Microbiology and Art: an unusual combination?

JoannaVerran,
Professor of Microbiology,
School of Biology Chemistry and Health Science
j.verran@mmu.ac.uk

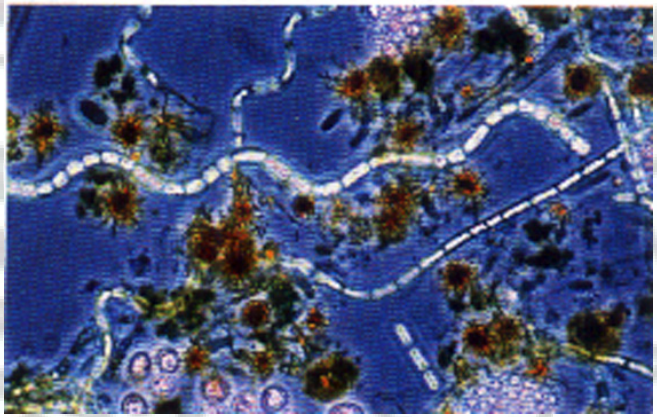
SLTC, June 2007

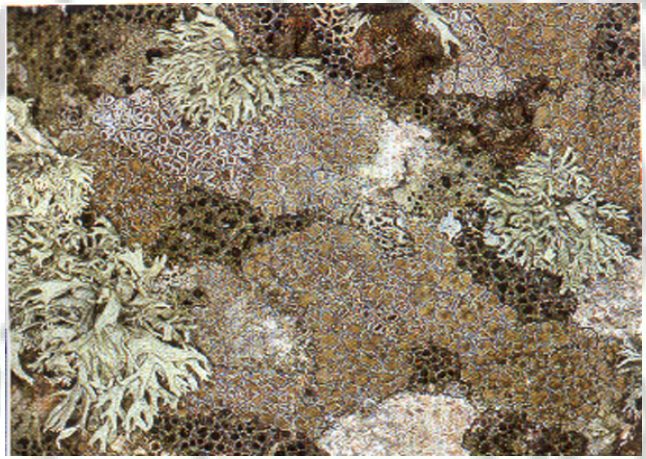
Microbiology and Art – Lecture Outline for ‘Frontiers’ module (Year 1)

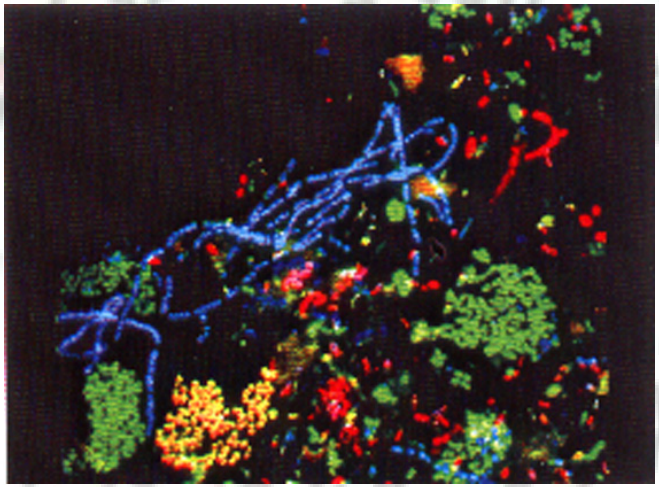
- Microbiology and Art
  - Deterioration of Art
  - Beauty of Microorganisms
  - Microorganisms in Art
  - Microbiology and Art (sciart projects at MMU)
  - Assignment (produce anything linking the two subjects)

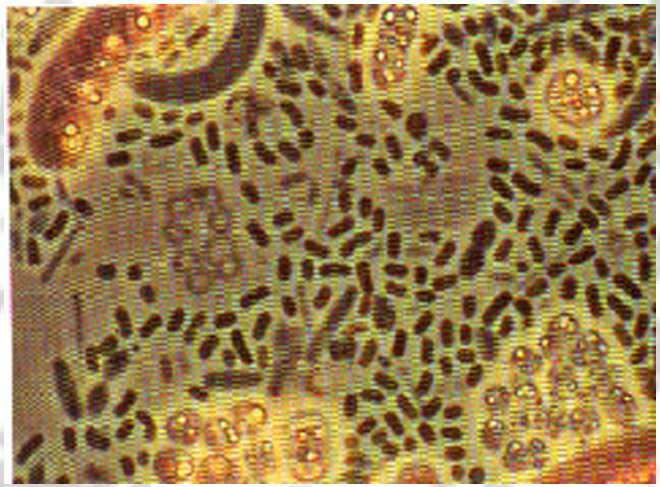
Deterioration and Conservation of Art

Art about, of, and by microorganisms



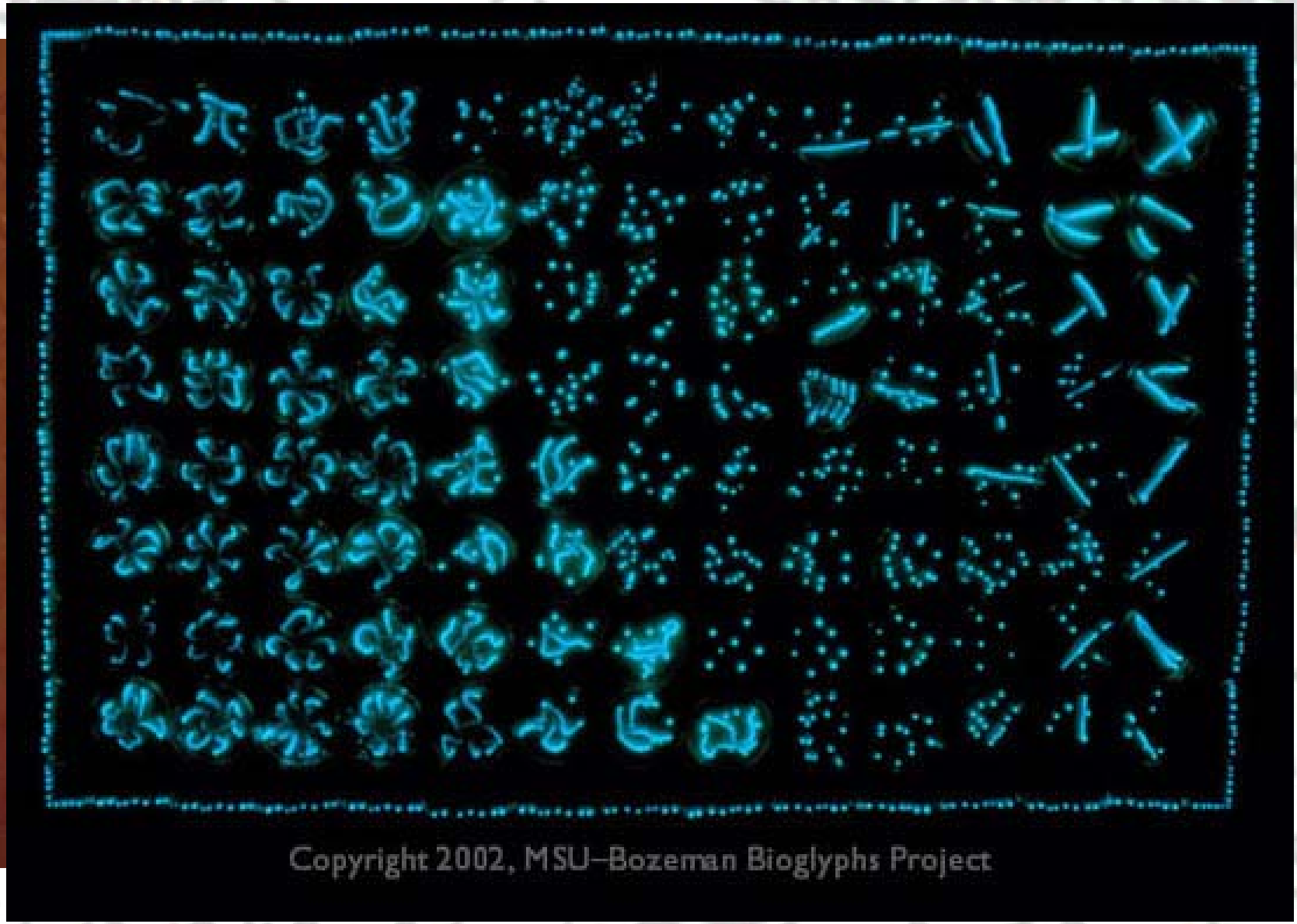




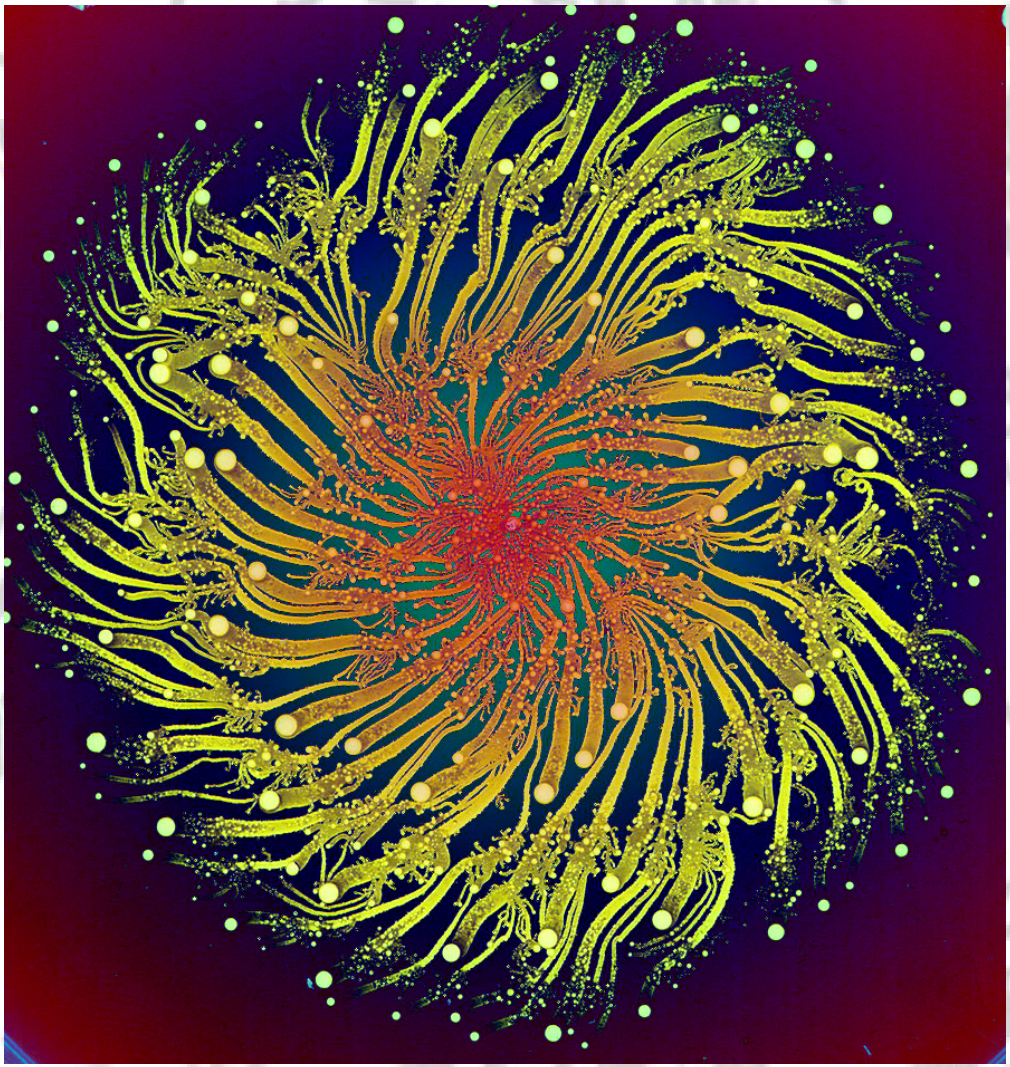


www.iawareables.com

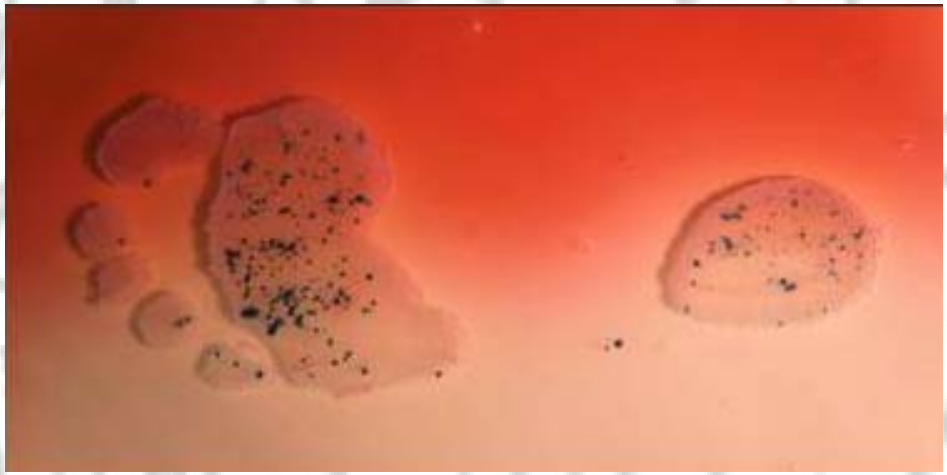
This is not
written with ink
but with bacteria which
develop colonies they grow.
(1) B. violaceus
(2) B. prodigiosus
3 Serratia


Copyright 2002, MSU–Bozeman Bioglyphs Project

Colony morphology and stress ‘social intelligence’

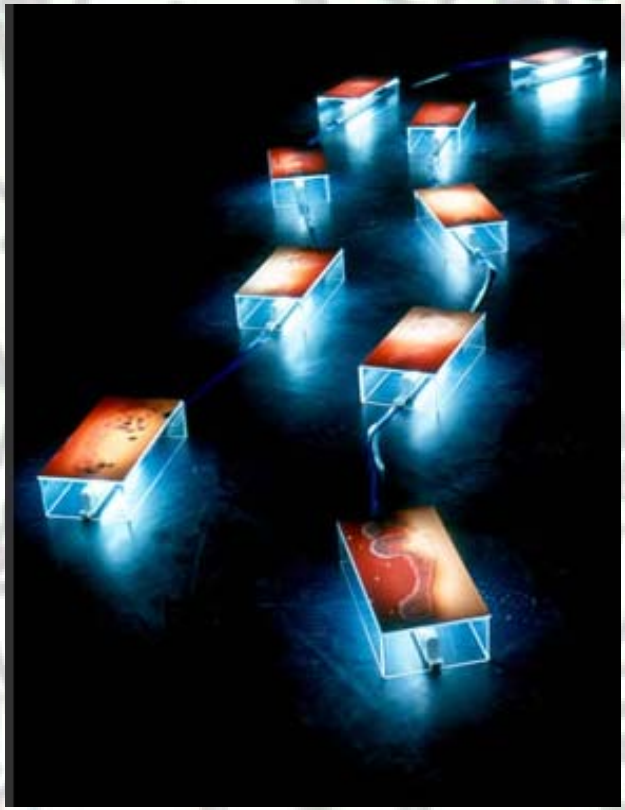


School of Physics and Astronomy,
Tel Aviv University
eshel@tamar.tau.ac.il



Heather Barnett was born in 1970. In 2000 she collaborated with microbiologist George Hounsome to produce laboratory-based art work. 'Cultured Colonies‘ explores biomedical representation and the identity of the individual within the medical institution, and pushes the boundaries of what can be considered a portrait. The installation treads a fine line between seduction and repulsion; the clusters of organisms are affluent and colourful, glowing like micro solar systems, yet their origin is disturbing and their ability for growth shocking.

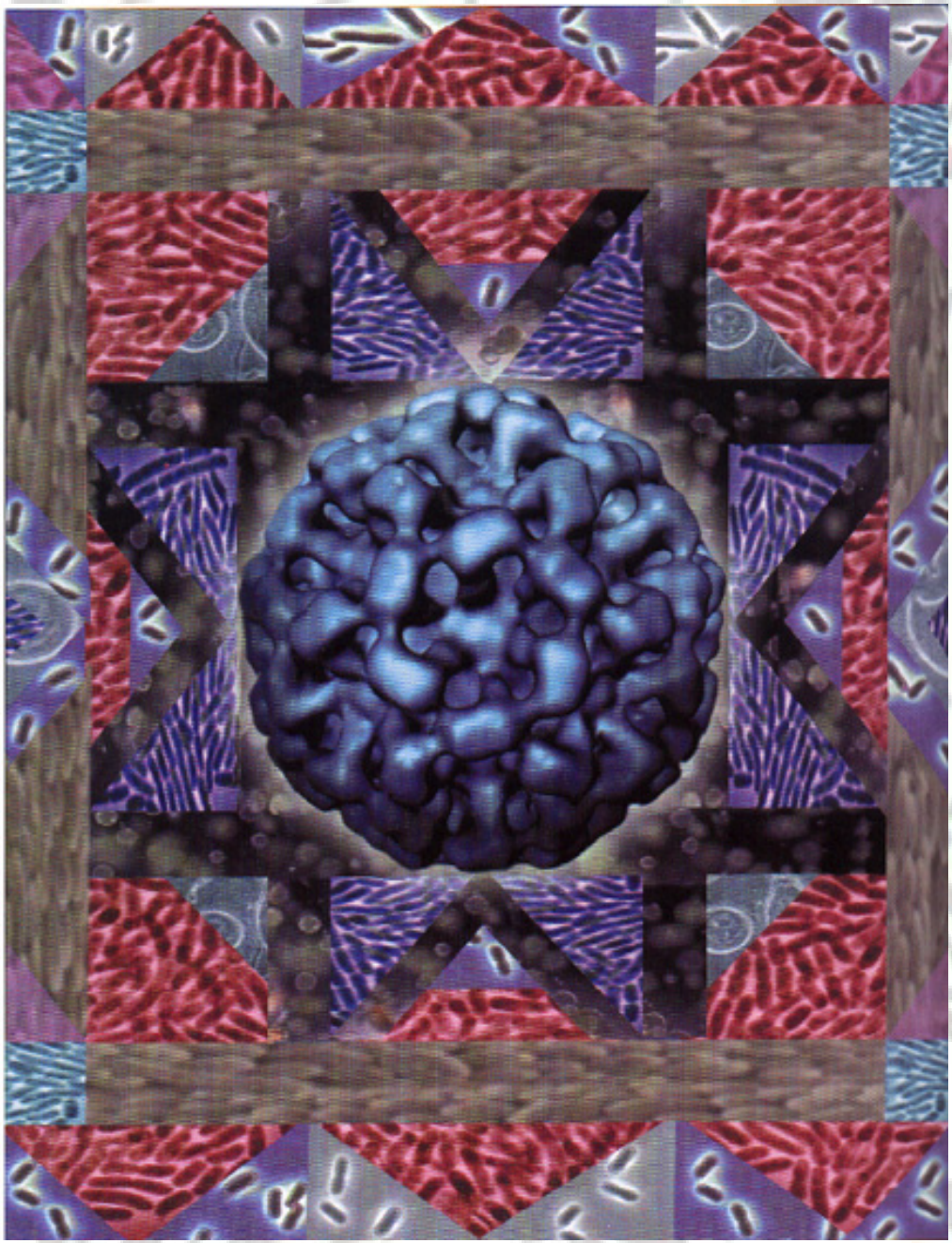
‘Cultured Colonies’ is made up of 9 glowing footprints. The normally harmless organisms have grown in an exaggerated form that would be potentially dangerous to the host.



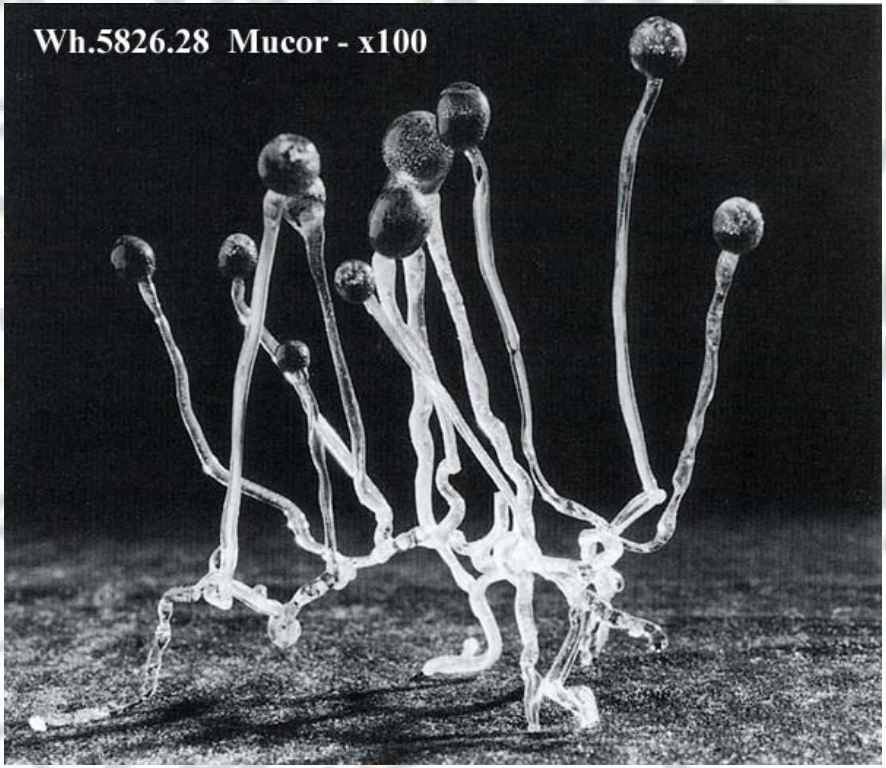
www.diatoms.co.uk

‘Rice’
Biofilm art, Japan

Gorbouchina



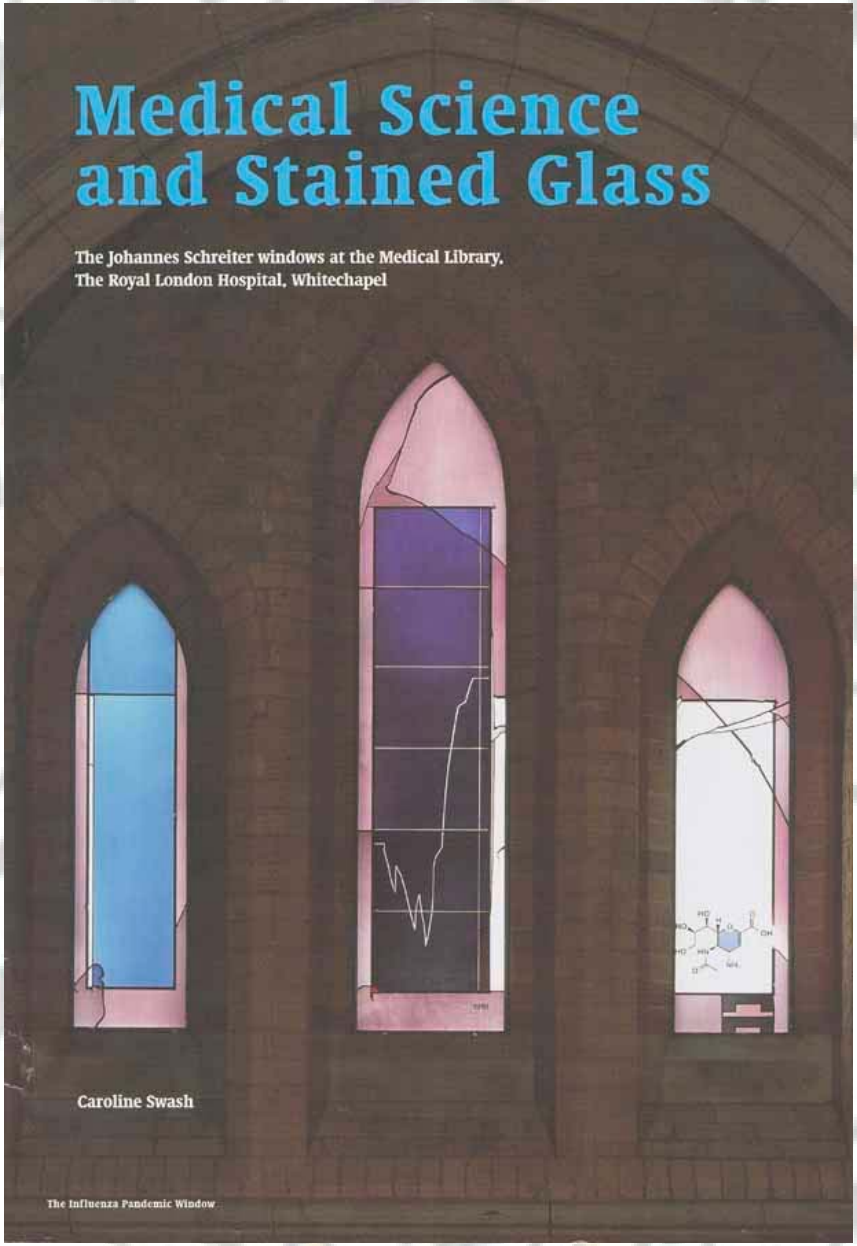
ASM

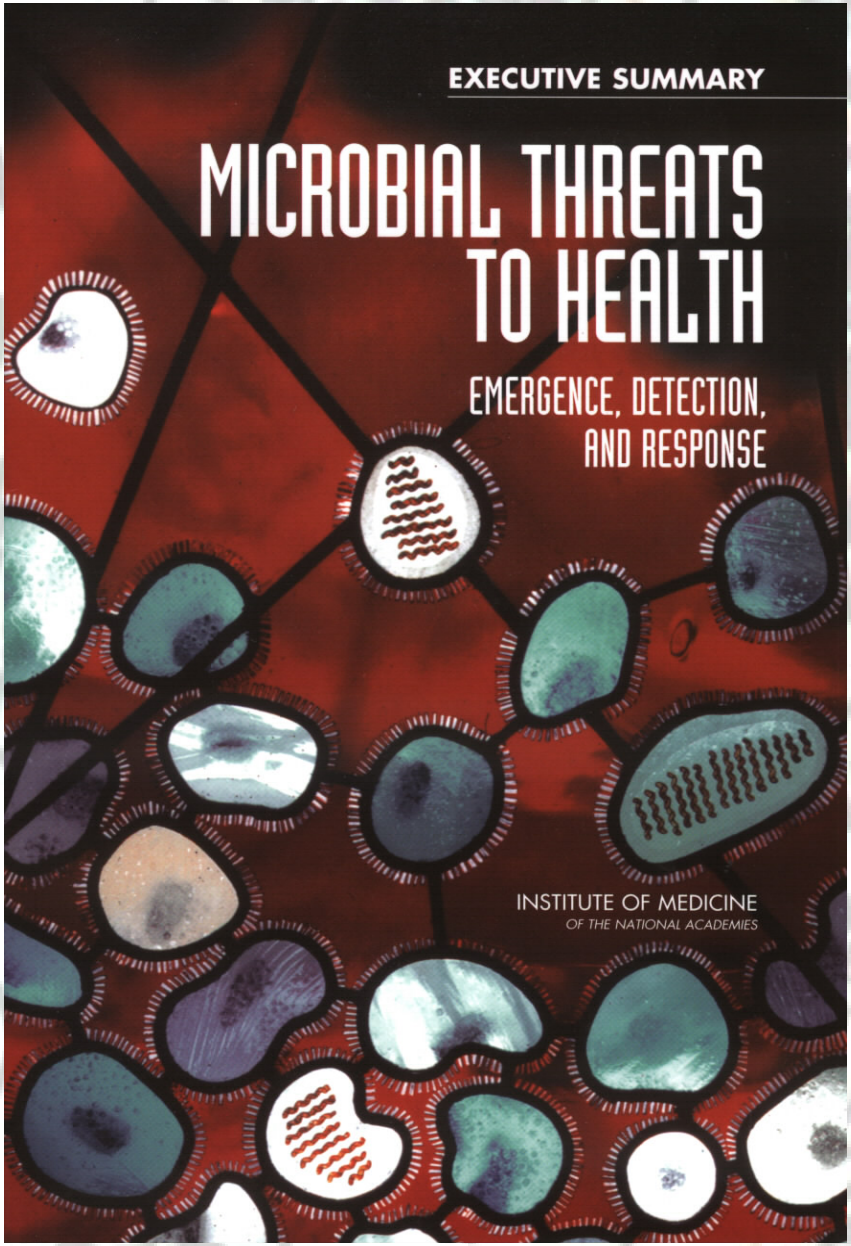


Whipple Museum of History of Science, University of Cambridge

Fountains of the forest –
the interconnectedness between trees and fungi (AD Rayner)

(wellcome.ac.uk)

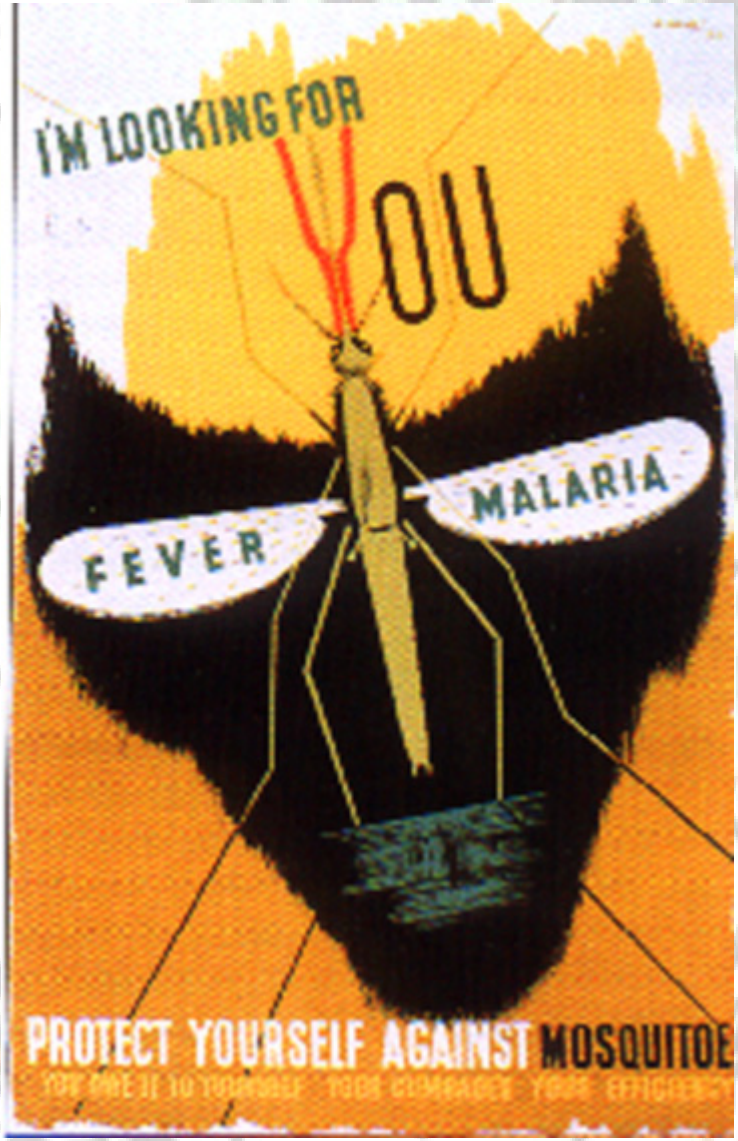

Medical Science and Stained Glass
The Johannes Schreiter windows at the Medical Library, The Royal London Hospital, Whitechapel
Caroline Swash
The Influenza Pandemic Window


EXECUTIVE SUMMARY
MICROBIAL THREATS TO HEALTH
EMERGENCE, DETECTION, AND RESPONSE
INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES


1 4 8 4


MERCVRE.


¡atención!
las ENFERMEDADES
VENÉREAS amenazan
tu salud
¡PREVENTE CONTRA ELLAS!


I'M LOOKING FOR
OU
FEVER
MALARIA
PROTECT YOURSELF AGAINST MOSQUITOE

Work produced after ‘Art’ Lecture


PREVENT DISEASE
FIGHT TUBERCULOSIS
WITH MODERN WEAPONS
Christmas Seals help fight Tuberculosis
"Healthy looks" can hide TUBERCULOSIS
YOUR LUNGS
Are Your Lungs Weak or Paiful
CONSUMPTION
Captain of Death: The Story of Tuberculosis
the X-RAY will show it before you know it
PROTECT
CARELESS
SPREAD INFLUENZA and TUBERCULOSIS
COVER UP!
YOUR COUGHS AND SNEEZES
PROTECT
FROM TUBERCULOSIS
THE NEXT TO GO
FIGHT TUBERCULOSIS
Red Cross Christmas Seal Campaign
TUBERCULOSIS
THE RETURN OF THE WHITE PLAGUE
THE RULES OF HEALT
ISOLATION
FEELING A DRAUGHT.

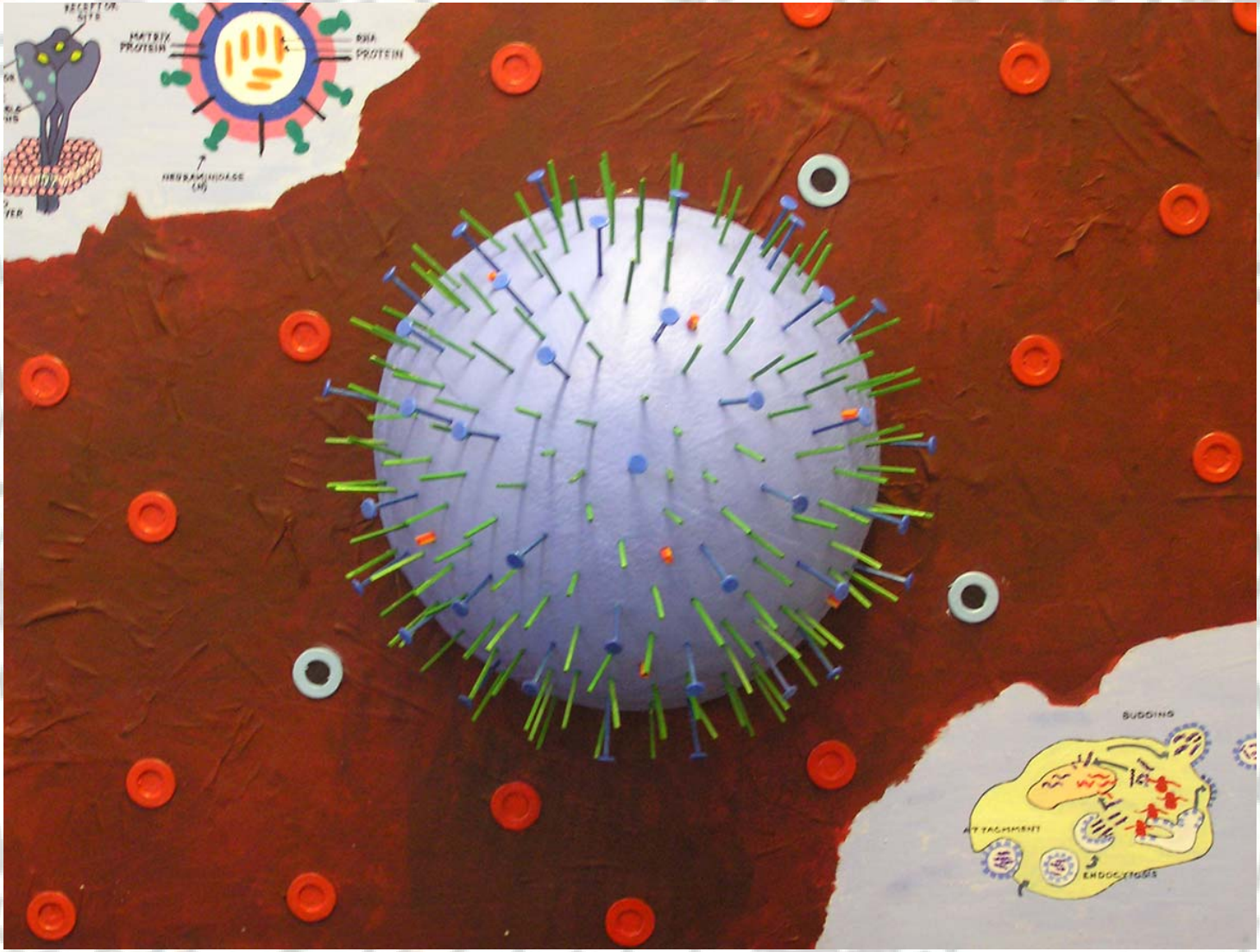

Spirilla (helical)

'Aspergillus'
by Natasha Khan
School of Biology, Chemistry & Health Science

First prizewinner in the 2006
Microbiology & Art Competition

Sponsored by Leica Microsystems


INNER BEAUTY
OR
CELLULAR CHAOS???
By Anne Carlisle & Martin Curtis-Emerson


MATRIX PROTEIN
RNA
PROTEIN
BUDDING
ATTACHMENT

"Stitching Up Oxford Road" is a new project creating original textile art from recycled plastic bags along Manchester's Oxford Road. This activity involving members of the public and the business community is designed to celebrate the rich cultural heritage and diversity of Oxford Road whilst helping Manchester to become a cleaner, greener city. The project is being led by internationally acclaimed textile artist and MMU lecturer Lynn Setterington and a team of willing volunteers.

"I read somewhere that that every person in the country uses an average of 134 plastic bags every year. The idea of ***Stitching Up Oxford Road*** *is to make something positive out of carrier bags; a wasteful and harmful product in the environment can be turned into a positive and thought provoking textile"*

Lynn Setterington

Stitching up Oxford Road

Biodegradation is the decomposition of organic material by micro-organisms, converting the organic material back to CO_2+ H_2O or CH_4.

Decomposers break down anything from human corpses, waste products and dead vegetation.

Fungi can decompose cellulose and lignin of plant cell walls. Almost any Carbon containing material can be consumed by a type of fungi, including jet fuel and even wall paint.

The inorganic elements are then recycled into organic compounds by Producers. These organic compounds then move up trophic levels. This is sometimes called chemical recycling.

Detritivores, aka decomposers, decompose the organic material in every ecosystem and transfer the basic chemical elements in inorganic forms to abiotic reservoirs (soil, water or air).

Ecosystems depend on continual recycling of chemical elements between living and non-living components. Generally chemo-heterotrophic prokaryotes function as decomposers.

Decomposition is important in electricity generation. Methane generated by fermentation of organic material (manure, municipal solid waste + sludge) can be used to make electricity.
This is becoming more important because burning CH_4 produces less CO_2 for each unit of heat released and the latest is that it is CH_4 causes more global warming than CO_2.

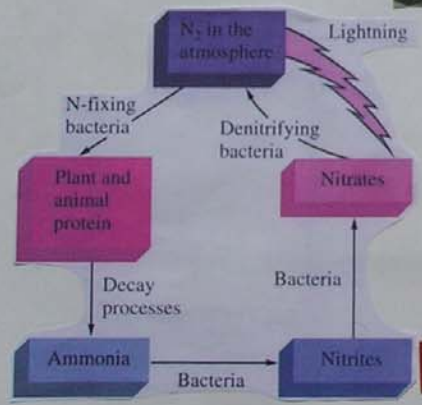


Diagram of the Nitrogen Cycle: showing the cycle of Nitrogen in the environment and the role of bacteria.

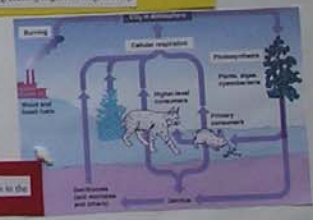


Diagram of the Carbon Cycle: showing the cycle of Carbon in the environment and the processes involved.

PRODUCTION AND USE OF PLASTICS

Plastics are resins, or polymers, that have been synthesized from petroleum or natural gas derivatives. The term"plastics" encompasses a wide variety of resins each offering unique properties and functions. Plastics production and use has grown because of the many advantages plastics offer over other more traditional materials (1) design flexibility (2) high resistance to corrosion (3) low weight (4) shatter resistance.

Table PLASTIC RESIN CHARACTERISTICS AND PRODUCTS

Resin Name	Characteristics	Product Examples
Low-Density Polyethylene(LDPE)	Moisture-proof; inert	Garbage bags
Polyvinyl Chloride(PVC)	Clear; brittle unless modified with plasticizers	Construction pipe; meat wrap; cooking oil bottles
High-Density Polyethylene(HDPE)	Flexible; translucent	Milk and detergent bottles; bolt-in-bag pouches
Polypropylene(PP)	Stiff; heat- and chemical- resistant	Syrup bottles; yogurt tubs; office furniture
Polystyrene(PS)	Brittle; clear; good thermal properties	Disposable linen dishes and cups; cassette tape cases
Polyethylene Terephthalate (PET)	Tough; shatterproof	Soft drinks bottles; food and medicine containers

Problem Caused by Plastic Wastes

The major impacts of marine plastics are entanglement and ingestion by marine animals, and aesthetic and economic losses caused by lost fishing gear and by litter on beaches.
Entanglement affects seabirds, seals, whales, turtles, fish and crustaceans, may have an adverse impact on the populations of endangered species. Fish continue to be caught and killed by lost"ghost" nets.
Ingestion of plastic wastes is particularly serious among birds and turtles, injury to the digestive tract, intestinal blockage and starvation.

DEGRADABLE PLASTIC

Biodegradation and photodegradation are principal mechanisms currently being explored and commercially developed. Before the application of these technologies can be promoted, the uncertainties surrounding degradable plastics must be addressed.

Degradable Plastic Defined

Degradable plastics are engineered to be less resistant to degradation than "normal" plastic. Most prominent technologies being investigated photodegradation and biodegradation.

Degradables Fit into Solid Waste Solutions

Degradable plastics do NOT reduce the volume or toxicity of waste produced. In fact, for certain applications, additional plastic may be required to offset the weakening effect of adding biodegradable components. Enhancing the degradability of plastics will have little if any effect on landfill operation or space.
Plastic recyclers fear that degradable plastics will contaminate the recycled plastic waste stream, resulting on products that do not perform well. There is a question as to whether degradability might encourage littering.


CHESTNUT MUSHROOMS
89p
99
65p
ALLINSON
YEAST
OFFER PACK
SERIOUSLY STRONG
RED
Daktarin
Daktarin GOLD
Perfectil
KINGSMILL
WHOLEMEAL
MEDIUM
Presented By: Faiza Alizai
Rukhsana Parveen
Leenah Ayyad


FRIED

Music

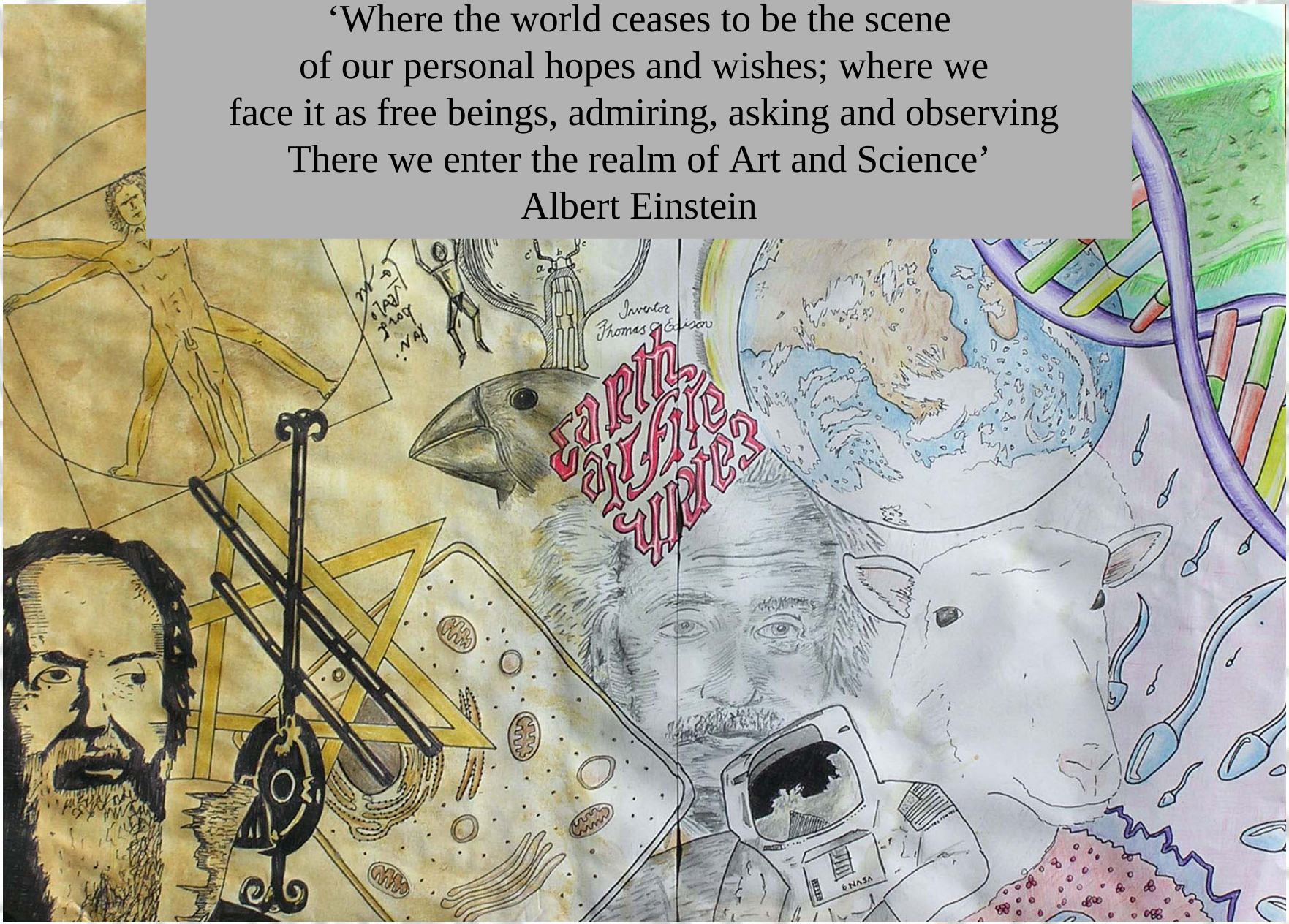
- Prof Helen Davies, University Pennsylvania
- Uses musical mnemonics to help medical students' recall
- Received many prizes, accolades…student nominated best teacher for 15th year
- Example: to tune of 'Sound of Silence'
  - Hello, herpes my old friend
  - You'll be with me 'til the end
  - 'cause the virus softly creeping
  - Left its genes while we were sleeping….

daviesh@mail.med.upenn.edu

To tune of ‘Yesterday’

- Leprosy-
- Bits and pieces falling off of me
- But it isn’t just toxicity
- It’s just neglect of injury.
- Suddenly,
- I’m not half the man I used to be!
- Can’t feel anything peripherally
- From swollen nerves, hypersensitivity.
  - Why don’t leprae grow in vitro, we cannot say
  - In vivo, they grow slow, only once in 12 da…a….ays
- Hard to get,
- But the stigma hasn’t faded yet.
- Don’t keep an armadillo as a pet!
- Clofazamine and dapsone, don’t forget…

‘Where the world ceases to be the scene
of our personal hopes and wishes; where we
face it as free beings, admiring, asking and observing
There we enter the realm of Art and Science’
Albert Einstein



- Microbiology
  - Subject content/concepts
- Communication, imagination
  - Students (learning styles, transferable skills)
  - Peers (professional societies/conferences)
  - Public (PR for subject, understanding of science)
- Any subject can combine with microbiology
- Any subject can combine with art
- Stimulating, interesting, memorable and fun!