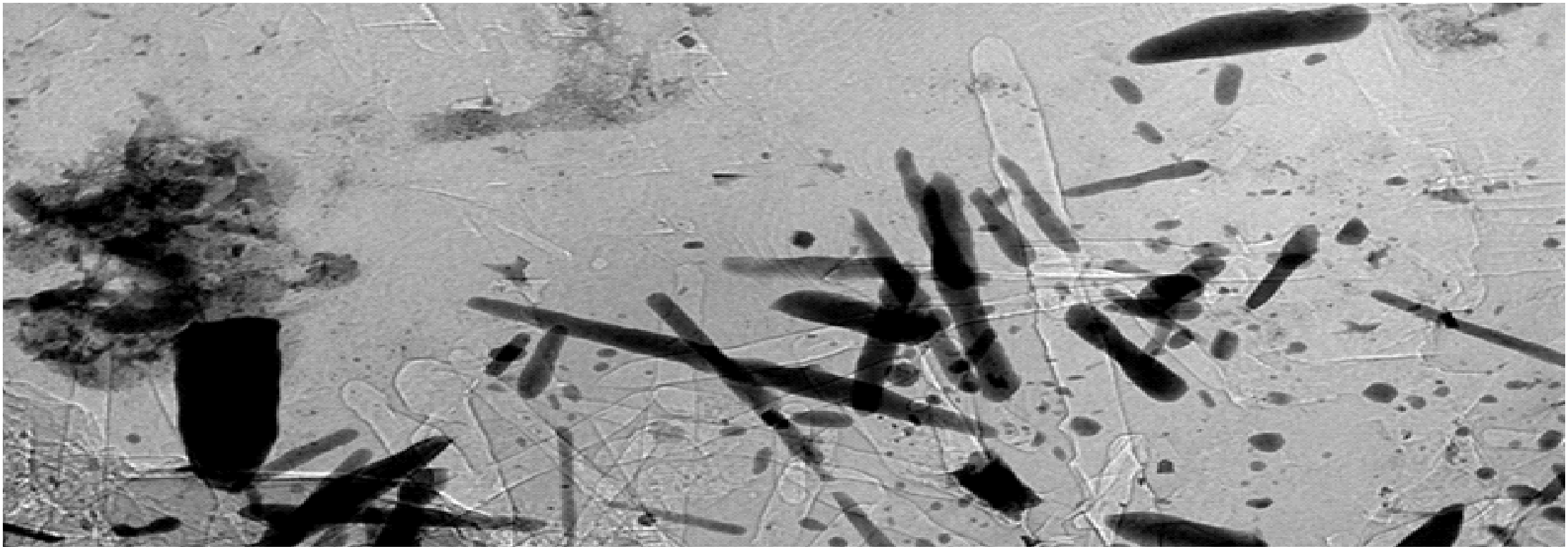


X-RAYS @ WORK

Phase Contrast X-ray Imaging

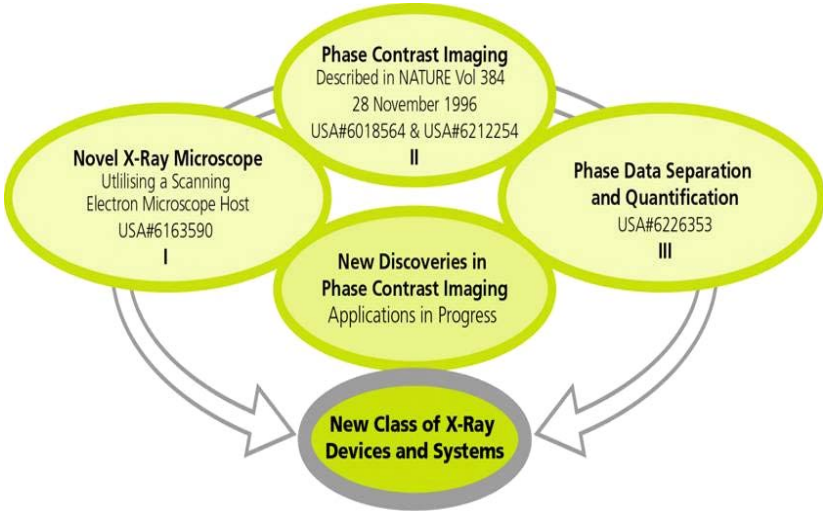
XRT
The Sharper Edge In Imaging

Images

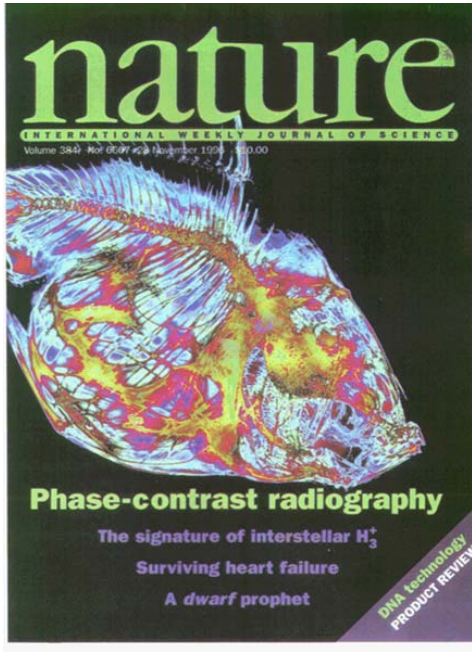
Cover Image:
2D PCX image of an aerospace composite

Image right:
XRT's patent families

Image far right:
First publication in 1996 by Dr Steven Wilkins research group at CSIRO



XRT Limited has 5 successful patent applications across more than 10 geographic legal jurisdictions.



Pioneering research in 1996 by Dr Steve Wilkins' group at the CSIRO took phase contrast imaging out of the realm of specialised equipment and made it compatible with conventional and relatively low cost components

XRT Limited was setup to commercialise the results of these discoveries and now owns a suite of globally issued patents in this field.

"Phase Contrast imaging using *polychromatic* hard x-rays"

S.W. Wilkins, T.E. Gureyev, D. Gao, A. Pogany & A.W. Stevenson
NATURE Vol 384, 1996

Phase contrast X-ray imaging

XRT is the pioneer in phase contrast X-ray imaging using ground-breaking technology originally developed by CSIRO (Commonwealth Scientific Industrial Research Organisation) Australia. XRT holds international patents in the field which are in effect in most countries of the world including Japan, Asia, Europe and USA.

When X-rays penetrate through a sample, two major things happen.

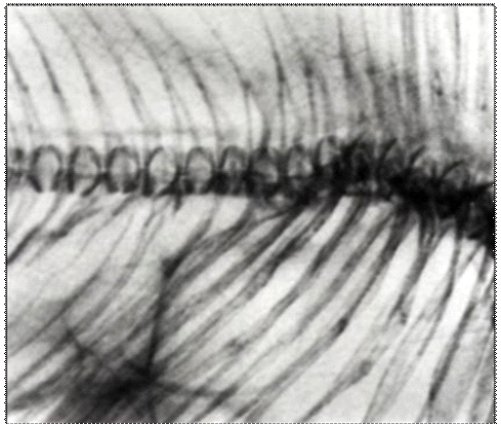
1) Absorption – the X-rays are attenuated by the sample through mechanisms such as scattering and fluorescence.
2) Phase Change – the X-rays are "bent" or deflected by refraction as they pass through the sample.

In an imaging system these two effects lead to absorption contrast and phase contrast respectively. There are three important things to understand about these contrast mechanisms:

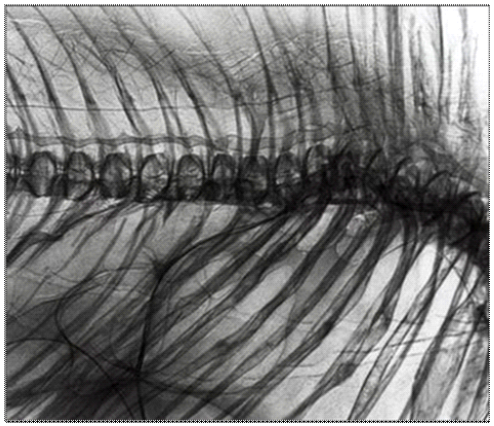
1) Phase contrast is significantly larger than absorption contrast in the normal X-ray energy range.

2) Absorption contrast is inversely proportional to $(kV)^3$ and it drops off very rapidly with increasing X-ray energy. Phase contrast on the other hand is only inversely proportional to kV, it drops off much less rapidly with increasing X-ray energy.

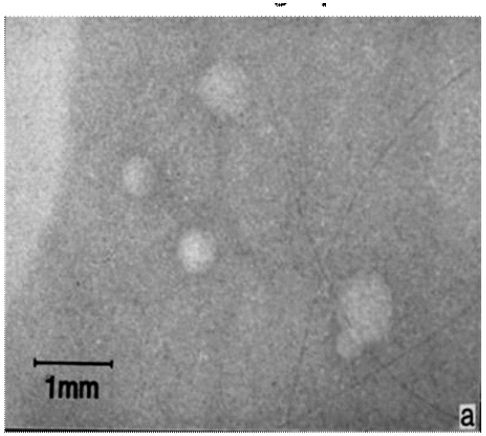
3) Absorption contrast is proportional to $(\text{Atomic Number})^4$ whereas phase contrast is roughly proportional to Electron Density.



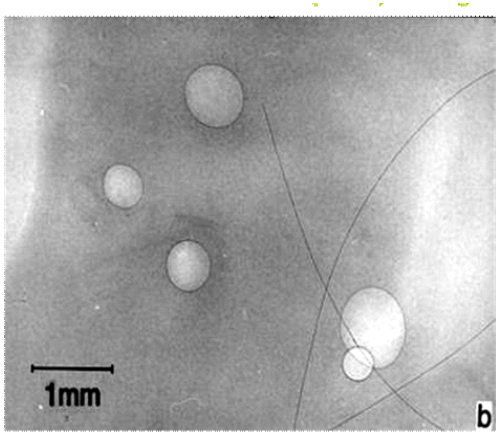
Conventional, absorption image



Phase contrast image



Conventional, absorption image



Phase contrast image

Images:

Some examples of images, with and without phase contrast visualisation

Phase contrast – A paradigm shift in x-ray imaging

Traditionally, because of technology limitations, X-ray imaging systems have only been able to see the absorption contrast component. This has generally limited the application of X-ray imaging to structures made up of materials higher up in the periodic table. Now, using the latest advances in source and detector technology and implementing it's propagation methodology, XRT is able to deliver practical phase contrast X-ray imaging systems with the following advantages:

1) Systems enabled for phase contrast can generally achieve much higher image contrast (quality) on all types of samples compared to those using absorption contrast alone. Simply put, features become visible or more visible with phase contrast.

2) Phase contrast systems are able to use higher X-ray energy and still achieve good contrast which enables the imaging of thicker/more dense samples thereby increasing the types of samples that may be imaged and easing the requirements for sample preparation.

3) Low atomic number structures can be imaged by phase contrast which would be impossible by absorption contrast alone, phase contrast is also particularly sensitive to voids, cracks, delamination etc.

XRT, the Company

XRT's core expertise lies in developing and commercialising new technologies in the field of X-ray phase contrast imaging.

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XRT
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