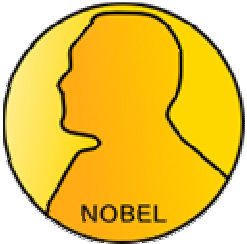


Me, Myself and MRI

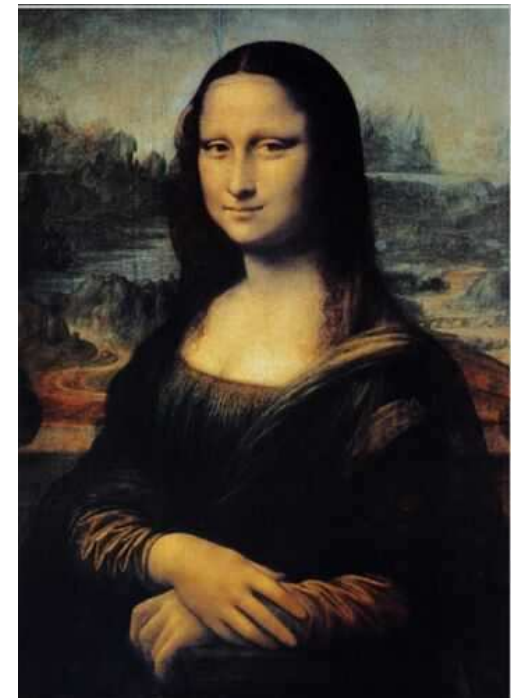
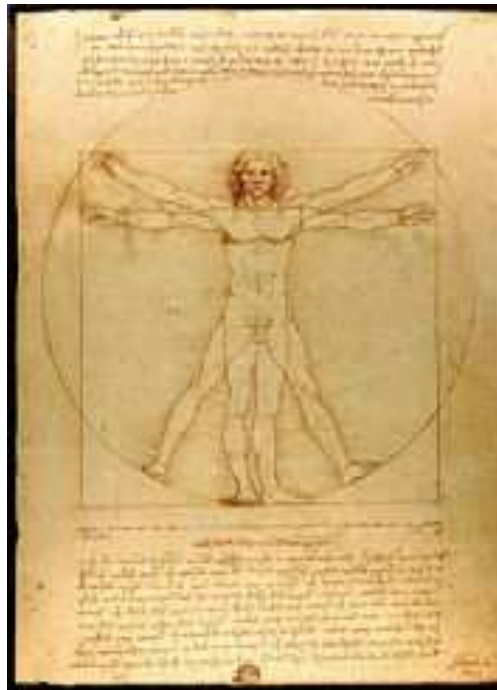


Geodesic Arts – Who We Are...

- *Kirsty Halliday – Project Manager*
- *Mark Hildred – Technical Producer*
- *Damian Murphy – Lead Artist*

Me, Myself and MRI – The Project

- *Sci-art project:*
 - Looking at the links between science and art



Me, Myself and MRI – Topics

- *MRI scan technology*
- *Ethics*
- *The history of portraiture*
- *Installation art*
- *What makes you an individual*
- *Creative technology*

Me, Myself and MRI – The End Result

- *A touring exhibition of digital portraits including MRI scan data, photographic prints and audio and video footage.*
- *You will select the people whose portraits will be exhibited*
- *You will write the interview questions*
- *You will write the briefs for the artists*

Portraits – A True Picture...?

- *Portraits are a picture of an individual:*
 - but do they always tell a true story...?



Portraits – A True Picture...?

- *Portraits can bend the truth a bit by:*
 - Positioning the subject in a specific location
 - Showing the subject carrying out an activity of task
 - Using props and/or costumes
 - Using different sorts of lighting

Portraits – Who Am I...?

- *What makes you an individual....?*
- *Is it:*
 - The way you look?
 - The music you listen to?
 - What you like to do in your spare time?
 - The job you do?
 - The country or town you live in?
 - The applications you have on your Facebook profile?
 - Or is it all the above...
....and more...?

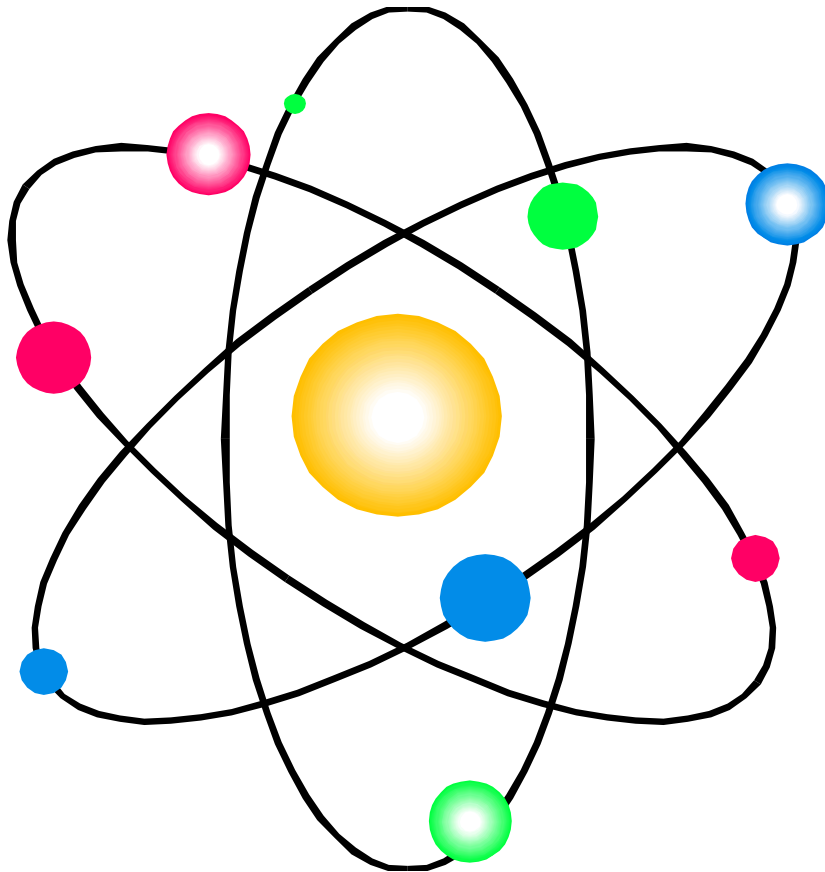


The Science Bit...

- *What is MRI....?*
 - Magnetic Resonance Imaging
- *What is it used for...?*
 - Looking inside the human body (without opening them up of course...)
- *Does anyone have any experience of one? Or know anyone has been in one...?*
- *I Have!*

MRI in Action...

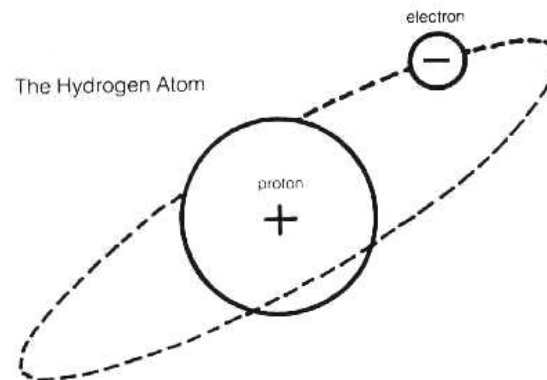
The Atom and Atomic Motion



- *The **electron** orbits the nucleus*
- *The electron spins on its own axis*
- *The **nucleus** also spins on its own axis...*

MRI and Hydrogen

- *The Hydrogen Atom has one Electron*
- *The nucleus has no neutrons but one proton*
- *It has an overall positive charge*
- *The hydrogen nucleus is a spinning, positively charged particle!*



Simple Electromagnetism...

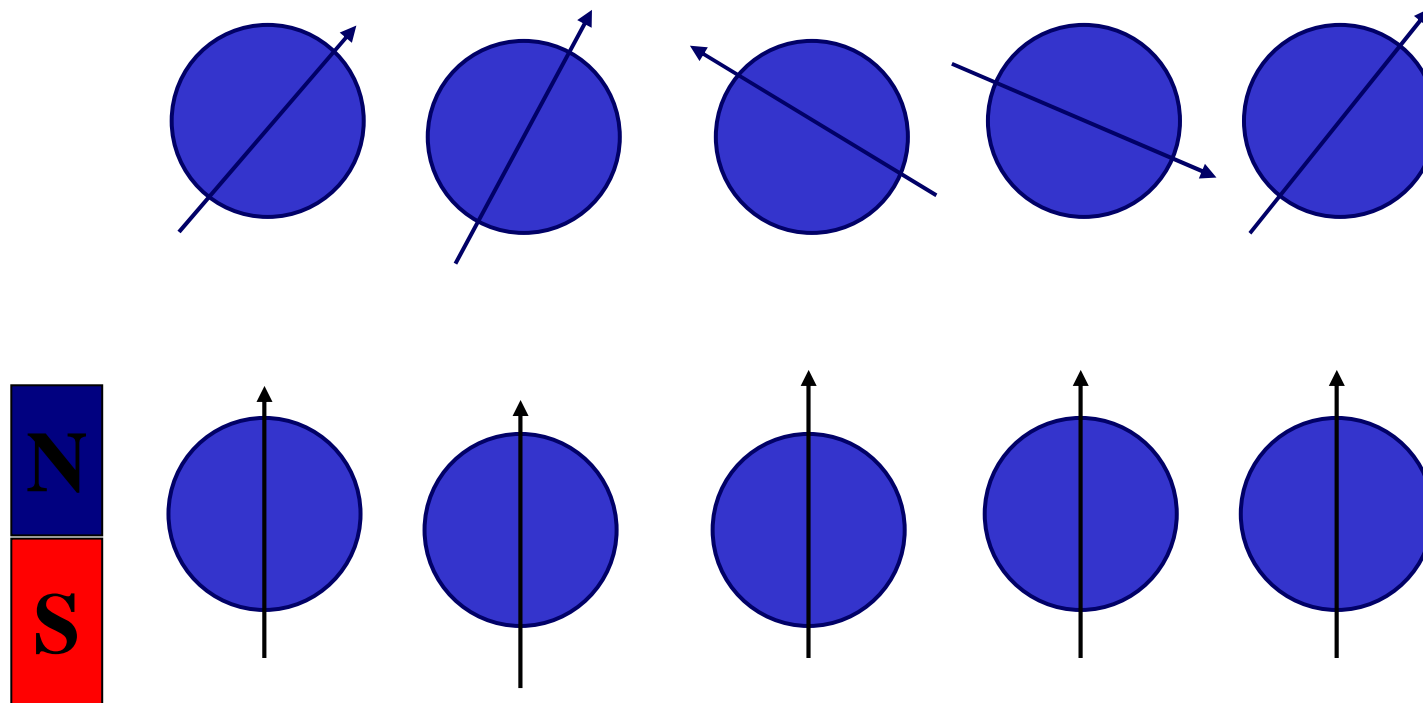
- *A charged particle in motion will create a magnetic field.*
- *Our positively charged spinning hydrogen nucleus generates a magnetic field (it is charged and moving!)*
- *But why Hydrogen???*
- *The human body is mostly water = H₂O*



- *Put some positively charged and moving hydrogen nuclei in a magnetic field and “their axes of rotation” will all line up! (This tendency is called **Magnetic Moment**)*

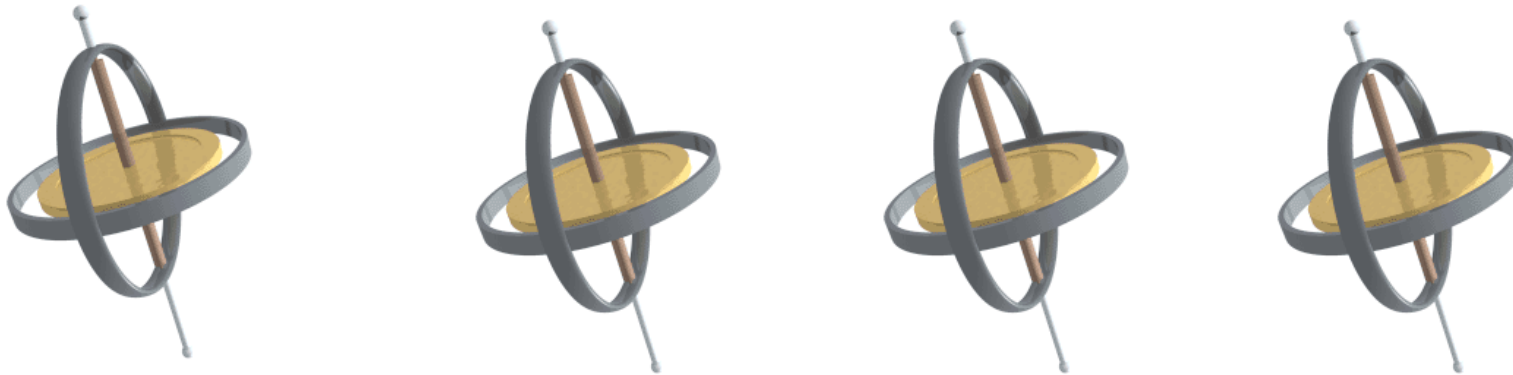
Lining up your hydrogen

- When you are placed into the MRI scanner, the magnetic field cause all your hydrogen nuclei to line up



Wobbling Nuclei - Precession

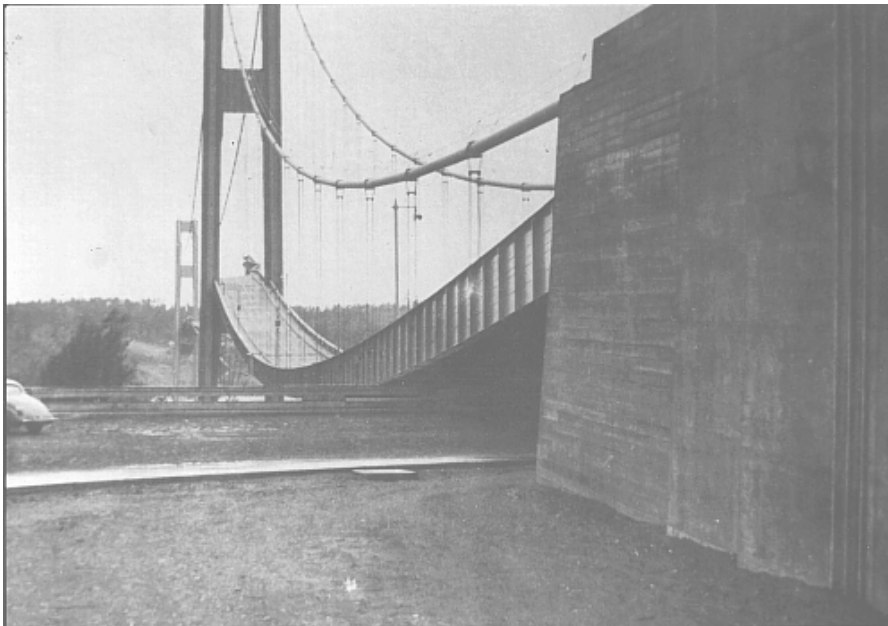
- *The magnetic field makes the hydrogen nuclei wobbles or **precess***
- *This wobbling path – the precessional path – is very random.*
- *The amount (or rate) it wobbles at is known – it depends on how strong the magnetic field is.*
- *We need to make them all move in step!*



What is Resonance...?

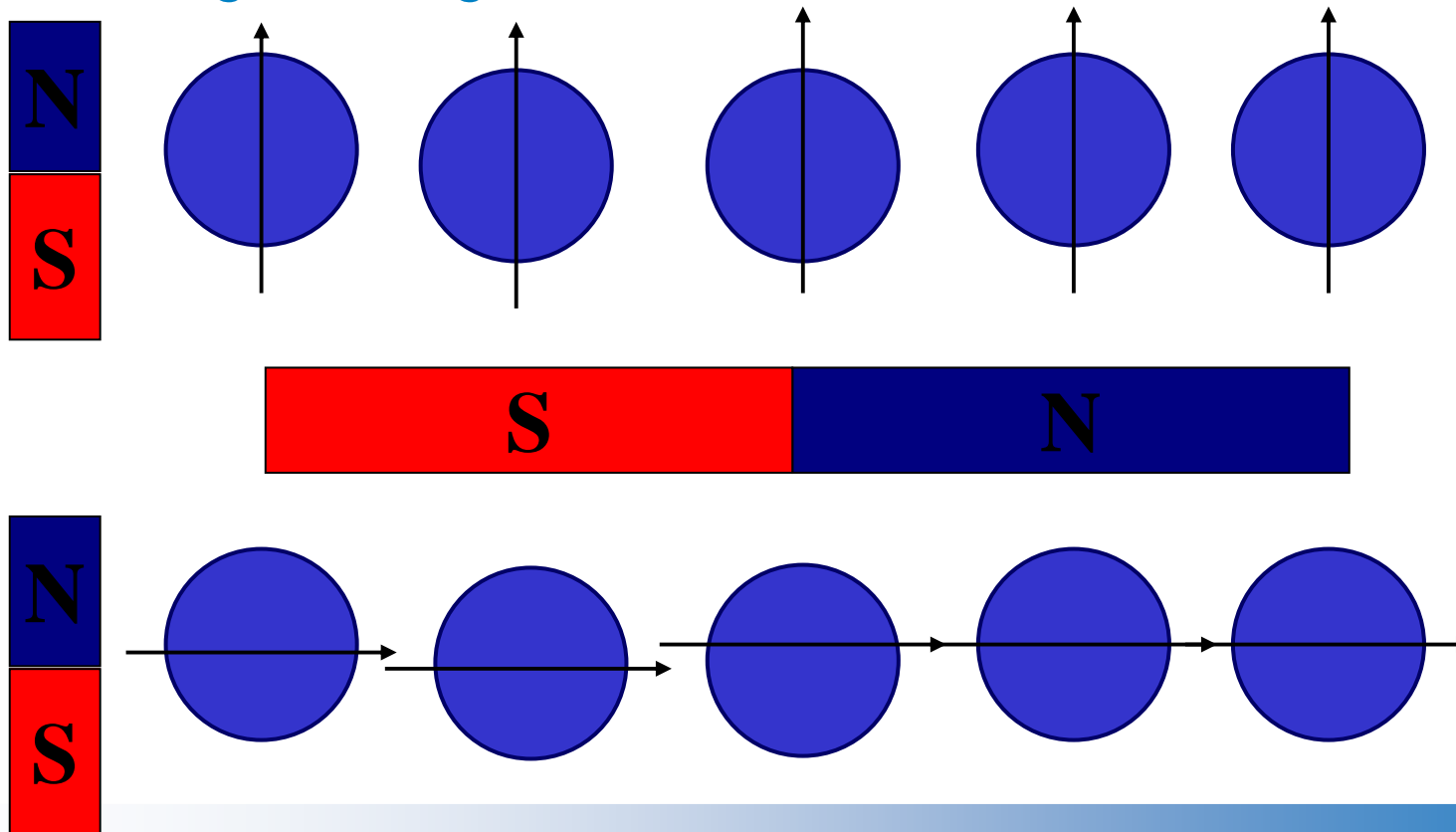
What is Resonance...?

- *Frequency of excitation applied to an object is close to the natural frequency (or mode of oscillation) of the object*



Magnetic Resonance is applied to our Hydrogen

- Applied as a “pulse” during MR sequences at 90 degrees to the original magnet.

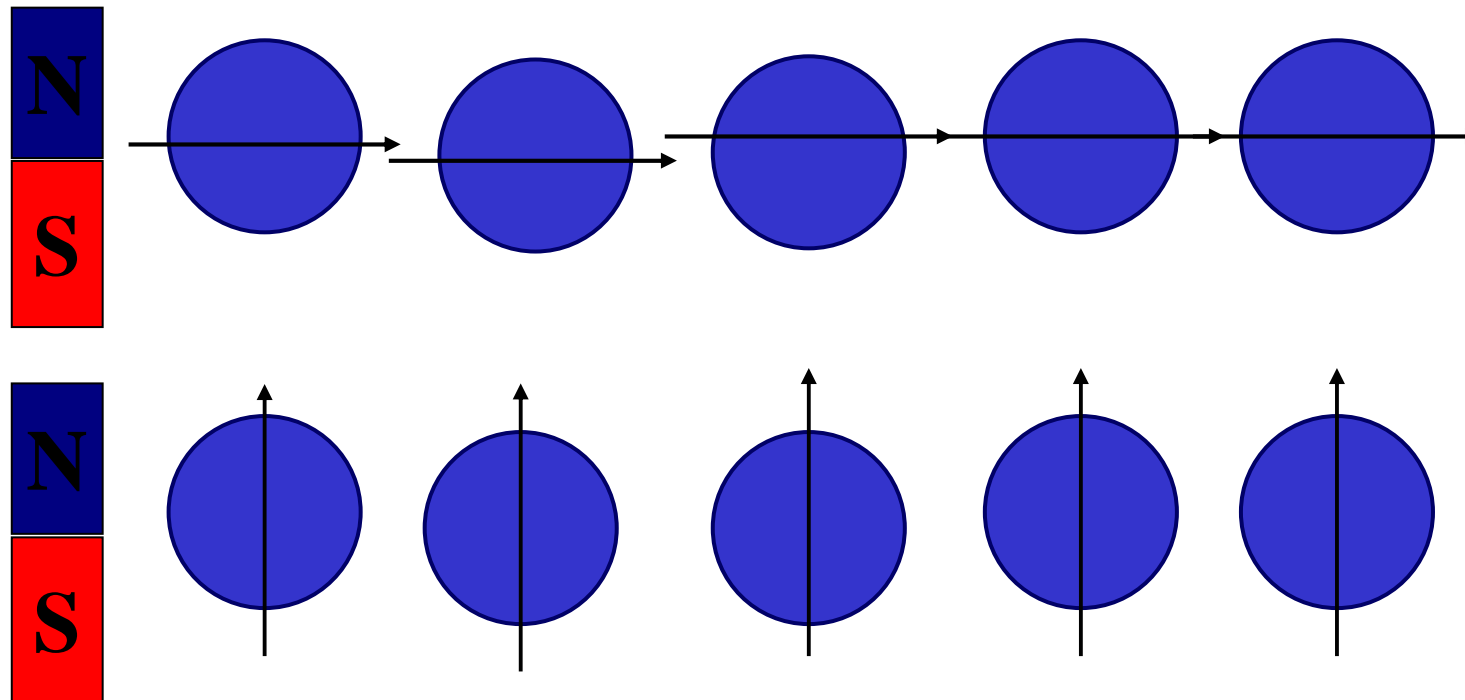


Induction...

- *As the Hydrogen are now all **precessing** together at the same rate and by the same amount due to this pulse, a **changing magnetic field is created...***
- *If you place a coil of wire in a changing magnetic field you **induce** a current.*
- *[Like a dynamo for a bike light – or a microphone].*
- *So around the MRI machine are lots of hidden coils of wire. They are used to:*
 - Generate the pulse needed.
 - Receive the induced current.
 - Tune the machine to areas of the body

And Relax...

- When the pulse turns off the hydrogen goes back to its original (wobbling) direction – called **relaxation**



The MR SIGNAL to MR Image.

- *The pulses are applied very quickly in succession*
- *A 3 minute sequence to give 20 **slices** through the brain might use 60 of these pulses*
- *The results are “collected” by the coils*
- *Transformed into some useful data that can be stored...*
- *Then finally mapped onto an “image matrix”*
- *The image shows the soft tissues in the body (they contain water) and so is different from an X-ray*

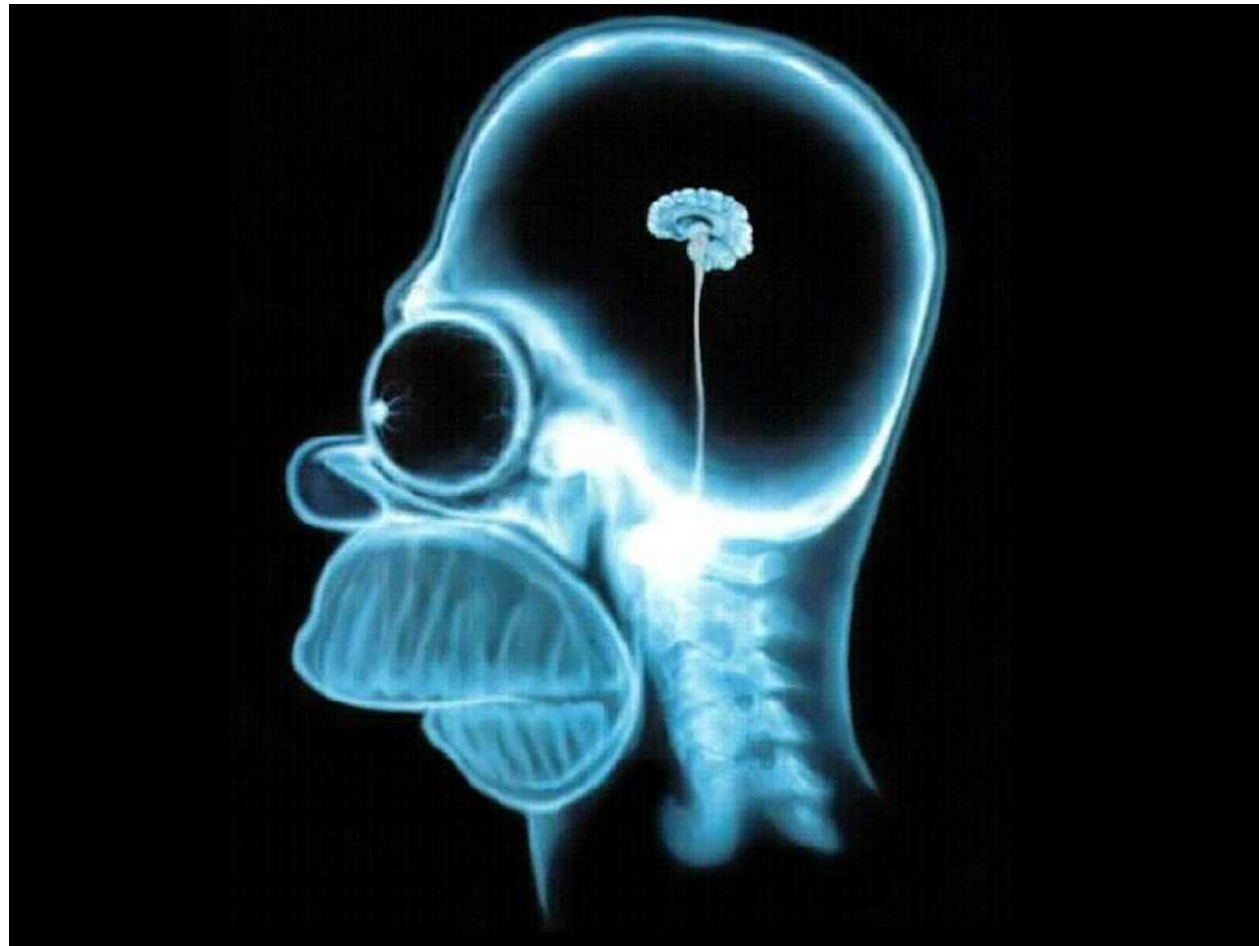


The MR SIGNAL to MR Image.



http://nobelprize.org/educational_games/medicine/mri/

The Results.... Magic!



The Results.... Magic!



Safety...

- *The magnet is on all the time...!*
- *It is 100x stronger than a fridge magnet*
- *No metal allowed in the scanning room:*
 - harmless items can become deadly projectiles – keys, safety pins, coins, scissors!!
- *It can damage electronic devices:*
 - mobile phones, bank cards.

Ethics and Awareness...

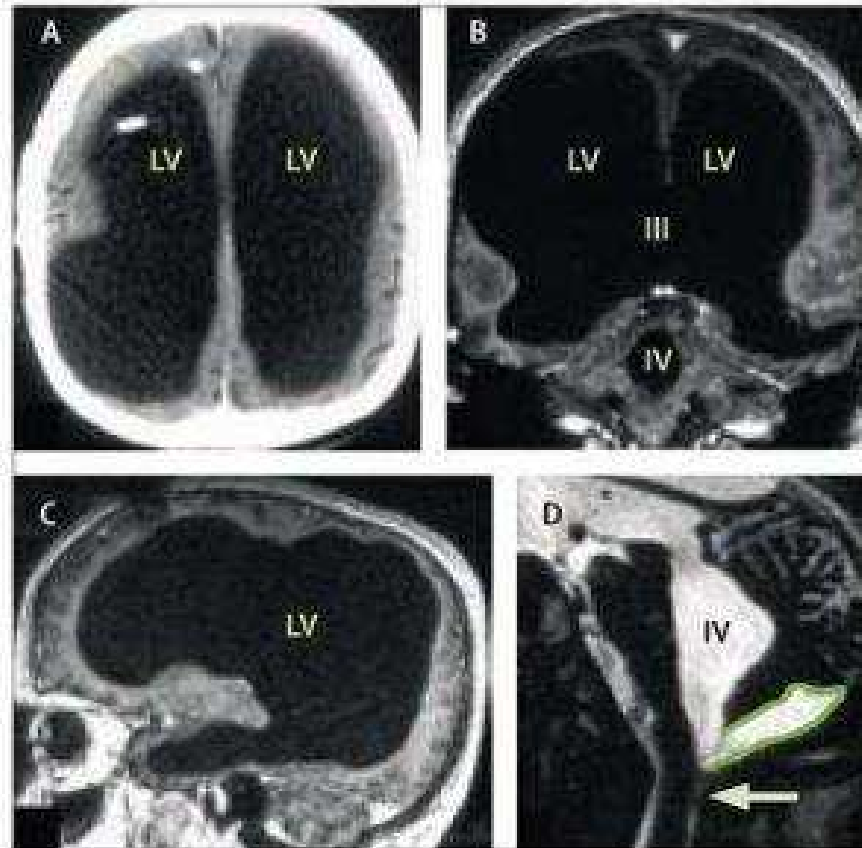
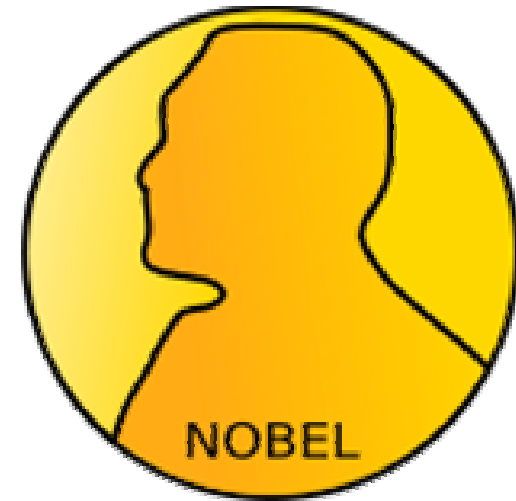


Figure: Massive ventricular enlargement, in a patient with normal social functioning

The Nobel Prize for Physiology or Medicine, 2003



**Sir Peter Mansfield
(shown)
and
Paul Lauterbur**



“The whole of my remaining ... estate shall be dealt with in the following way... The said interest shall be divided into five equal parts, which shall be apportioned as follows... one part to the person who shall have made the most important discovery within the domain of physiology or medicine;...”

[Alfred Nobel, *Alfred Nobel's Will*]

Which is Me...?



Science - Art – Self
Sir John Sulston; Marc Quinn



Previous Work - Sense of Place

An interactive sound and light installation reflecting the 2000 year old link between two of the most important sites in the City of York. **York Minster** originally the site of the Roman Legionary Headquarters and the symbolic heart of the City, and **Bootham Bar**, one of the four main gates of the Roman legionary fortress and still used as an entrance to the city today.



Arts & Humanities
Research Council



Previous Work - Sense of Place cont.



Above: Lighting is used to evoke various atmospheres in the performance space in Bootham Bar.

Above & right: Recording the 'acoustic fingerprint' of York Minster.



Right: Maps are projected to give people a sense of where they are in the history of the city.



Other projects



Venues



The Project Team

- *The other people involved with the project are:*
 - Sam Johnson – Science Manager at YNiC
 - John Oxley – Video artist
 - Kippa Mattews – Photographer
 - Griselda Goldsbrough – Art historian
 - Anne McNeill – Director of Impressions Gallery

The Project Timetable

- ***January 2008:***
 - Visit YNiC and start sessions
- ***March 2008:***
 - Visit art exhibition(s) to do some research
- ***Easter 2008:***
 - Participants have MRI scans
- ***Summer 2008:***
 - You work with the creative team on preparing the exhibition
- ***September 2008:***
 - Exhibition launch at the National Science Learning Centre

What Now...?

- *Check out the project blog at:*

<http://geodesicarts.blogspot.com>

- *Start thinking about who you might want to select to take part in the project...*
- *Talk to people about using medical data to create a piece of art:*
 - What do they think?