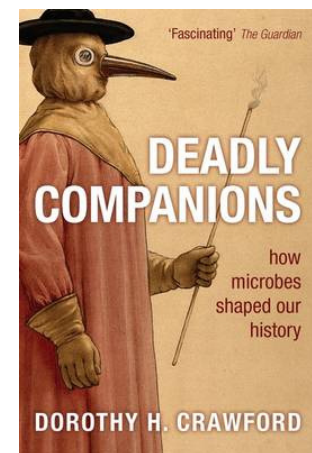
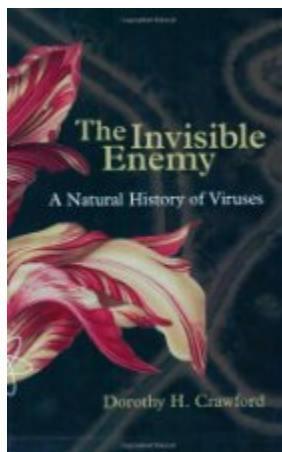


# Viruses:

## *The Invisible Enemy Revealed*

Dorothy H Crawford  
University of Edinburgh  
UK









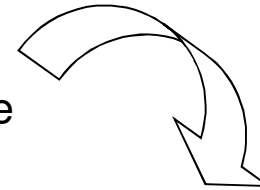








# Two years later









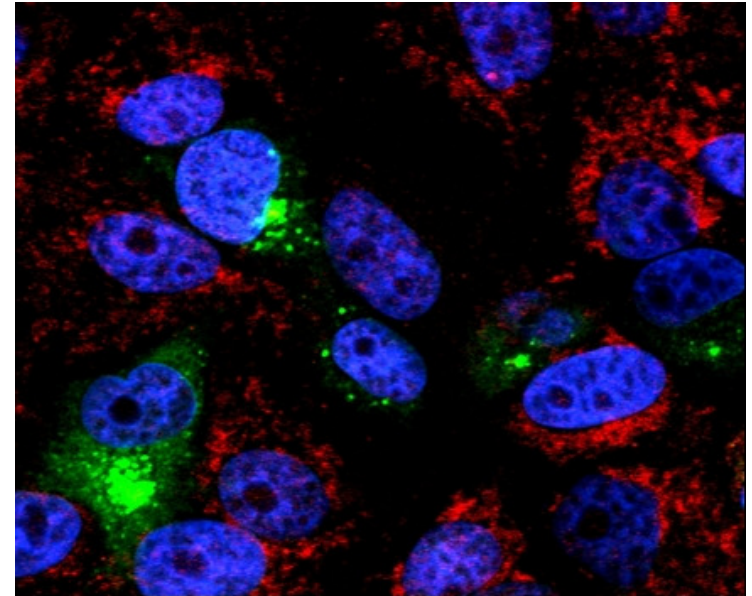
# Dinner for 120 Doctors



## 28 Days Later:

- 50 guests
- the chef
- 1 waiter

developed jaundice  
caused by hepatitis A  
virus





# Virus Spread





# What are Viruses?

Sir Peter Medawar:

***‘A piece of bad news wrapped up in protein’***

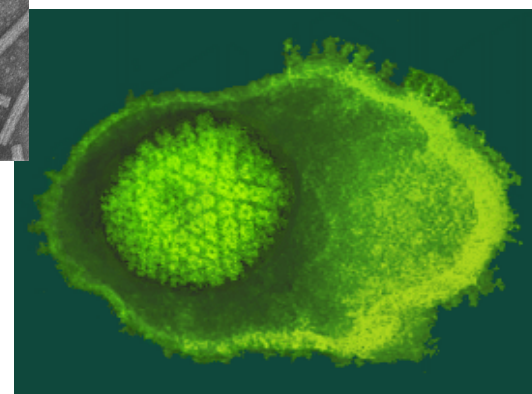
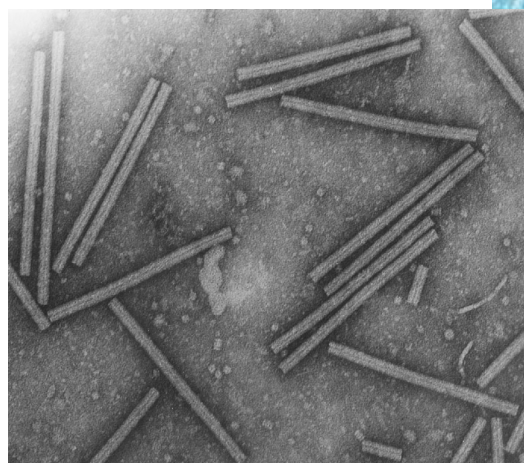
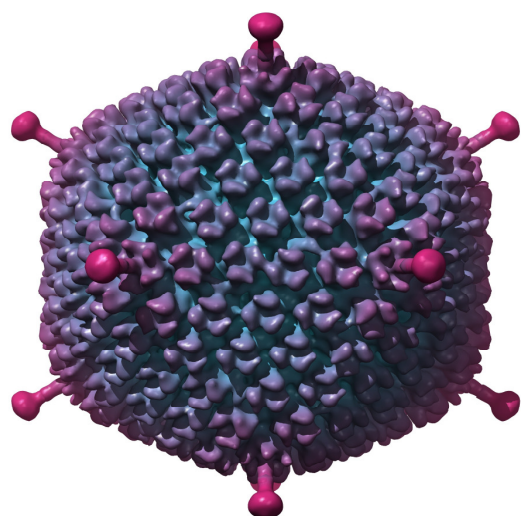
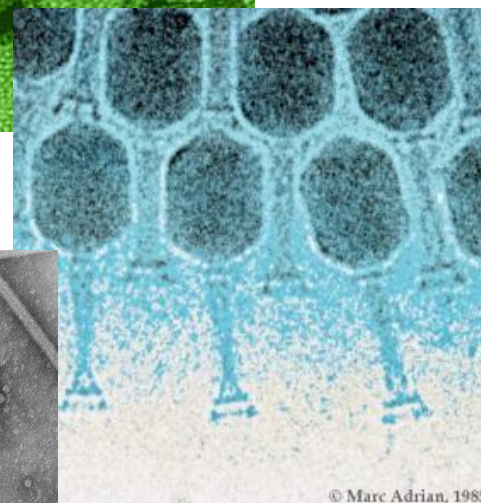
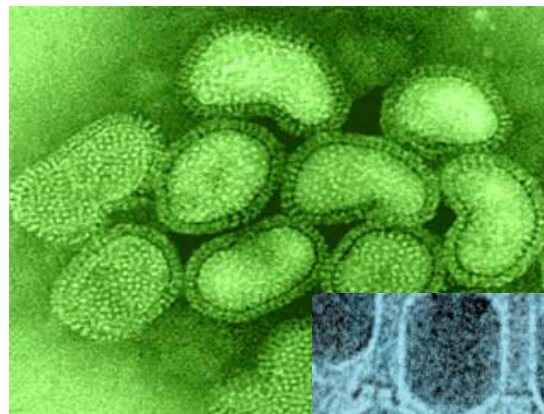
## Unique features of viruses:

- Inert particles
- Genetic material is DNA or RNA, never both
- No molecular machinery for generating energy or making proteins
- Obligate intracellular parasites

**Are viruses alive?**

**Do they fit into the tree of life?**

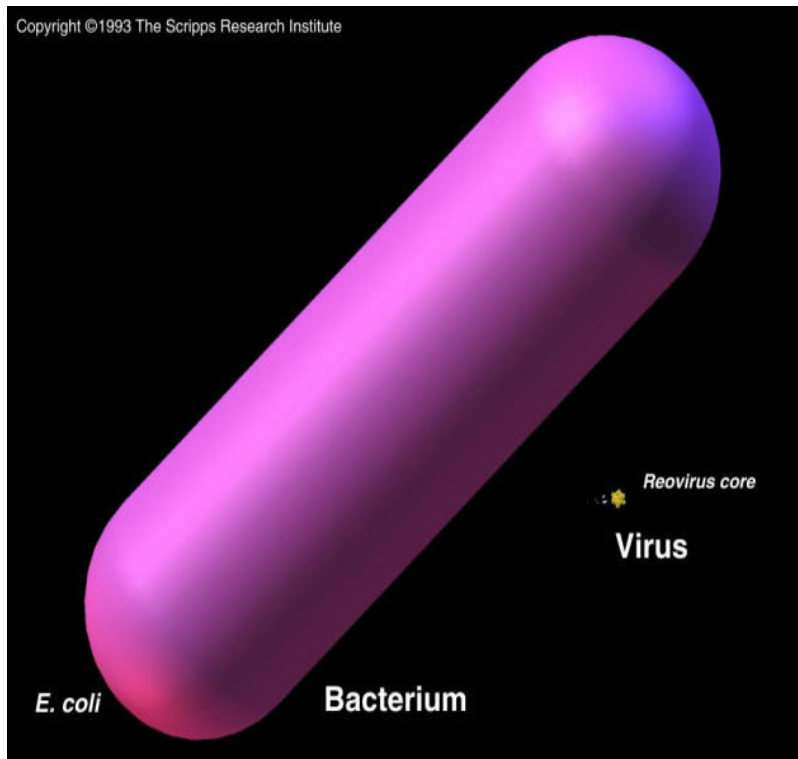




© Marc Adrian, 1985

# Viruses are Tiny

- 20-300nm in diameter (1 nm is a thousand millionth of a metre)
- Contain 2-200 genes

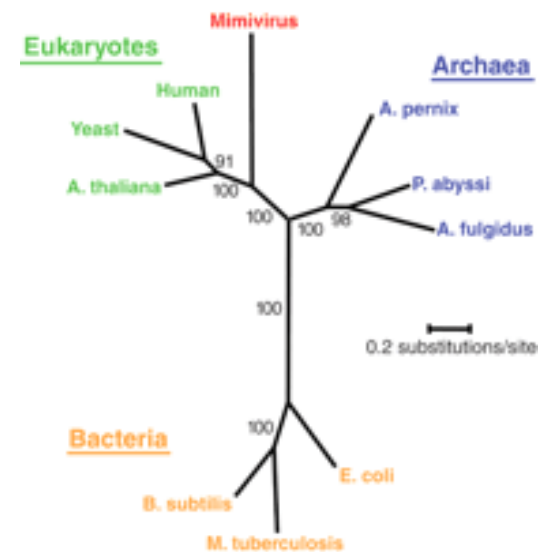
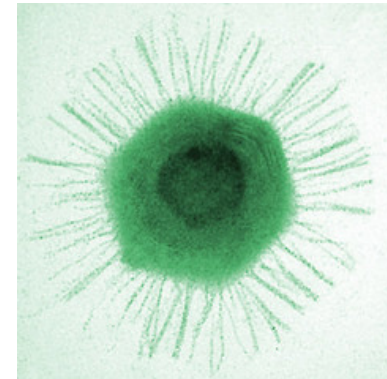




# Mimivirus

## A Giant Among Viruses

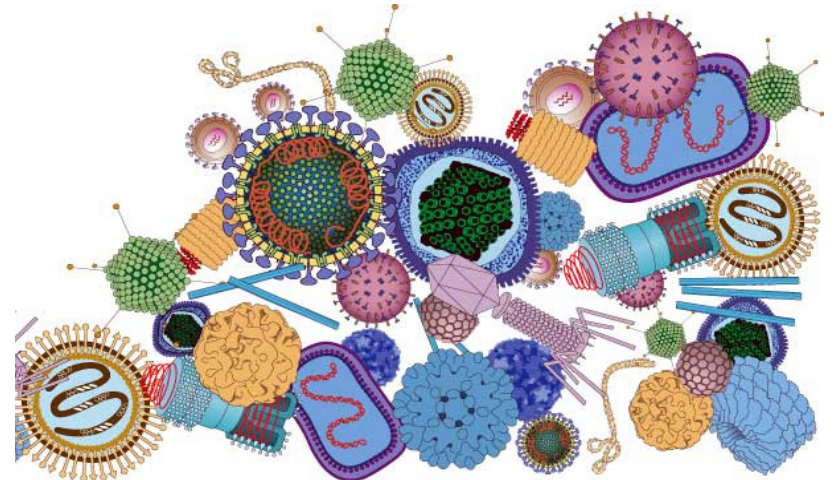
- Found inside an amoeba in a cooling tower in Bradford UK in 1992
- Thought to be a bacterium but later found to be a very large virus
- Has around 600 genes – more than many bacteria





# How Do Viruses Survive?

- They hijack cells and use their molecular machinery for new virus production
- They dodge the host's immune response until their life cycle is complete
- They produce thousands of new viruses very rapidly
- They jump efficiently between susceptible hosts



# Rhinovirus

## The common cold virus

- Infects cells lining nose and throat
- Causes symptoms in 24 hours
- Tickles nerve endings to cause sneezing
- Spreads through the air, best in crowded places

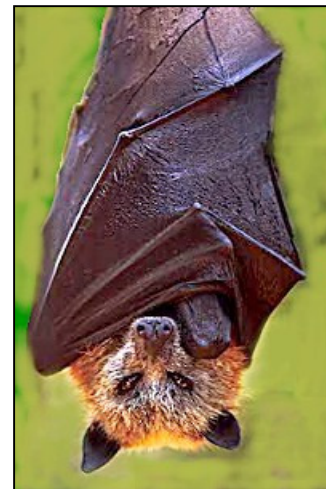
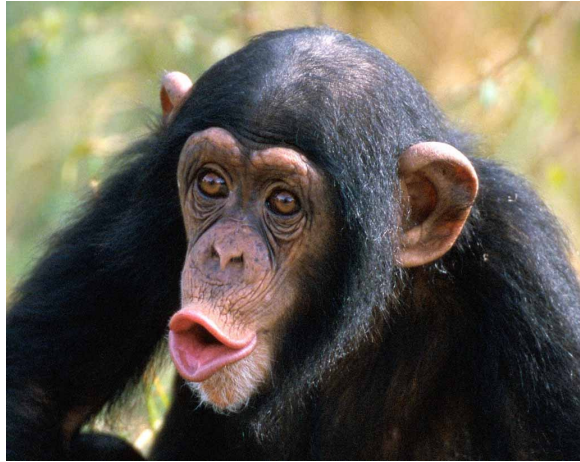


# How Many Viruses Are There?

- Viruses are the most abundant life form on the planet – the virosphere
- There are over 100 million different types
- 1 litre of sea water contains 10 billion viruses
- Laid side by side viruses in the oceans would span 200 million light years
- Carbon content equivalent to 200 million beluga whales

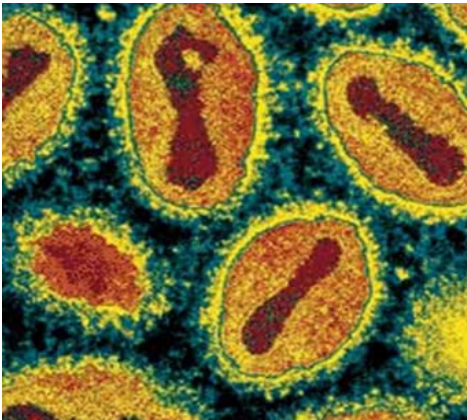


# Where Do New Human Virus Infections Come From?

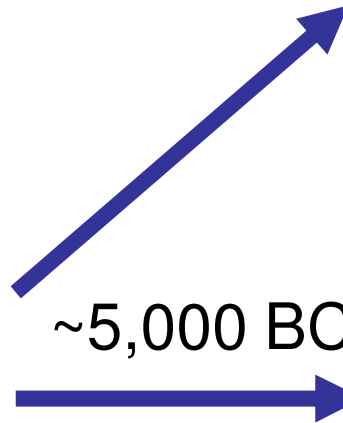




# Smallpox Virus



Gerbil



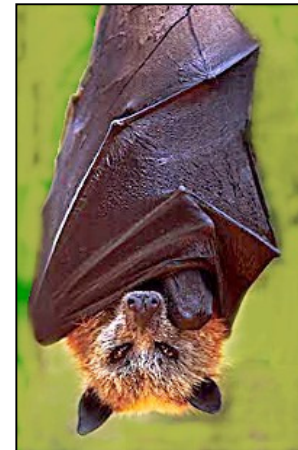
~5,000 BC



Camel

# Nipah Virus

- Emerged in Malaysia in 1999
- Caused respiratory illness in pigs
- Then pig farmers developed encephalitis
- Fatal in 50% of cases



# Monkey Pox

- Emerged in USA in 2003
- Caused 71 cases of a mild smallpox-like disease
- Imported in a Giant Gambian rat from Ghana
- Jumped to prairie dogs in a pet shop
- Jumped from prairie dogs to their owners



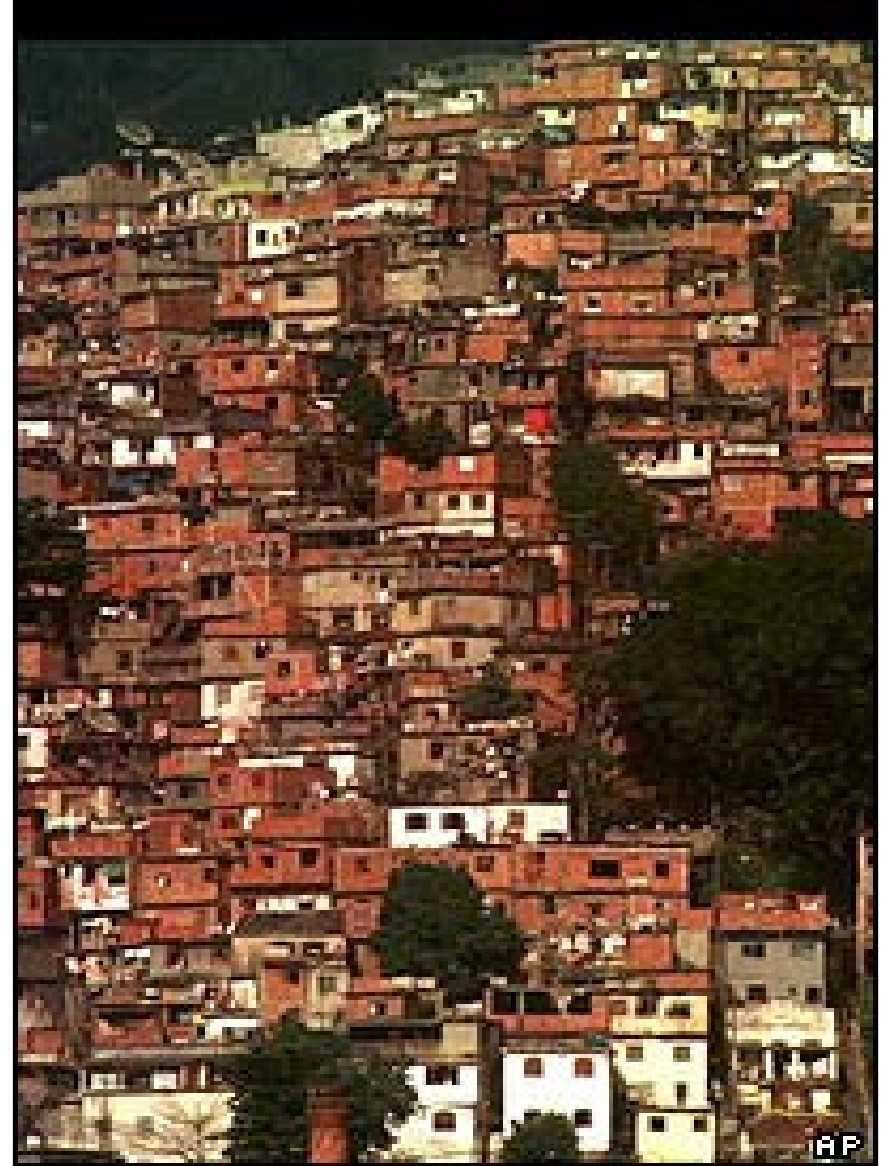
Giant  
Gambian rat



Prairie dog



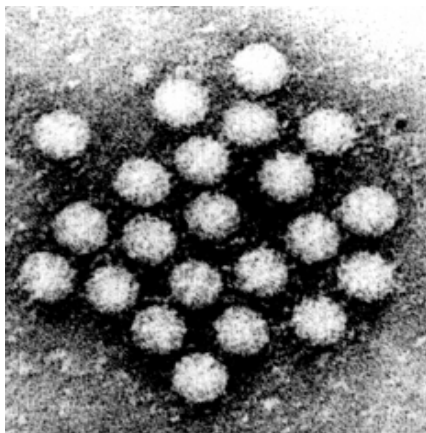
# Crowding & Poverty



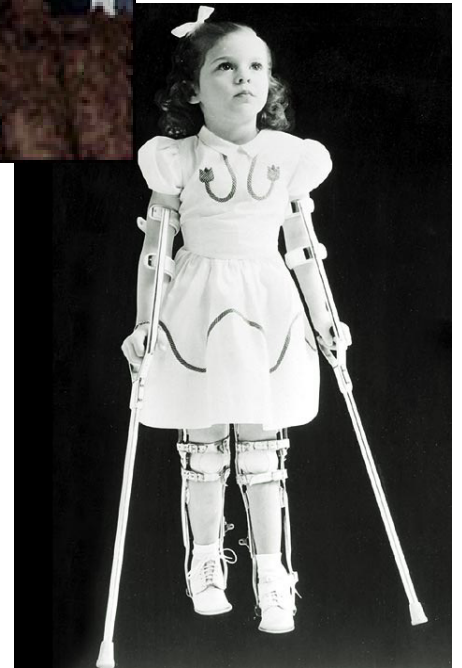




Norovirus



# The Devastating Effects of Viruses



# Broken Tulips

Caused Tulip-mania in 17th Century Holland

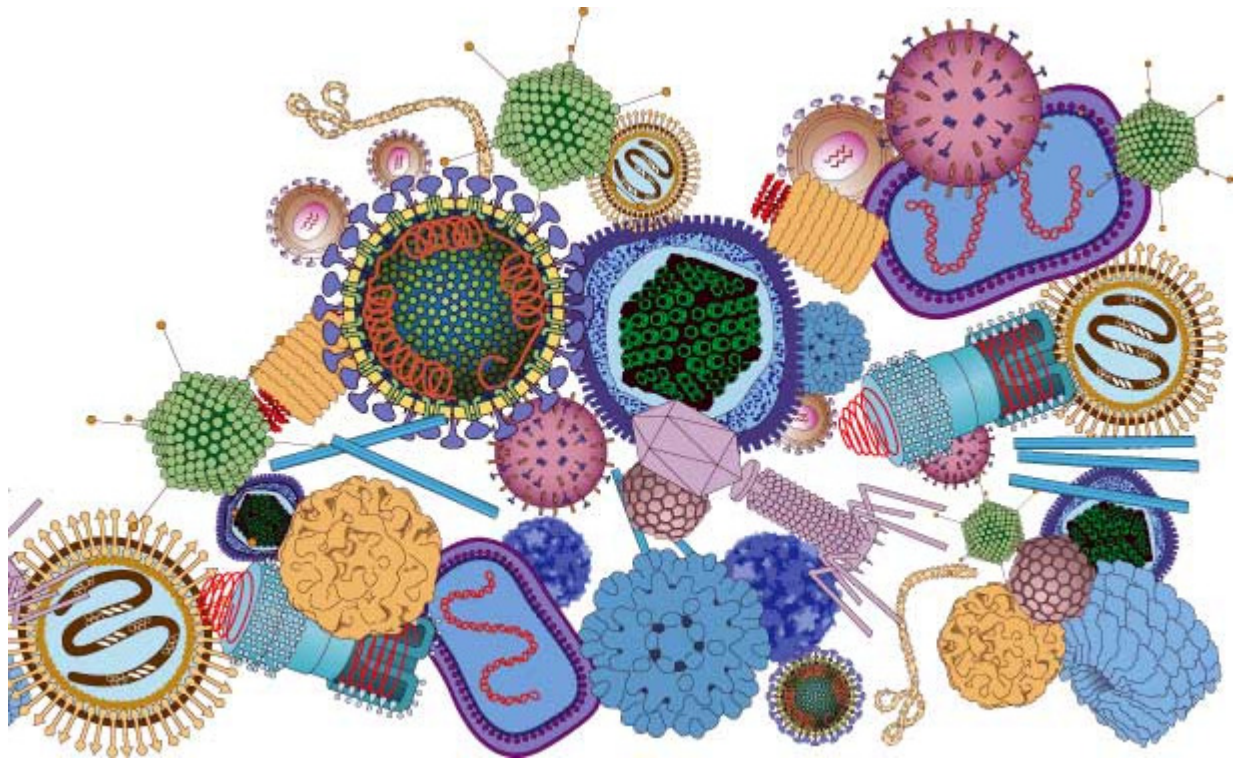


George Klein:

***‘The stupidest virus is  
cleverer than the cleverest  
virologist.’***



Thank you for listening



# Why are viruses so clever?

- Over millions years of co-existence viruses and their host species have been evolved in an escalating arms race
- Viruses have the advantage because they evolve much faster than their hosts

