



## Röntgen Prize for X-ray research goes to Christian David

In a ceremony held at the University of Giessen (Germany) on 26<sup>th</sup> November 2010, Christian David, a scientist at the Laboratory for Micro and Nanotechnology at the Paul Scherrer Institute, received the Röntgen Prize for research in radiation science. David pioneered a method for enhancing the quality of X-ray images. He developed an X-ray interferometer that allows the phase shift and scattering power of an object to be visualized, in addition to obtaining conventional radiographs produced by absorption. The interferometer is based on a set of diffraction gratings with micrometre-sized slits, developed and manufactured by David's group at the Laboratory for Micro and Nanotechnology. Christian David received the award jointly with Franz Pfeiffer from the Technische Universität München, who worked closely together with him.

Normal X-ray images are based on absorption contrast, which means that they show the shadow of the inner structure of the object being investigated. Therefore, materials with different absorption coefficients – such as bones and soft tissue in a medical examination – can be easily distinguished in an X-ray image. Materials with similar values of the absorption coefficient, however, look almost the same, which may be problematic in medical investigations, such as when a tumour has to be distinguished from the healthy tissue surrounding it.

### Award for high-quality X-ray images

Several methods for enhancing the quality of microscopic images in optical microscopy have been used for decades, among them being phase contrast microscopy, which employs the differences in phase shifts accumulated by the beam at different points of the sample, and dark-field microscopy, which is based on observation of the scattered part of the beam, instead of the transmitted one. This year's 2010 Röntgen Prize from the University of Giessen was awarded to Christian David from PSI and Franz Pfeiffer from the Technische Universität München for applying these methods to X-ray imaging techniques, by using a grating interferometry technique.

In 2001, Christian David started to perform experiments on synchrotron beam lines, to record the phase shift in X-ray images using two micro-fabricated diffraction gratings. Some years later, he and Franz Pfeiffer discovered that the method can also be used on standard X-ray machines, when a third diffraction grating is introduced. This key development distinguishes the method from other X-ray phase-contrast imaging methods, as it allows for widespread application outside the field of large-scale research facilities. In addition, these scientists showed that this setup is also capable of providing a dark-field image of a sample, giving information on the local scattering power of the sample. The discoveries of these laureates are expected to have significant impact on medical imaging, as well as in the non-destructive testing of industrial products, or even in luggage security checks.

### The laureates

Christian David, born in 1965, is Head of the X-ray Optics and Applications Group at the Laboratory for Micro- and Nanotechnology at the Paul Scherrer Institute. David studied Physics at the University of Göttingen and, after a postdoctoral stay at the University of Heidelberg, started working at PSI in 1996. He was awarded the Röntgen Prize together with his colleague Franz Pfeiffer, born in 1972, a former scientist at PSI and now Professor of Physics at the Technische Universität München.