

MATH BITES

BY CLIFFORD
THE DOG

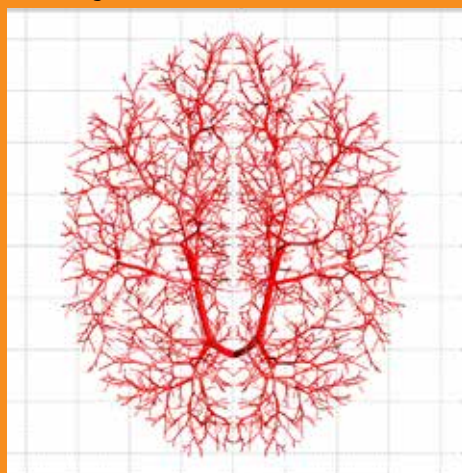


Teachers could photocopy this page to use in class

BRAIN IMAGING

Brain imaging is carried out using magnetic resonance imaging (MRI) and positron emission tomography (PET) as well as ultrasound and X-ray spectrography.

With data from these, mathematical models are being developed for blood vessels in the brain using fractals and networks (trees) to assist in diagnosis and treatment of medical conditions such as strokes and neurodegenerative disease.

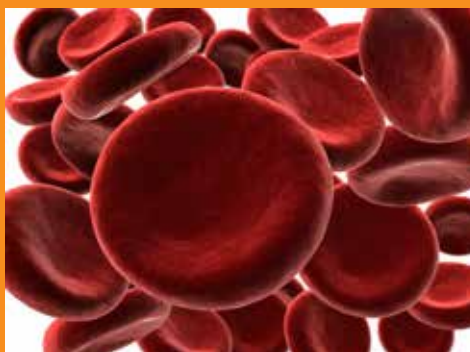


Activity

Investigate applications of mathematics in medicine. See references for websites that might come in handy.

RED BLOOD CELLS (ERYTHROCYTES)

These have a bloody marvellous design and play the key role of delivering oxygen to cells using haemoglobin. Their properties are determined in part by their shape, with respect to cross section, surface area and volume. They have a bi-concave shape and the oval of Cassini given by the relation $(x^2 + y^2 + a^2)^2 - 4a^2x^2 = c^4$ where a and c are parameters related to diameter and minimum thickness.



Activity

Plot graphs of this relation, using cartesian, polar and parametric forms.

SPACE INVADERS (VIRUSES)

Viruses such as the human immunodeficiency virus (HIV) are slightly more than fifty times smaller than red blood cells. The HIV virus infects cells in the immune system. The geometry of viruses is an important area of research - many viruses have an icosahedral structure within an overall spherical envelope. The image is a representation of an HIV virus (see referenced websites for example).



Activity

Investigate geometric representations of the shape of various viruses in relation to polyhedral structures.

REFERENCES AND FURTHER READING

Brain imaging

www.csiro.au/Outcomes/Health-and-Wellbeing/Prevention/Advanced-Imaging-And-Neurophysics.aspx

www.csiro.au/en/Organisation-Structure/Divisions/Computational-Informatics.aspx

Image created by Anh Nui, used with permission, CSIRO.

Red blood cells

<http://onlinelibrary.wiley.com/doi/10.1002/pamm.200700108/pdf>

Space invaders

www.liga.ens.fr/~deza/Sem-FullCCirmVirusSpFull/VirusConf.pdf

<http://designculturelab.org/2009/09/16/visualisation-materialisation-and-affect>