Prof Vasilis Ntziachristos, Director - Institute for Biological and Medical Imaging

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Modern imaging methods greatly exceed the possibilities of X-rays. Vasilis Ntziachristos holds the Chair of Biological Imaging at the Technical University of Munich (TUM) and is Director of the Institute for Biological and Medical Imaging at Helmholtz Zentrum München. In this interview, he talks about the fascination of imaging techniques and about finding a common language for engineers and doctors.

Professor Ntziachristos, you have been working on imaging techniques for quite a while now. How did you end up in this field?

I began working with imaging very early on. Back in 1993, I received my diploma for a thesis on Magnetic Resonance Imaging electronics and sequences. Since then, I looked into several different ways of making biological information visible - optical techniques, radio frequency imaging, combinations with X-ray, CT, MRI and ultrasound - but it has always been imaging.

What is it about imaging that got you?

Images are a fundamental way of understanding the world. They say an image is worth a thousand words, and it's true. Take biology: There is a lot of information to be found in the spatial relation of biological contrast and interworking of cell populations. It is fascinating when you visualize processes that are usually hidden. Using technology, we can for instance see what happens functionally in tissues. Not just the anatomy, but also the distribution of cells or molecular information, such as the concentration of oxygen within different tissues.

You received praise, awards, and research grants for several research projects. How many different imaging techniques are you and your colleagues working on?

We have three major directions: fluorescence imaging, thermoacoustics, and optoacoustics. Within these fields, we work on different devices and different applications. In optoacoustics, for example, we have three microscope implementations with very different abilities; we have developed three different mesoscopes for skin and subsurface tissue visualization and several other optoacoustic devices. Overall, there are at least ten different implementations of the technology, probably more, depending on how you count.

Your optoacoustic devices are in various stages of development. How long will it be until the first one of them will be in everyday use in hospitals?

In biomedical technology, this is always a long process. There actually are optoacoustic systems in hospitals today for research purposes but not for everyday routine use. We believe, however, that it won't be long until these methods are used in cardiology, in cancer, dermatology, and other fields. Through research and through tests in clinical environments we should be able to find the key diagnostic and theranostic applications in the next two to three years.

What are the typical problems if you want to adapt a technology you developed for practical use?

You need to be able to bridge the gap between engineering and medicine. Engineers tend to develop technologies because they can be developed and because it is scientifically interesting to develop them. Everyday use, however, comes from not only having a good technology but from solving an unmet clinical need. You have to find a common language to understand the needs of medical doctors.

How do you address this in your projects?

When we developed the proposal for Innoderm - a handheld device for dermatologists that we are currently working on - we sat down and talked to several dermatologists at Klinikum rechts der Isar. It turned out that there are several unmet needs. One of them, for example is to assess treatment of the skin accurately and quantitatively. It is important to quickly understand if a certain treatment works or if a different therapeutic approach must be followed. As a next step, we go into the clinic to do pilot studies to show the feasibility of our techniques and then a more extensive study to show the clinical value. The Innoderm project, which started in March, is going to last for five years. In the first two years we are going to improve the technology and adapt it to solving particular problems. Then, we are going to apply it to further clinical tests.

Apart from Innoderm, where are your goals right now?

We want to identify where we can really have an impact on society and health care with our technology. We have many ideas about how to further evolve ways of sensing and visualizing information that is invisible as of yet and can lead to earlier and more accurate diagnosis. You could say that half of our activity is dedicated to this goal. The other half will remain on the technical development of devices.

Prof. Dr. Vasilis Ntziachristos

Vasilis Ntziachristos as assistant professor and Director of the Laboratory for Bio-Optics and Molecular Imaging at Harvard University and Massachusetts General Hospital, before being appointed to the Chair of Biological Imaging at TUM. The Chair is closely linked with the Institute for Biological and Medical Imaging at Helmholtz Zentrum München, of which Prof. Ntziachristos is Director. Among other honors, Prof. Ntziachristos received the Gottfried Wilhelm Leibniz Prize of the Deutsche Forschungsgemeinschaft (DFG) and several grants by the European Research Council (ERC).

INNODERM

With "Innoderm" TUM is heading a European research project, where engineers and physicians together develop a new optoacoustic handheld instrument for early diagnosis of skin cancer. The goal is to provide the physicians with a tool that allows on site-assessment of morphological, physiological and cellular changes of the skin area examined not only by inspecting the skin surface, but also sub-surface features within several millimeters of depth. The project combines the expertise of engineers, scientists and clinicians in a consortium comprising five partners from four European countries. The project has been awarded a grant of 3,8 million € from Horizon 2020, the EU framework program for research and innovation.

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