

# DESIGNS FOR LIFE – A FUSION OF SCIENCE AND ART

## Seeing science in a different light

Designs for Life is a science and art project inspired by the work of the UK's national synchrotron, Diamond Light Source. Situated in south Oxfordshire, Diamond is a research facility that enables scientists to use intense, pinpoint beams of X-ray, ultraviolet and infrared light to investigate the world around us on the molecular and atomic scale.

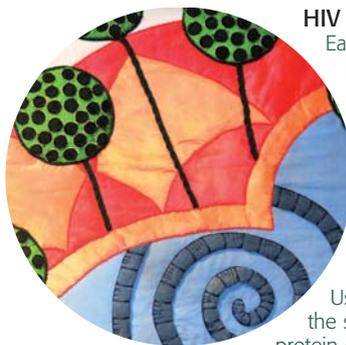
Funded by the Government, via the Science and Technology Facilities Council (STFC), and the biomedical research charity the Wellcome Trust, Diamond endeavours to communicate its science on a regional, national and international scale – not only through the traditional route of published research in scientific journals but also through creative and interactive initiatives to reach out to new audiences and widen access to science as much as possible.

One of Diamond's first projects of this kind, in collaboration with Science Oxford and funded by a People Award from the Wellcome Trust, was Designs for Life, which began in early 2006 when members of the Oxfordshire Federation of the Women's Institute (WI) were invited to Diamond to meet its scientists and to take part in a specially designed dialogue project.

The research which takes place at Diamond is selected via a peer-review panel, who rate the proposed projects according to the quality and technical viability of the science. The dialogue project saw the WI ladies being presented with a number of realistic research proposals and tasked with taking on the role of a peer-review panel to discuss and debate which proposals they believed deserved to be prioritised.

This was a stimulating activity which saw two audiences that aren't traditionally associated with each other – scientists and the WI – getting into really thought-provoking discussions on the socio-ethics of scientific research and the criteria, such as technical feasibility, safety and the quality of the science, on which proposed experiments are judged. It was a mutually beneficial exercise: the scientists present were able to hear first-hand the opinions of the WI ladies on the research at the facility, who in turn learnt about the peer-review process and the challenges involved. Enthused by this experience, and feeling more familiar with the scientific content, the WI groups took away design templates for each panel to begin interpreting scientific images into works of art.

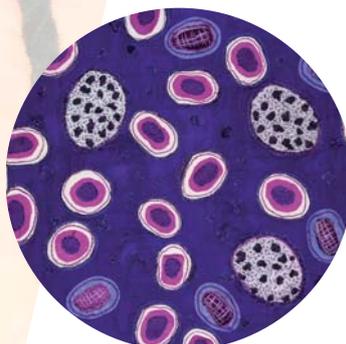
Susan Myburgh from Bloxham WI contributed to a number of the panels. She enjoyed the crossover of science and art and thought it worked very well. She says, "I think both sides gained a lot from the experience; the WI had an insight into modern science processes, and the scientists had the opportunity to find out about the many facets of the WI. It seemed an unlikely combination but we all, scientists and WI, rose to the challenge and thoroughly enjoyed it!"



**HIV Virus.** Design by Anne Griffiths, made by East & West Hendred WI and Chilton WI.

HIV (Human Immunodeficiency Virus) is a virus that attacks our immune system. This means that our immune system cannot kill HIV as it would other viruses. HIV can also mutate or change its form very easily, so even once someone has developed some immune response, the virus can mutate to evade it.

Using Diamond's intense X-rays to look at the structure of part of the HIV virus (a protein called reverse transcriptase) will help researchers to identify new areas to target with drugs.



**Malaria.** Design by Anne Griffiths, made by Bodicote WI, Little Compton WI, Over Norton WI and Salford WI.

Many of the ladies were keen to work on panels that had a significant meaning to them through their personal experiences of some of the diseases. WI member Jackie Flynn, the wife of an Alzheimer's sufferer, chose to work on the BSE/vCJD panel because it represents the way diseases like BSE, CJD and Alzheimer's affect the brain. Commenting on the science and art project, she says, "From my point of view it's a good thing because it raises public awareness of the disease."



**Chromosomes.** Design courtesy of the Wellcome Trust, made by Otmoor WI, Clagrove WI, Waterstock & Tiddington WI, Benson WI, and Cuddesdon & Denton WI.

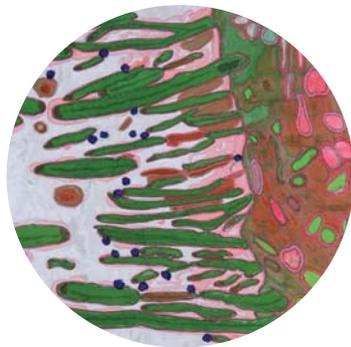
Anne Barber of Standlake WI works as a nurse and was interested to learn more about the flu virus, and the research being carried out in this area. She enjoyed the challenge of taking the designs and interpreting them into art. Anne says, "The panels are a really good visual representation of science. I think it was great that Diamond was able to reach out to members of the community who aren't usually involved in science and give them the opportunity to take part in a project like this."



**Brain scan.** Design by Anne Griffiths, made by Begbroke WI, Filkins WI and Broughton Poggs WI.



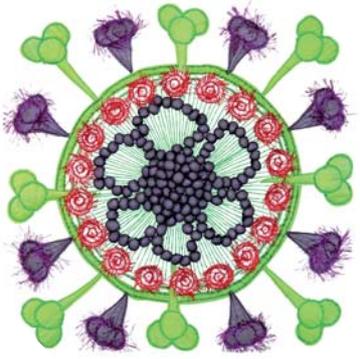
**Osteoporosis.** Design by Jill Gemmell, made by Chadlington WI.



**Asthma and pollen.** Design courtesy of the Wellcome Trust, made by Bodicote WI and Weston on the Green WI.



**Breast Cancer.** Design by Michele Tootelle, made by Weston on the Green WI and Stanton St John WI.



**Flu Virus Cross Section.** Design by Anne Griffiths and Jane Madden, made by Filkins WI and Standlake WI.

A notable example of the successful use of synchrotron technology to advance drug design lies in the development of the anti-flu drug Tamiflu® (approved in 1999) which was designed based on knowledge of the 3D structure of the enzyme neuraminidase.

One of Diamond's users, Prof Elspeth Garman from the University of Oxford, will be using Diamond to examine the N protein in the new H1N1 swine flu virus since the disease can be contained by locking this protein into a cell, preventing swine flu from spreading through the body.

Rates of breast cancer in the UK are still rising despite much better prognosis and treatment, with around 40,000 new cases of breast cancer diagnosed each year.

A number of Diamond's experimental stations, or beamlines, are dedicated to making important advances in the field of life science. These beamlines can be used by researchers to solve the atomic structure of the proteins that play a part in this common disease. Knowing the structure of a protein helps scientists to come up with potential drug targets.



**BSE/vCJD Plaques.** Design by Anne Griffiths, made by Stoke Lyne WI and Bucknell WI.

Bovine Spongiform Encephalopathy or BSE is a disease that affects the brain and central nervous system of cattle. BSE is caused by prion proteins inside the animal's brain and nervous system changing into a new, deadly shape.

Creutzfeldt-Jakob disease (CJD) is a very rare form of dementia that is also caused by prions. The prion involved is similar to the BSE prion and the two conditions seem to be linked.

The normal type of the prion involved can be broken down inside the brain by the body's own chemicals. The abnormal form, which causes diseases, has refolded into a different shape, which means it can't be broken down easily. The prion builds up inside the brain, so that it becomes riddled with holes, giving it an unmistakable spongy appearance.

Prions are currently not very well understood. By using a synchrotron to look closely at the structure of both the normal and abnormal forms of the prion, scientists hope to be able to understand the job the prion should be doing inside the brain.



**Alzheimer's Tangles.** Design by Anne Griffiths, made by Stanford in the Vale WI, the Letcombes WI, Charlton WI and King Alfred's WI.

Alzheimer's is caused when nerve cells in the brain responsible for processing, storing and retrieving information degenerate and die. Scientists have found two unusual structures called 'plaques' and 'tangles' in sufferers' nerve cells. Affected areas also seem to contain unusually high concentrations of iron-rich particles.

Diamond's intense synchrotron light can be used to investigate the structure of the proteins responsible for forming the plaques and tangles, and to identify the areas in the brain which contain unusually high concentrations of iron.

Completed in December 2006, the panels were put on public display at a number of venues throughout Oxfordshire before returning to Diamond in July 2007 for its public open day, which saw over 4,000 people visiting the facility. The panels' most recent outing was at the Royal Society's Summer Science Exhibition in July this year.

Isabelle Boscaro-Clarke, Diamond's Head of Communications, says, "Diamond is extremely grateful to all the

members of the Oxfordshire WI who contributed to this exciting science/art project. The initiative has been a fantastic success and reflects Diamond's commitment to working with the local community to promote a better understanding of our work. This innovative fusion of science and art is now on display in the Diamond House atrium, where staff and visitors can enjoy its intricate stitch work, stunning colours and thought-provoking source material for years to come."

The panels are currently at the Diamond facility and will be on public display at the North Wall Arts Centre in Oxford from 11th – 29th January 2010. [www.thenorthwall.com](http://www.thenorthwall.com)

There are a number of opportunities to visit Diamond throughout the year, if this is of interest to you, please call 01235 778639 for more information. [www.diamond.ac.uk](http://www.diamond.ac.uk)