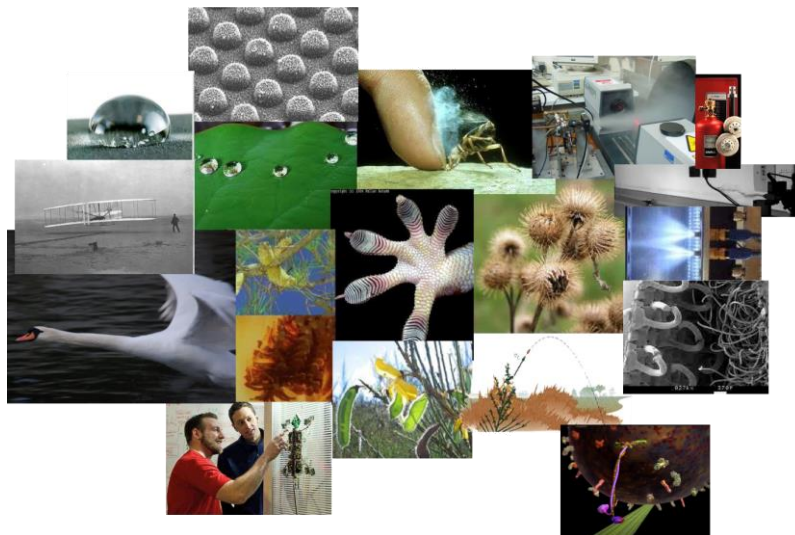


## Biomimetics: Detecting and Imitating Design Ideas in Creation

Biomimetics is a term used for copying engineering ideas from the natural world, and it has become a great source of innovative inventions. One of the most famous is the Wright brothers with their first heavier-than-air flying machine which directly copied the wings of birds. Other examples are the burdock plant which inspired the invention of Velcro, the Gecko which led to robots which can walk even upside down, the lotus leaf which has led to self-cleaning glass and the bombardier beetle which has a number of applications including a sprinkler system for targeting potential fire hazards and an engine additive injection system. How do these inspirations help us to build an argument for design in nature?.

**Andy McIntosh** holds an Emeritus Chair in thermodynamics at the University of Leeds, is an Adjunct Professor at Liberty University in Virginia, and has lectured and researched in these fields for over 30 years. He has a PhD in combustion theory from the aerodynamics department of what was then Cranfield Institute of Technology (now Cranfield University), a DSc in Applied Mathematics from the University of Wales, and worked for a number of years at the Royal Aircraft Establishment. He is a Fellow of the Institute of Mathematics and its Applications, the Institute of Energy, the Institute of Physics and the Royal Aeronautical Society. A chartered mathematician, engineer, and author of over 200 papers and articles, his research has been in combustion in fluids and solids. His work has also included investigations into the fundamental link between thermodynamics and information, and in latter years he has been involved in research in the area of biomimetics where the minute combustion chamber of the bombardier beetle has inspired a patented novel spray technology. He now lectures widely on origins, has authored the books *Genesis for Today* (Day One, 6<sup>th</sup> Edition, 2017) and *A Verse by Verse Examination of Genesis 1-11* (Day One, 2016), and has contributed to a number of other books including *Wonders of Creation – Design in a Fallen World* (co-authored with Stuart Burgess and Brian Edwards, Day One, 2017), *Origins – Examining the Evidence* (Truth in Science, 2011), *In Six Days* (Master Books, 2009), and *Should Christians Embrace Evolution?* (IVP, 2009). He has also produced the booklets *Are you really an atheist?* (2018), and (with Stuart Burgess and Brian Edwards), *Is it true? – Evidence for Creation* (Day One, 2018). He is a member of Logos Research Associates <https://www.logosresearchassociates.org/update-mcintosh>, is co-director of the UK education think tank *Truth in Science* <https://www.truthinscience.uk>, is on the Advisory Board of *The Values Foundation* <https://www.values.foundation/> (an influential advocacy group representing Judaeo-Christian Values in Education to the UK Government), and is also on the steering group of the *International Certificate of Christian Education* <https://www.icce.education/>. Andy is married with 3 children and 6 grandchildren.



Biomimetic collage of ideas – including lotus leaf, bombardier beetle, knobcone pine, gecko foot, burdock plant, Scottish broom, Wright Flyer, and walking molecules (Kinesin)

## **I. Biomimetics – quite what is it?**

### A. Some famous examples

1. Velcro and Burdock plant
2. Gecko Tape / Gecko robots
3. Self cleaning glass and Lotus leaf
4. Wright Flyer
5. Bombardier Beetle

### B. Implications to Design

### C. Pitfalls in Design argument

1. Non-fixity of species
2. Dangers of assumption of continuity
3. Predator-prey relationships

## **II. Smart Design : Inter-connected systems with dependence on each other**

### A. Irreducible complexity

### B. Layered systems

### C. Sensing, actuation and control

## **III. Examples**

### A. Feathers & especially the quiet wings of owls

### B. Flight control in Dragonflies

### C. Molecular motors in the cell

1. ATP Synthase
2. Kinesin

### D. Intermeshing gears in *Issus* planthopper

### E. Bombardier beetle biochemical production of Hydrogen Peroxide

### Some Quotes :

“Scientists discover the world that exists; engineers create the world that never was”  
Theodore Von Karman, Aerospace Engineer, UCSD

Rom 1:20 “For the invisible things of him from the creation of the world are clearly seen, being understood by the things that are made, even his eternal power and Godhead; so that they are without excuse.”

Leonardo da Vinci (1452-1519) wrote,  
*"Human subtlety will never devise an invention more beautiful, more simple or more direct than does nature because in her inventions nothing is lacking, and nothing is superfluous."*

In a lecture in 1847 Michael Faraday stated  
*"...And therefore our philosophy [here used as we would now say 'our science'], whilst it shows us these things, should lead us to think of Him who hath wrought them; for it is said by an authority far above even that which these works present, that 'the invisible things of Him from the creation of the world are clearly seen, being understood by the things that are made, even His eternal power and Godhead.' "*  
*"Michael Faraday", W.L. Randell, Leonard Parsons (London), and Small, Maynard & Co., (Boston, USA). 1924, pp. 132-133.*

### FURTHER NOTES

#### **Suggested Readings:**

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Forbes, P. *The Gecko's Foot*, Harper Perennial, 2006

McCullough, D., *The Wright Brothers*, Simon and Schuster, 2015

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