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**Photoacoustic imaging for characterising the structure and
function of vascular networks**

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Photoacoustic imaging is a new non invasive soft tissue imaging method in which low energy nanosecond pulses of visible or near infrared (NIR) laser light are used to excite subsurface ultrasound waves. The distinguishing advantage of the technique is that provides the high contrast and spectroscopic based specificity of optical techniques along with the high spatial resolution of ultrasound. Haemoglobin represents the most important source of naturally occurring photoacoustic contrast due its relatively strong optical absorption in the visible and NIR making the technique particularly well suited to imaging blood vessels. In addition, functional information can be provided by obtaining images at multiple wavelengths and applying a spectroscopic analysis to quantify the concentrations of endogenous chromophores such as oxy and deoxyhaemoglobin. These attributes make the technique well suited to studying a wide range of tissue abnormalities such as tumours and other pathologies characterised by changes in the structure and oxygenation status of the vasculature. A novel optical ultrasound imaging system has been developed and used to obtain 3D images of the superficial vascular anatomy of the mouse brain, skin and implanted tumours and demonstrate the spectroscopic capability of the technique.