ph.D.**

Professor Esener is an internationally known expert in photonics and opto-electronics, and he has been closely involved with five startup companies based on technology developed in his laboratories. Professor Esener co-founded San Diego-based Nanogen, Optical Micro-Machines, Parallel Solutions, Genoptix, and Call/Recall Inc.

His research interests include light modulation, detection, and amplification, heterogeneous integration of optoelectronic components, optical data storage, optical interconnects and related computing architectures, and biophotonics as applied to gene chips. Esener is a pioneer in the fields of free-space optical interconnects, parallel access volumetric optical data storage, DNA-assisted heterogeneous integration and optical cell sorting, and holds many patents in these areas. Esener's research team is working on diverse projects pushing the limits of the state of the art. They include active and passive photonic device processing and hybrid integration techniques; photonics sub-systems assembly such as optically interconnected Fast Fourier Transform accelerator boards; and parallel light tweezer systems for handling and characterization of biological entities.

Esener joined the UCSD faculty in 1987, after receiving his Ph.D. in Applied Physics and Electrical Engineering from UCSD the same year. He leads UCSD's OptoElectronic Computing Group, and is the director of: the DARPA-funded multi-university Center for Chips with Heterogeneously Integrated Photonics (CHIPS); the 3D-Opto-Electronic Stacked Processors industry/university consortium; and the Fast Read-out Optical Storage (FROST) Industry consortium. He has authored more than 100 journal publications and 200 conference abstracts. Esener is a member of IEEE, OSA, and SPIE.

## **About NanoBioNexus**

NanoBioNexus is the only San Diego organization exclusively dedicated to nanobiotechnology; boasting a growing international constituency. It is a non-profit corporation that showcases applications of nanotechnology in the Life Sciences. The NanoBioNexus mission is to provide a community service by building awareness and understanding of nanotechnology and by fostering business opportunities in the application of nanotechnology in the life sciences. NanoBioNexus serves as a catalyst for forming relationships and exchanging ideas by sponsoring acclaimed, ongoing forums that bring together target audiences that include scientists, entrepreneurs, business and legal experts, technology experts, academics, venture capitalists, and the general public. NanoBioNexus enables constituents in the Southern California area and beyond to keep up-to-date on the nanobio business environment.

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### **Additional Links:**

[CCNE Fact Sheet](#)

[Biographies - CCNEs](#)

[Questions and Answers: CCNE](#)

(Ed.'s note: Special thanks to Sandra Kay Helsel and the team at NanoBioNexus for all their help putting this interview together.)