



Government  
Office for Science

# Forensic science and beyond: authenticity, provenance and assurance

*Sir Mark Walport FRS*

*Chief Scientific Adviser to HM Government*

*2016 Government Chemist Conference*

*21 June 2016*



Government  
Office for Science

## Government Chief Scientific Adviser

- Health, wellbeing, security & resilience
- Knowledge translated to economic advantage
- The right science for emergencies
- Underpinning policy with evidence
- Advocacy and leadership for science





Government  
Office for Science

# 2015 Themed Annual Report

- The report is about the power of analytical science
- An overview of the opportunities and challenges for forensics
- Questions for policy makers





Government  
Office for Science

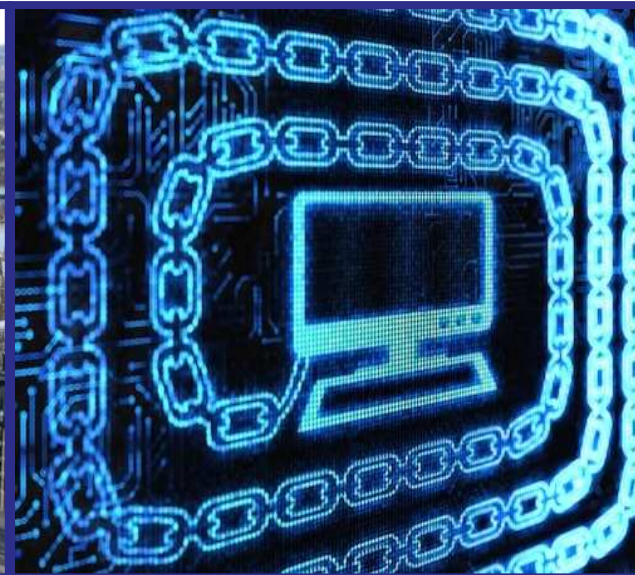
# Why Forensics?



Resilience



Policy



Emerging Technology



Government  
Office for Science

# Forensics beyond the courtroom

- Provenance
- Authenticity
- Assurance





# Forensic science and trustworthy food markets

- How do we know that an item of food is what it claims to be?
- How can we assure ourselves of its provenance?
- How can we assure the identity of the supplier?





Government  
Office for Science

# The challenges in food and drink authenticity control

- Identification of appropriate markers
- Access to authentic samples
- Creating reliable forensic evidence
- Requirement for appropriate reference databases





Government  
Office for Science

# Notions of purity: science meets values

- Food is inherently cultural
- Our ability to analyse may outstrip our ability to interpret
- People have beliefs and values that ignore the scientific perspective



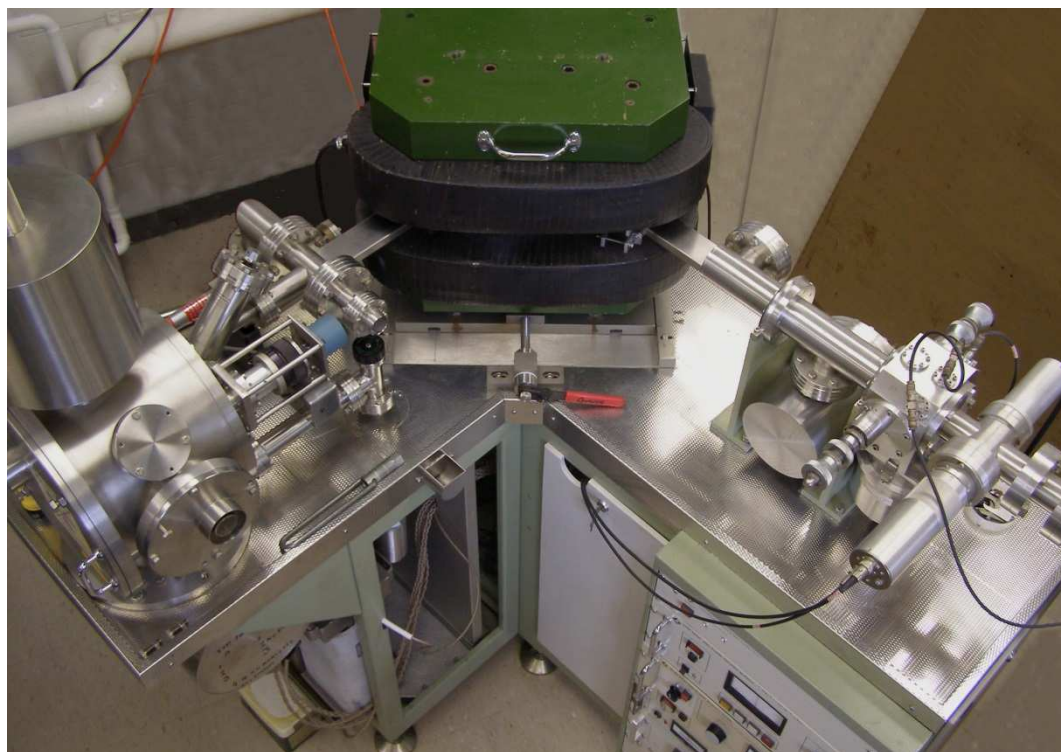




Government  
Office for Science

# Analytical techniques

- Electrophoretic (proteins)
- DNA analysis
- Spectroscopic
- Chromatographic
- Isotope analysis





Government  
Office for Science

# Stopping food fraud

- Keeping one step ahead of fraudsters across complex global supply chains
- Tackling it demands effective intelligence gathering, economic analysis and regular auditing
- Prevention through anti-counterfeiting technologies



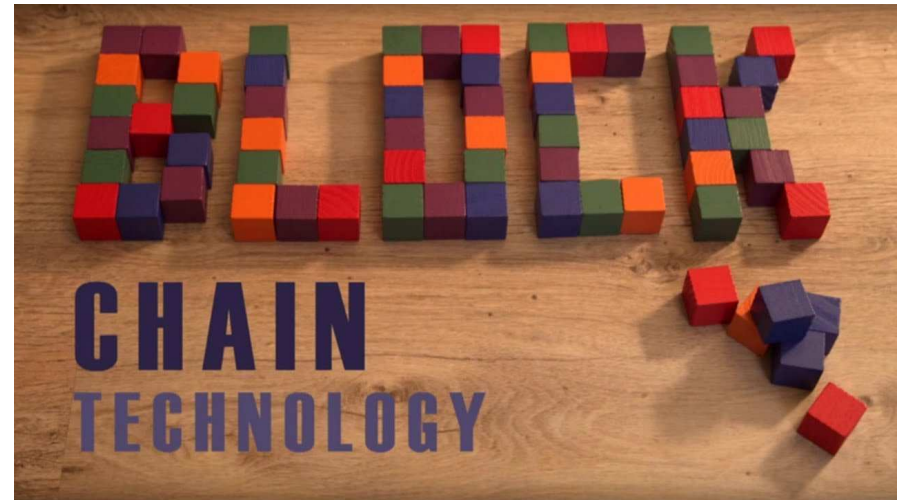


Government  
Office for Science

# Emerging technologies

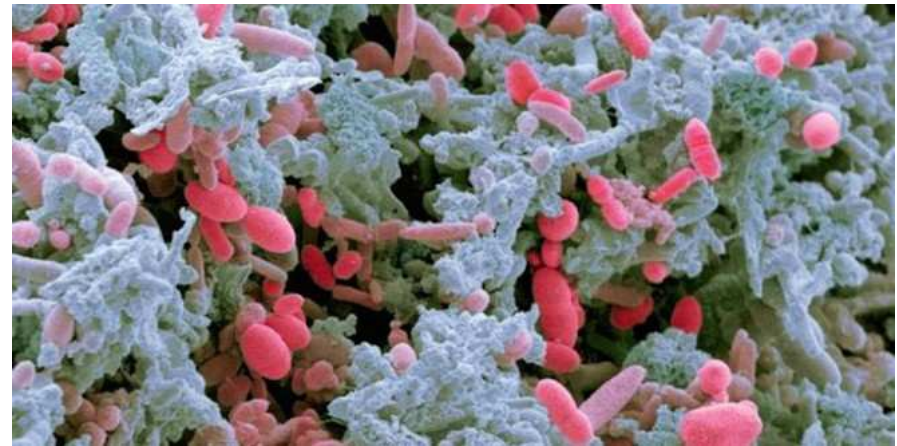
## Block chain technology

- Prove provenance
- Provide supply chain transparency
- Can provide real-time data on shipping conditions when linked to IoT devices



## Exploiting the microbiome

- Food waste (spoilage): using analysis of the microbiome to better understand and extend shelf life
- Food authenticity: using a food's microbiome as an authenticity marker or specification





Government  
Office for Science

# Capturing the opportunities for the UK

- Appropriate regulatory system
- Share innovation across sectors
- Public sector help to move and grow the market





Government  
Office for Science

# From Waste to Resource Productivity

- 2016 Annual Report
- Productivity & growth
- Resilience
- Science & Technology
- Seminar on how reducing Food Waste will cut Greenhouse Gas Emissions





Government  
Office for Science

# Technology enables diverse foods without using animals



**Ingredients:**  
Almonds, water, salt, enzymes, cultures  
  
That's it. Nothing else



Kite Hill cheeses in the gourmet  
cheese department at WFM



Government  
Office for Science

# The Impossible Burger

Made  
from  
Plants!



Patents  
Pending



Government  
Office for Science

@uksciencechief

[www.gov.uk/go-science](http://www.gov.uk/go-science)

Every effort has been made to trace copyright holders and to obtain their permission for the use of copyright material. We apologise for any errors or omissions in the included attributions and would be grateful if notified of any corrections that should be incorporated in future versions of this slide set. We can be contacted through [enquiries@bis.gsi.gov.uk](mailto:enquiries@bis.gsi.gov.uk).