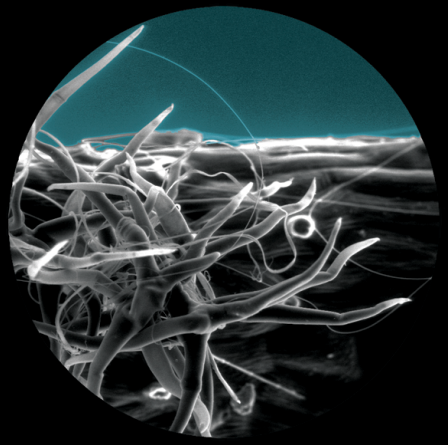


CRICBristol

Artist Residency

Dr Catherine Baker

£6.6m Clinical Research and Imaging Centre for Bristol

- The University of Bristol and United Bristol Healthcare Trust (UBHT) joined forces to establish a new state-of-the-art Clinical Research Imaging Centre (CRIC) at St Michael's Hospital on St Michaels's Hill in Bristol. The build cost for the centre was £6.6m, being jointly funded by the University of Bristol, UBHT and a £1.5m award from the Wolfson Foundation. This unique collaboration between the University and the NHS enables people in Bristol and the South West to benefit from the latest, high-quality, cutting-edge research being conducted locally.

- Catherine Baker was invited to be an Artist in Residence at the Centre. As CRIC was under construction the residency visits took place at various hospitals and University departments across Bristol over the period of one year.

- A CRICBristol advisory team was put in place, which consisted of academics and hospital clinicians. The team met regularly and Baker participated in discussions about the development of the Centre. As a result she met individually with a number of the board members. In addition she made contact with academic staff in the Medical Sciences building, who assisted her in her research.

Public Facing Artwork

The brief given to Baker was completely open and she decided that the artefacts produced should focus on CRIC users, both academic researchers and patients. In order to understand the activity around CRIC in more depth she began to shadow the Centre's research staff.

As a result she worked directly with:
Emeritus Professor Andrew Whitelaw, School of Clinical Sciences – Area of Research: Mechanisms and Treatment of Neonatal Brain Injury
Professor Risto Kaupinnen, Chair in Imaging – Area of Research: Magnetic Resonance Techniques for Brain Imaging
Dr Diane Crawford, Director of Medical Physics and Bioengineering, University Hospitals **Bristol NHS Foundation Trust**
Dr Paul Verkade, School of Biochemistry – Area of Research: Reader in Cell Imaging
Dr Chiara Bucciarelli-Ducci, Consultant Senior Lecturer – Area of Research: Cardiology, Cardiovascular Imaging, Cardiac MRI
Professor Iain Gilchrist, Professor of Neuropsychology – **Area of Research: Visual Exploration**

She was also assisted by the radiology team, public engagement team, grounds and estate teams, and CRIC centre staff including Dr. Jade Thai (CRIC centre manager) and Emily Austin.

Outside the University and Hospital teams, Baker also consulted Kew Gardens and the Royal Horticultural Society on specific aspects of the research.

H

F

Platanus Orientalis Digitata

The Platanus Orientalis Digitata is also known as the Plane Tree. More importantly it is reputed to be the tree under which Hippocrates taught the earliest medicine, and the Greek Government are known to still gift young specimens of this tree to significant medical institutions across the world.

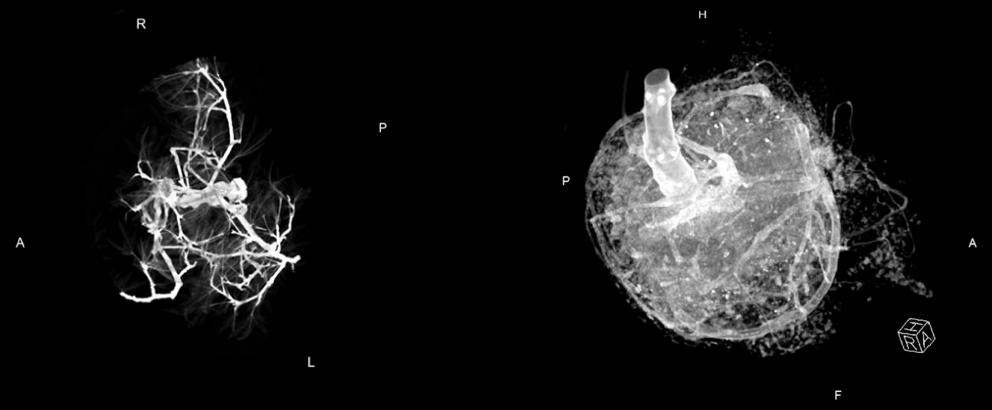
Baker decided to respond to the nature of CRIC as an imaging centre, using the Hippocrates tree as a metaphor for life. She explored how it might be investigated and documented using the bio-medical imaging processes available at CRIC and St Michael's Hospital. Dr Diane Crawford facilitated Baker's work in the Hospital's radiology department. Central to the research was the interpretation of the tree through diagnostic imaging processes, which were used to articulate to patients the processes under daily use at both CRIC and the Hospital Trust.

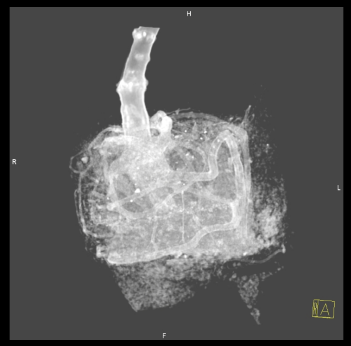
Biomedical imaging techniques make it possible to visualise what is hidden from the naked eye, thus extending the diagnostic capabilities of the clinicians and researchers exponentially. Throughout her research Baker used MRI, CT Scanning, Mammogram imaging, X-ray, and Electron Microscopy to describe the hidden aspects of the tree. The Royal Horticultural Society provided a link to specialist nurseries in the UK that might be able to supply a 'human sized' tree, so that it would fit in the machinery designed specifically for human use, and the research staff at Kew provided advice on how to sustain the tree throughout the imaging process.

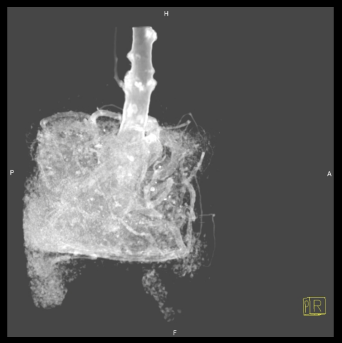
Imaging

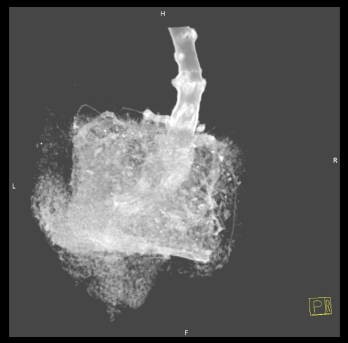
Inverted joined CT scans of root ball and branch structures

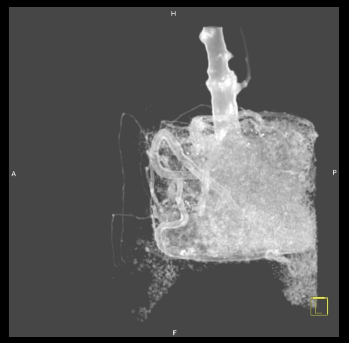
Magnetic Resonance Imaging revealed little about the internal composition of the tree. MRI makes use of the magnetic properties of certain atomic nuclei. An example is the hydrogen nucleus (a single proton) present in water molecules, and therefore in all body tissues. The hydrogen nuclei behave like compass needles that are partially aligned by a strong magnetic field in the scanner. The nuclei can be rotated using radio waves, and they subsequently oscillate in the magnetic field while returning to equilibrium. Simultaneously they emit a radio signal. This is detected using coils and can be used for making detailed images of body tissues. The very detailed images associated with MRI were not possible due to the low water content of the tree. Although a living specimen, the resulting MRI was poor quality as it only captured the area next to an inner layer of bark, whereby the tree transports water from the roots. Professor Risto Kaupinnen carried out the scanning using CRIC facilities. By altering parameters throughout the process more detail was able to be imaged but it was CT scanning which revealed the most about the tree's structure.

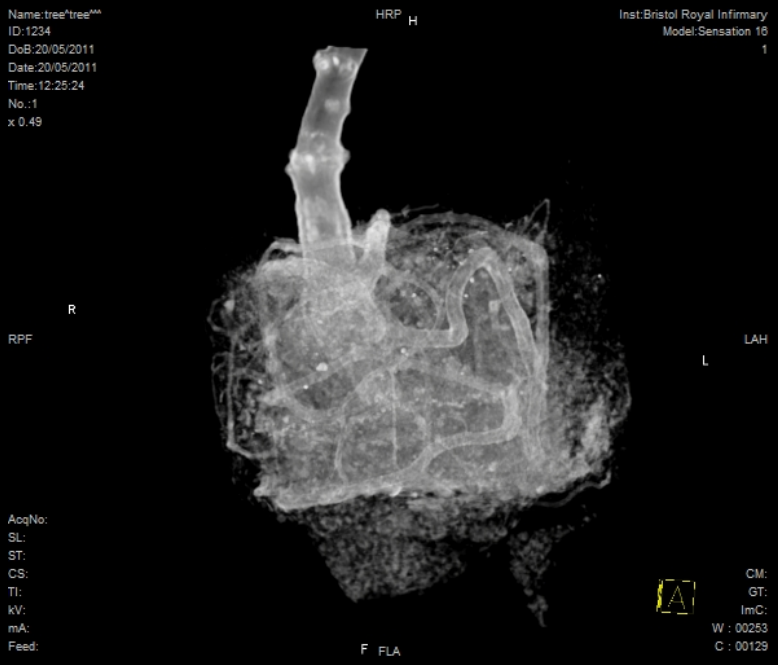


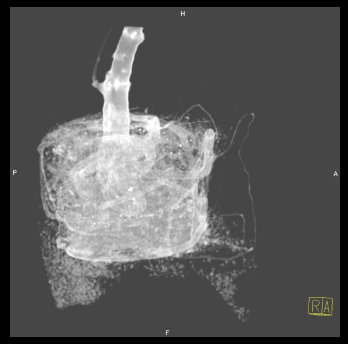


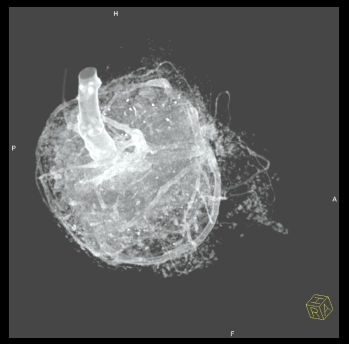




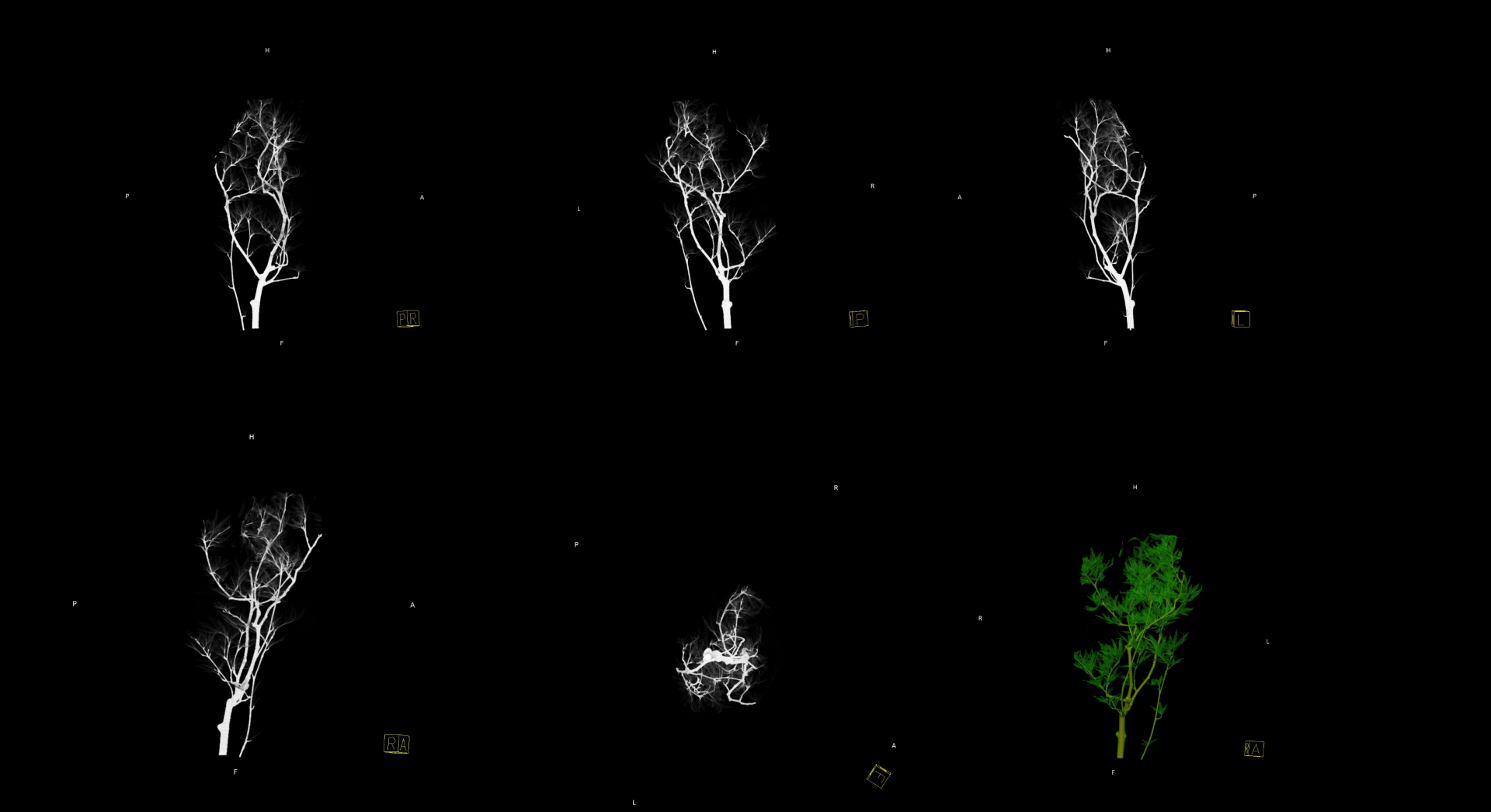








Root sequencing CT



Branch sequencing
CT

Environmental Scanning Electron Microscope ESEM

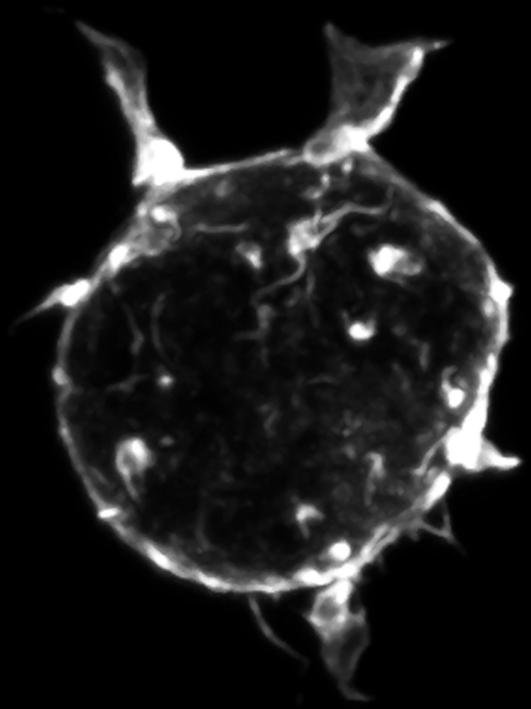
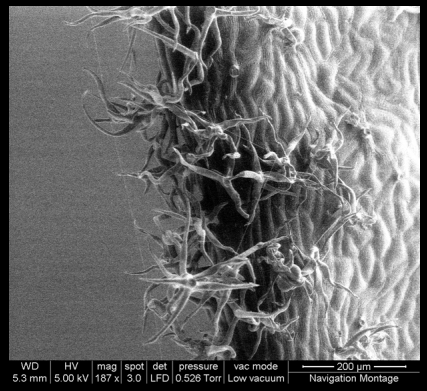


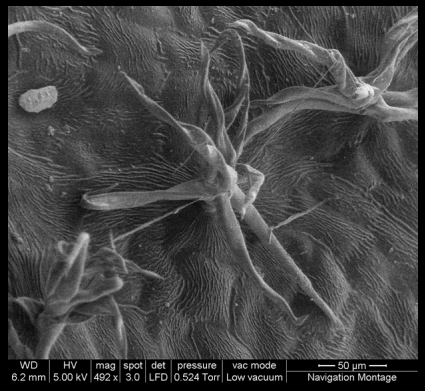
Image courtesy: Britton

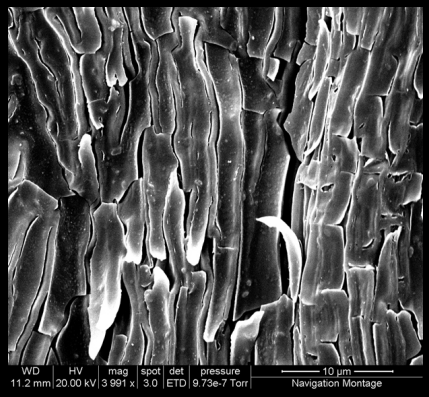
Samples were taken from the tree and developed further with the support of Dr. Paul Verkade, Reader and Judith Mantell from the Wolfson Bioimaging Facility in the Medical Sciences Building of the University of Bristol. In addition Rebecca Jones, of the same facility, helped to supply additional Bioimaging micrographs, kindly provided by members of the faculty of medical and Veterinary Sciences for the CRICBristol Artwork book.

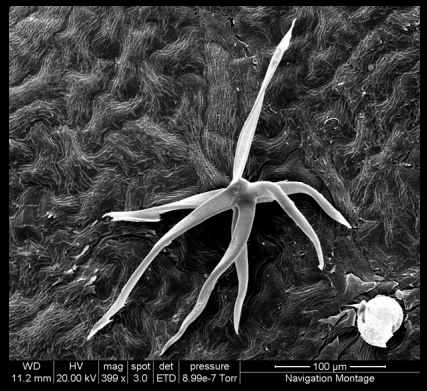
Judith Mantell assisted Baker in gaining the microscopic images of the tree. This process revealed some amazing SEM images of the Hippocrates tree leaf. The scanning exposed beautiful spiky hairs on the leaf that, we discovered, were called ‘trichones’. Mantell used both a drying and coating technique, which allowed the leaf to be imaged at high vacuum and high resolution. This process sometimes resulted in a loss of the more delicate structures of the leaf. The leaves were also imaged using a low vacuum technique, where the leaf is put straight under the microscope without intervention. The low vacuum technique images were 'noisier' and lower resolution but closer to nature. After much experimentation and development 8 images were selected to be installed in CRIC and far more were documented in the book.

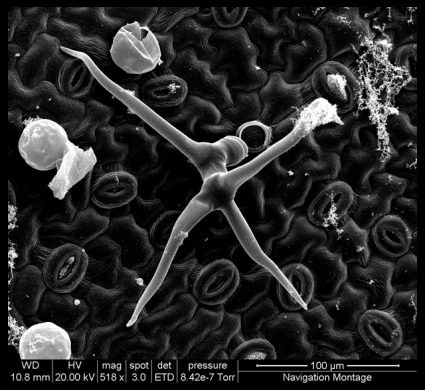
The following slides represent a selection of the ESEM / SEM images selected from the hundreds taken.



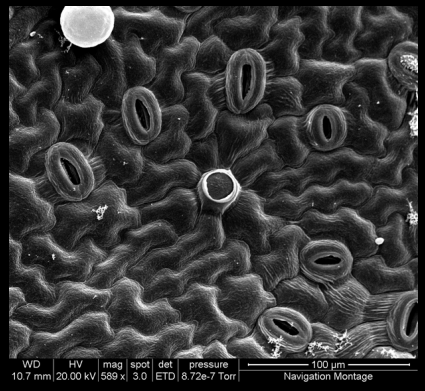


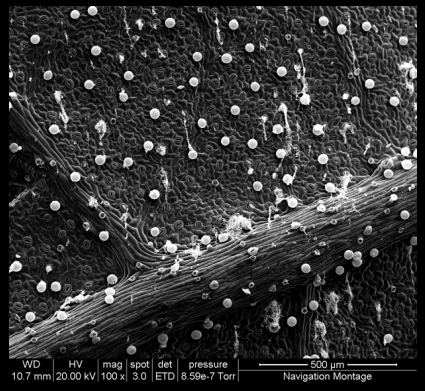


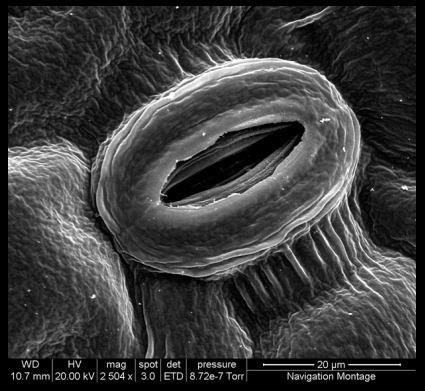


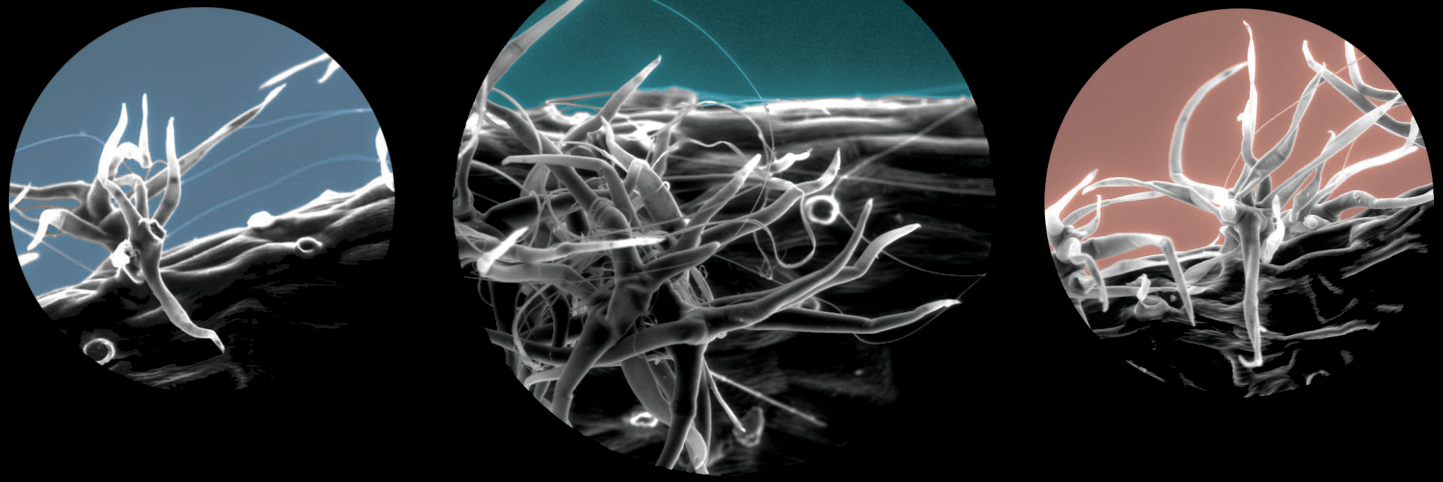


These images show the different levels of magnification tested and the tricone that was identified (middle and upper rows), plus both stimata and stomata taken from the upper and undersides of the leaf (bottom images).
The image in the top right, we suspected, had been contaminated by the coating process and thus only the peeling coating was exposed.



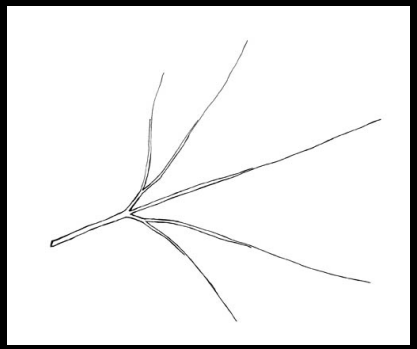


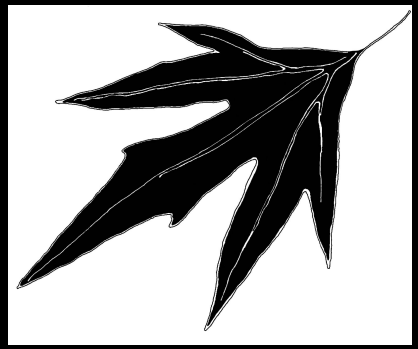




Mammogram

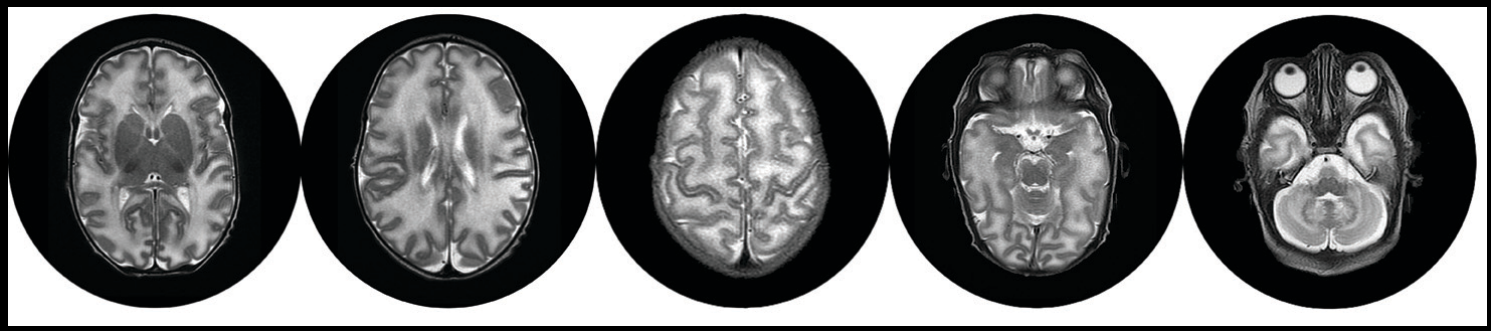
A selection of leaves underwent a mammogram procedure, much like MRI. The resulting images did not capture sufficient detail, however the outline shape was revealed. These images highlighted the unique nature of the leaf which contributed, in part, to its name ‘digitata’. The five pointed ‘finger’ like digits were clearly visible and the mammograms were used in conjunction with the CT scans for the artwork, which was developed for the glazing panels in the waiting area of CRIC. The delicate leaf structures were, in part, lost through the CT process so the mammograms provided the missing part of the structure.

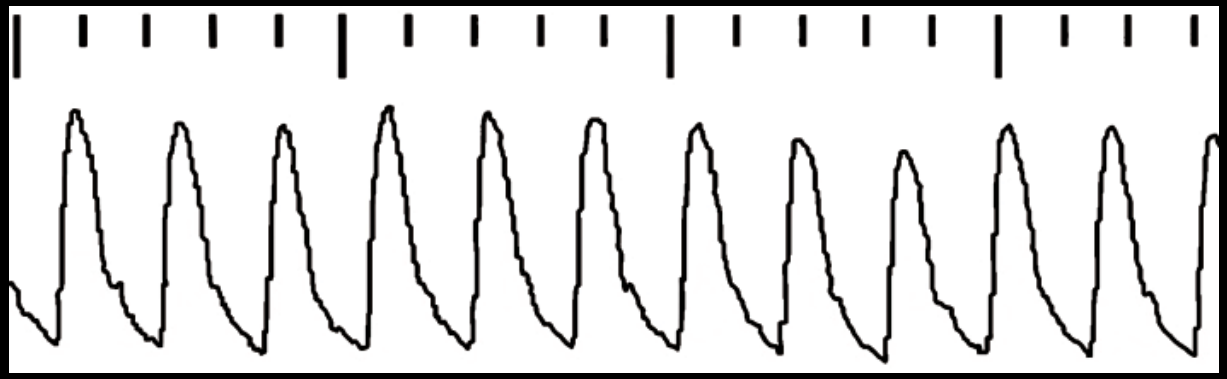




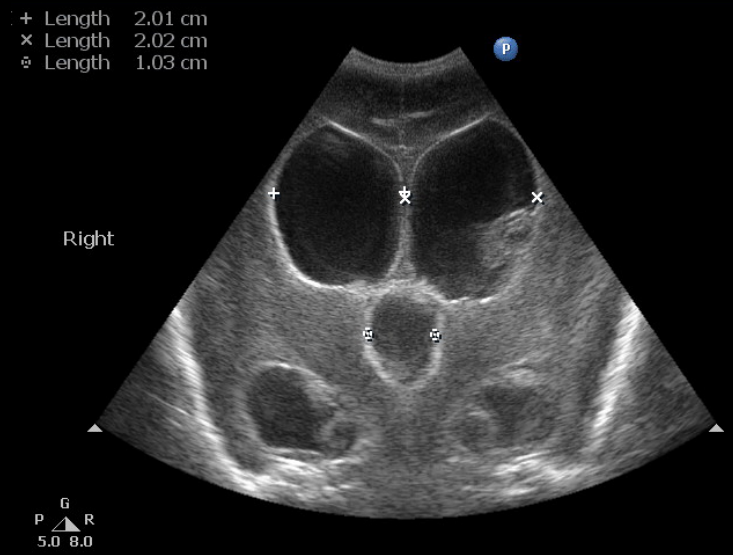
Appropriated images

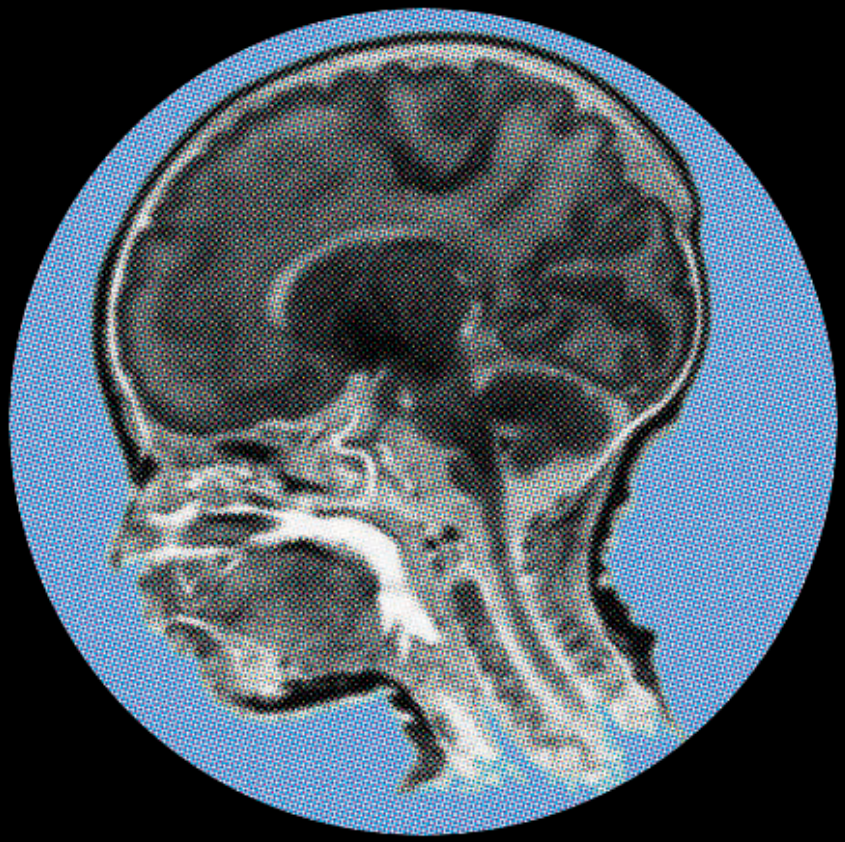
At this stage all of the image techniques had been used to investigate and re-image the tree. However, additional images were incorporated into the research to reveal the breadth of research activities that take place within CRIC, and that were also considered important in terms of producing publicly-engaging artwork. The following images were anonymised and developed for use as artefacts. They symbolize easily-recognisable human parts presented in their entirety, even though they may be quite graphically shocking for a general audience.





Ultrasound scale





Infant ultrasound and profile brain scan

Installed artwork

CRICBristol patients waiting area
under construction

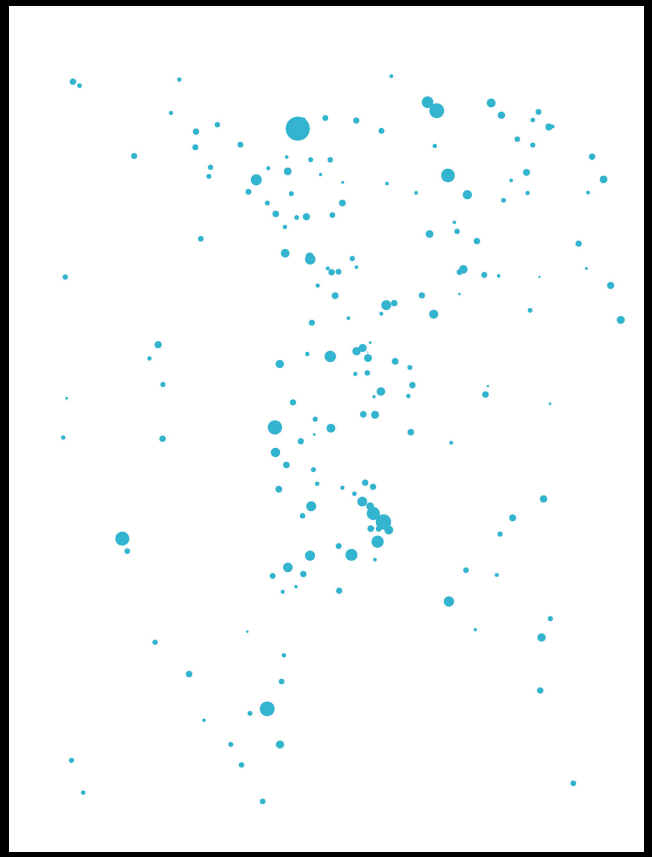
Exterior view

The tree – glazing units

The CT scan of the tree was developed for installation on one of the main glazing units, with related laser-cut vinyl leaves linking other glazing units through the entrance, reception and waiting area. The CT tree was intended to link the inside and outside spaces, suggesting a non-confined environment. CRIC is surrounded by large well-established trees. Baker's medically constructed tree stimulated a visual dialogue with the outside in all possible contexts.

Ultra sound scales were converted into laser-cut vinyl and installed with horizon lines developed from forest tree tops, which were installed alongside in vinyl.

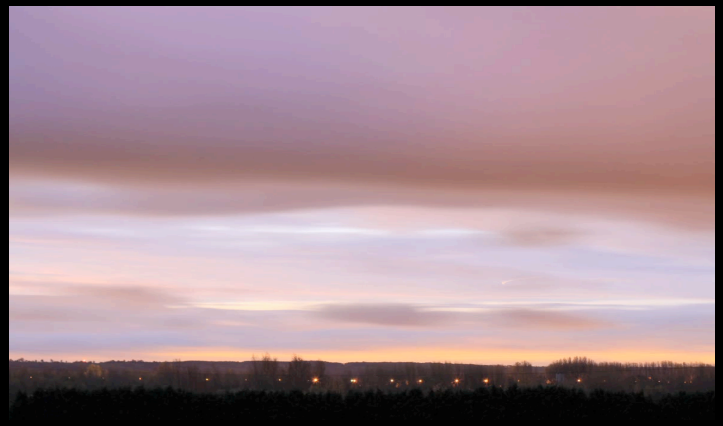
A one-minute duration eye tracking drawing (shown on the left) provided the layout ideas for installing the image based discs.
The discs were produced as sealed digital prints on 5mm Dibond as this material can be easily cleaned and more importantly is hygienic and suitable for a clinical environment.



The artefacts installed at CRICBrsitol, and the process behind their production, was captured in a book that is available at CRIC. A further edition of 30+ books was gifted by CRIC to its shareholders and partners.

Additional funding from the BBSRC secured through collaborative work with Professor Iain Gilchrist from the Department of Experimental Sciences supported the production of a short-run video that was designed for patient use in the MRI scanner. The video's duration matched the length of a structural scan and was designed by Baker to alleviate stress during the scanning process. The video was shown at the 2011Bristol Magnetic Resonance Summer School and 40 copies were produced to be shown at other MRI centres across the UK.

The video consisted of a 24hr time lapse depicting a section of British countryside near to Baker's studio. The piece documented a day, showing the beautiful colours and rolling clouds, often un-witnessed, that appear in the very early hours of the morning. The piece was made using thousands of still photographs, sliced and pieced together to echo the way in which diagnostic images are formed through a sequencing process. The video had no difficult conceptual idea to unravel or decipher, it was designed to take the patient somewhere, in their thoughts, other than where they were at that precise moment. The piece was simply about watching time pass in a relaxing, calm manner, becoming an axis around which the patient could direct their mind elsewhere.



This project was made possible through financial support provided by the University of Bristol, additional support both financial and in-kind was provided by the following institutions.

Some additional pieces of the artwork produced were part of the Bristol Neuroscience Festival 2013
http://www.bris.ac.uk/nsqi-centre/events/2013/533.html

CRICBristol and the installed artworks were officially opened by Professor Lord Robert Winston
on 19th September 2011

NORWICH UNIVERSITY OF THE ARTS

University of BRISTOL

BBSRC bioscience for the future

NHS