The British Society for the History of Science

BSHS ANNUAL CONFERENCE

University of St Andrews

3-6 July 2014
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Emergency Contact Details

Contact Details for Halls

Agnes Blackadder Hall
North Haugh
St Andrews
Fife
KY16 9XW
Tel: 01334 467000
Email: agnes.blackadder@st-andrews.ac.uk

University Hall
Kennedy Gardens
St Andrews
Fife
KY16 9DL
Tel: 01334 467165
Email: unihall@st-andrews.ac.uk

University Switchboard: internal 0 or external 01334 476161
Available Monday-Friday, 08.30-17.30

Security, Emergency Services, Police

Out of Hours University Security: 01334 476161

To contact the emergency services, dial 9999 from an internal telephone, or 999 from an external line.

The police non-emergency number is 9101 from an internal telephone, or 101 from an external line.
Welcome to the BSHS 2014 Annual Conference!

I am delighted to welcome you to the beautiful and historic city of St Andrews for the BSHS 2014 annual conference. It is a wonderful place to resume our series of annual conferences, after the two-year hiatus during which we focused on participating in the Three Societies conference in Philadelphia in 2012, and in hosting the International Congress of History of Science, Technology and Medicine in Manchester in 2013. After these two major international events, it is a pleasure to witness the gathering of a much-strengthened BSHS for what promises to be our largest-ever annual conference.

This is a crucial and exciting time for the BSHS. The annual postgraduate conference series is booming, a clear mark of the present and future health and liveliness of our scholarly community. We are launching a new journal, provisionally entitled BJHS Themes, which will be open-access without any charges to authors. Adding to the Dingle, the Singer and the Great Exhibitions Prizes, we have just established the biennial Pickstone Prize, in fond memory of the late Professor John Pickstone.

So many people from all over the world enjoyed and benefited from the wildly successful International Congress in Manchester last summer, and this has raised the global profile of the BSHS very significantly. We thank once again everyone who worked so hard to make the event such a triumph. The unexpectedly large attendance at the Congress has also generated a considerable budgetary surplus, with which we will be very pleased to support various activities in the next five years. There will be subsidies to help BSHS members attend the next International Congress, in Rio de Janeiro in 2017, and other worthwhile conferences. The BSHS budget to support the organisation of conferences by members will also be increased, and the BSHS postgraduate master’s bursaries will now be offered at a higher rate.

The annual conference, normally the highpoint of the year for the BSHS, could not take place without the support of the host institution, this year the University of St Andrews. We have the pleasure of acknowledging the expert hand of lead local organiser Aileen Fyfe and her colleagues in hosting a conference that is both academically and socially exciting. We thank members of the BSHS Programmes Committee for their heroic effort in constructing a large and rich programme — especially Ben Marsden, the chair of the committee, and Jenny Rampling, the programme coordinator. We also thank the BSHS executive secretary Lucy Santos (Tetlow), our web manager Jia-Ou Song, Malcolm Noble, and various other members and officers of the BSHS Council for their supporting roles.

I hope you will enjoy this year’s conference, and let its warm glow prompt you to return to next year’s meeting in Swansea!

Hasok Chang
President, BSHS
### Local Gazetteer

**Bookshops**  
Waterstones (103 Market Street); Blackwell’s (St Mary’s Place, in Students Union); Bouquiniste (31 Market Street, second-hand and antiquarian books – past Cromar’s fish bar where Market Street narrows).

**Breakfast**  
Breakfast will be served in the halls of residence.

**Buses**  
For arriving and departing by train, delegates can catch any of the '99' services which run every ten minutes (peak time) to and from Leuchars train station (and Dundee). St Andrews Bus Station is five minutes’ walk from the North Haugh and the halls of residence. When departing, there is a bus stop on the main road near the Gateway building, with departures a minute or two after the bus station.

**Cafés**  
St Andrews is served by a multitude of cafés. Zest Café (95 South Street) has free wifi, as does Beanscene (4B Bell Street). Taste (148 North Street) is said to serve the best coffee in town but due to its size is best for takeaway. Costa and Starbucks can be found at 83 and 127-129 Market Street respectively. There is also a small café in the Gateway building, in which the majority of conference activities will be taking place.

**Cashpoints**  
The nearest cashpoints (ATMs) to the Gateway Building and halls of residence are situated on Market Street, outside Tesco and across the street outside the Santander bank. Cashpoints throughout town are highlighted with stars on the map.

**Checking in/out**  
Accommodation check-in is from 2 pm on the day of arrival at Agnes Blackadder Hall and University Hall (North Haugh). Check-out is at 10 am. Storage facilities (at your own risk) for luggage will be available at the Gateway Building.

**Chemist**  
Boots (113-119 Market Street).

**Doctor**  
St Andrews Community Hospital and Health Centre, Largo Road, St Andrews, KY16 8AR. Tel: 01334 465656.

**Drinks machine**  
There are drinks machines in the corridor behind the café in the Medical Sciences Building and in the main library café area. Vending machines are in the foyer areas of halls of residence.

**Groceries**  
Tesco Metro (138-140 Market Street), and Sainsbury's Local (71 Market Street).

**Internet**  
Internet access will be via eduroam or by wifi visitor network (details in registration packs).

**Library**  
The University Library (see map) is open from 8 am to 10 pm on weekdays and from 10 am to 7 pm on weekends. The public library (Church Square) is open from 9.30 am to 7 pm on Thursday and from 9.30 am to 5 pm on Friday and Saturday. It is closed on Sunday.
Newsagents  Westwood's (213 South Street) or Innes’ (107 South Street).

Pharmacy  See 'Chemist'.

Police  Police Station, 68 Pipeland Road, St Andrews, KY16 8JW. For emergencies telephone 999. The non-emergency number is 101. If calling from an internal phone, dial 9 to get an external line.

Parking  Agnes Blackadder Hall offers free parking for guests. Parking permits are available from the reception and should be displayed for the duration of your stay.

Post-box  The nearest post-box to the Gateway Building is situated outside the Bus Station on City Road. The main post office is within W. H. Smith (90-92 South Street).

Printing  Printing for delegates will be available at Agnes Blackadder Hall.

Pubs  As with cafés, St Andrews is home to a wide variety of pubs and hotel bars. Drouthy Neebors (209 South Street), the Whey Pat (1 Bridge Street) and the Russell Hotel (26 The Scores) are all relaxed and welcoming and serve a variety of bar snacks and real ales. The Westport Bar & Kitchen (170 South Street) is a stylish ‘gastropub’. The Criterion (99 South Street) and the Central (77 Market Street) are both popular, with traditional décor. Aikman’s (32 Bell Street) has a wide range of real ales. Finally, the recently opened St Andrews Brewing Company (177 South Street) is fast becoming a firm favourite with its combination of real ales and ciders and tapas. The bar in Agnes Blackadder Hall will be open until 11.30 pm daily.

Registration  Initial conference registration will be taking place from 3.30 pm to 7 pm on Thursday in Lower College Hall (St Salvator’s Quad). Coffee and drinks will be available at Thursday’s registration session. For subsequent days the registration desk will be situated in the Gateway Building, and open from 8 am (8.30 am on Sunday).

Supermarkets  See ‘Groceries’.

Taxis  During the evening taxi ranks can be found on Bell Street and near the Bus Station. St Andrews Taxis – 01334 600600; HM Taxis - 01334 474700; Williamson’s – 01334 476787.
Map of St Andrews

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Directions
Bell Pettigrew Museum (2)
The Bell Pettigrew museum is located in the Bute Medical building.
Access can be gained through Door C.

Gateway Bus Stop(2)
Bus stop for services heading to and from Leuchars and Dundee
is located outside the Gateway Building.

Lower and Upper College Hall (5)
Located in St Salvator’s Quad, North Street. Enter through the archway
from North Street. Both venues are right ahead of you.

MUSA Collections (9)
The MUSA Collections Centre is located at 87 North Street, next door
to the University’s Development Office and opposite the old Police Station.
All lunches and coffee/tea breaks will be served in the Gateway Well.
Programme

Thursday 3 July

14.00 onwards  Check-in at accommodation
Agnes Blackadder or University Hall

15.30 onwards  Conference registration
Lower College Hall

16.00–17.30  Tours and Postgraduate Workshop 1
(Details below)

17.30–19.00  Wine reception
Museum of the University of St Andrews (MUSA)
Sponsored by the Institute of Intellectual History

19.00–20.30  Buffet dinner (cash bar)
Lower College Hall

20.30–21.30  Opening plenary lecture
Upper College Hall

21.45–23.45  Postgraduate social event
St Andrews Brewing Co. Brewpub (upstairs room), 177 South Street

Friday 4 July

07.30 – 09.00  Breakfast (At your hall of residence)

09.00–11.00  Academic sessions
(Details below, under ‘Full Listing of Academic Sessions’)

‘Life and physical science collections’ workshops
(Martyrs’ Kirk Reading Room, at 9.30 and repeated at 10.15)

11.00–11.30  Break

11.30–13.00  Academic sessions
‘Objects and material culture in HSTM’
Gateway Gallery

13.00–14.00  Lunch

Postgraduate Workshop 2
Gateway Lecture Room 3

14.00–15.30  Academic sessions
MUSA ‘Behind the scenes’ tour
MUSA Collections Centre (meet 14.15)

15.30–16.00  Break
16.00–18.00  Academic sessions
19.00–21.30  Conference dinner
              Lower College Hall
21.30–23.59  Ceilidh and cash bar
              Upper College Hall

Saturday 5 July

07.30 – 09.00  Breakfast (At your hall of residence)
09.00–11.00  Academic sessions
11.00–11.30  Break
11.30–13.00  Academic sessions
13.00–14.00  Lunch

              BSHS Extraordinary General Meeting
              Gateway Lecture Room 3
14.00–15.30  Academic sessions
15.30–16.00  Break
16.00–18.00  Academic sessions
18.30–19.30  Dinner (cash bar)
              All delegates eat at Agnes Blackadder Hall, self-service
20.00–22.00  Whisky (etc.) tasting
              Foyer, Medical Sciences Building

Sunday 6 July

07.30 – 09.00  Breakfast (At your hall of residence)
09.00–11.00  Academic sessions
11.00–11.30  Break
11.30–13.00  Academic sessions
13.00–14.00  Lunch

All lunches and coffee/tea breaks will be served in the Well area in the Gateway Building.
Tours and Special Sessions

Thursday 3 July

16.00–17.30

Postgraduate Workshop 1: ‘How to get the most out of a conference’
(Upper College Hall)
Participants: Frank Müller (University of St Andrews)
Alice White (University of Kent)

‘Scientific treasures of the University of St Andrews Library’
Drop-in session at the new Martyrs’ Kirk Research Library, North Street, featuring highlights from our Special Collections of early printed books, archives and photographs; no need to book.

‘Behind the scenes at the MUSA Collections Centre’
Curator-led tour of the MUSA store, which is rich in Victorian scientific instruments. Sign-up necessary (tour repeated on Friday). Meet at 16.00 at the MUSA Collections Centre (NB, not MUSA itself) at 87 North Street, directly in front of the University Library.

Tour of the Bell-Pettigrew Museum of Natural History
Curator-led tour of this early twentieth-century natural history museum. Meet at 16.00 at Lower College Hall, to walk as a group to the museum.

Walking tours of St Andrews
Meet at Lower College Hall at 16.00.

Friday 4 July

09.30–10.15
Repeated at 10.15–11.00

‘Physical Sciences’ workshop
‘Life Sciences’ workshop (including 101 things to do with a dead whale’)
Two parallel sessions, each repeated, led by Special Collections curators to introduce the University’s historic scientific collections, including an introduction to the marine science archives. Meet at Martyrs Kirk Research Library, North Street. Come to both, or just to one! (Maximum 20 per session.)
11.30–13.00

'Objects and material culture in HSTM'
(Gateway Gallery)
Organiser: James Stark
Chair: Melanie Keene
Participants:  
  * Tim Boon (Science Museum)  
  * Karin Tybjerg (Medical Museion, University of Copenhagen)  
  * Matt Sheard (MUSA)

13.00–14.00

Postgraduate Workshop 2: 'Moving on from the PhD'
(Lecture Room 3)
Participants:  
  * Sabine Clarke (University of York)  
  * Sarah Easterby-Smith (University of St Andrews)

14.15–15.15

'Behind the scenes at the MUSA Collections Centre'
Curator-led tour of the MUSA store which is rich in Victorian scientific instruments (repeat of Thursday's tour). Sign-up necessary. Meet at 14.15 at the MUSA Collections Centre (NB, not MUSA itself) at 87 North Street, directly in front of the University Library.

Saturday 5 July

11.30-13.00

Roundtable: ‘Editing the history of science’
(Lecture Room 3)
Organisers: H. Floris Cohen and Jennifer Rampling
Participants:  
  * H. Floris Cohen (Isis)  
  * Jon Agar (BJHS)  
  * Jennifer Rampling (Ambix)  
  * Iwan Morus (History of Science)

13.00-14.00

BSHS Extraordinary General Meeting
(Lecture Room 3)
Full Listing of Academic Sessions

Please arrive early to ensure that you secure a seat, as some sessions may be over-subscribed.

Thursday 3 July
Opening plenary lecture
20.30–21.30
Upper College Hall

‘National Health is National Wealth: Victorian Visions’
Sally Shuttleworth
(University of Oxford)

Friday 4 July
Academic session 1
09.00–11.00

Nature Repurpos’d: Recycling Ideas, Images, Objects and Spaces in Early Modern Europe
Lecture Room 4

Organiser: Jennifer Rampling
Chair: Anke Timmermann

‘The adaptive adept: retooling medieval apparatus for early modern chymistry’
Jennifer Rampling (Princeton University)

‘A quintessential craft: Hieronymus Brunswig’s adaptation of learned alchemical concepts of distillation into artisanal medicine making’
Tillmann Taape (University of Cambridge)

‘Preserving the cutting edge: woodblocks, visual knowledge, and recycling practices of botanical illustration in early modern Europe’
Bruce T. Moran (University of Nevada, Reno)

‘Making a home for science in early modern England’
Simon Werrett
(University College London)

Colonial and Imperial Science
Boardroom

Chair: Jessica Ratcliff

‘The minds of men are on the move’: phrenology in Bengali print culture, 1845-1850’
James Poskett (University of Cambridge)

‘Mutual transformation of Colonial and Imperial botanizing? The intimate and remote collaboration between Chung Tyaihyon and Ishidoya Tsutomu in Colonial Korea’
Jung Lee (Needham Research Institute, Cambridge)

‘From ethnoscientific to ethnological: indigenous plant knowledge in Imperial context’
Geoff Bil (University of British Columbia)

‘The Minor Horrors of War’: insects, the British Empire, and the First World War’
Arik Clausner (University of St Andrews)

Semantic History of ‘Thinking about Science’ in the Twentieth Century
Seminar Room 4/5

Organiser: Robert Bud
Chair: Eric Schatzberg

‘Basic research and innovation: the “new” semantic pair’
Benoît Godin (INRS, Quebec)

‘Science policy in search of new semantics: basic research in the era of the Second World War’
Désirée Schauz
(THI, Technische Universität München)
‘Modernity, mobility and modernization: “fundamental research” in a new vision of colonial development, 1940-1960’
Sabine Clarke (University of York)

‘Making sense of modernity: the categories of pure and applied science in the public sphere of early twentieth-century Britain’
Robert Bud (Science Museum)

Genetics
Seminar Room 6

Chair: Fern Elsdon-Baker

‘The rhetoric of genes: utopia promises of a pragmatic science, 1930-2000’
Maurizio Esposito (University of Santiago)

‘The biology of altruism and the post-war social order: a reconsideration of the meaning behind inclusive fitness’
Sarah Swenson (University of Oxford)

“‘Erroneous assumptions regarding genes” in the twentieth century’
Annie Jamieson (University of Leeds)

‘Cataloguing Dolly: the curious tale of archives and animal genetics in Edinburgh’
Clare Button (University of Edinburgh Main Library)

Images of the Sciences
Lecture Room 3

Chair: Rebekah Higgitt

‘When Urania meets Terpsichore: an early nineteenth-century lecture on astronomy in the Lord Chamberlain’s Plays’
Hsiang-Fu Huang (University College London)

‘Visualising human emotion: François-Francé’s archive at the Collège de France’
Allison Huetz (De Montfort University)

‘Framing relativity: artistic glimpses of Einstein’s theory’
John G. Hatch (Western University)

‘At the edge of their universe: art and science at CERN, 1954-2014’
Camilla Mørk Røstvik (University of Manchester)

Friday 4 July
Academic session 2
11.30–13.00

Archaeology, Anthropology and Human Identity
Lecture Room 4

Chair: Oliver Hochadel

‘Excavating “Deep History”: archaeological field practice and narratives of human identity’
Amanda Rees (University of York)

‘Controversial archaeology as entrepreneurship: Pedra Furada and the Brazilian First American (1979-2009)’
Miquel Carandell Baruzzi (Universitat Autònoma de Barcelona)

‘The making of the Mexican face: “Caramex” and the history of criminal identification’
Abigail Nieves-Delgado (National Autonomous University of Mexico)

Scientific Careers
Lecture Room 3

Chair: Thomas Lean

‘Rebelling against the “System”: embarking on a scientific career in Britain from World War Two to the early post-war period’
Ruth Wainman (University of Kent)
‘Discrepancies become disturbing: changing attitudes towards women scientists and engineers in Britain during the late 1960s and 1970s’
Sally Horrocks (University of Leicester)

‘Autobiography and the history of forensic science in the twentieth century’
Alison Adam
(Sheffield Hallam University)

Science at Sea
Seminar Room 6

Chair: Sophie Waring

‘Jane Squire: class, gender, and religion in the search for the longitude’
Alexi Baker (University of Cambridge)

‘Sampling the South Seas: examining the collection and interrogation of scientific specimens on mid-nineteenth-century voyages of Pacific exploration’
Sarah Louise Millar
(University of Edinburgh)

‘Physical deterioration, national efficiency, and the Royal Navy, 1880-1910’
Elise Smith (University of Oxford)

People, Place and Things: Locating the History of Technology
Boardroom

Organiser: Alison Hess

Roundtable participants:

Alison Hess (Science Museum)
Simon Naylor (University of Glasgow)
Klaus Staubermann (National Museums Scotland)

Friday 4 July
Academic session 3
14.00–15.30

The Mathematical and the Baconian Sciences Revisited: Traditions of French Physical Science during the Eighteenth and Nineteenth Centuries
Lecture Room 3

Organiser: Daniel Jon Mitchell
Chair: John R. R. Christie

“‘Les Minéralogistes-Physiciens”: physics at the Jardin du Roi from Charles Dufay to Antoine-César Becquerel”
Michael Bycroft (Max Planck Institute for the History of Science)

‘The Berthollet-Haüy controversy: definite proportions in chemistry and crystallography’
Stephen T. Irish (University of Cambridge)

Daniel Jon Mitchell (University of Cambridge)

Darwin in Iberia
Seminar Room 6

Chair: Jim Secord

‘Darwin in Portugal: the introduction of Darwin in Portuguese science and culture (1865-1914)’
Ana Leonor Pereira (University of Coimbra)

‘The role of Júlio Augusto Henriques in the advancement of scientific knowledge at the University of Coimbra: natural history, botany and pharmacy’
João Rui Pita (University of Coimbra)
'Different truths at different levels: communication policy on evolution in Franco’s Spain (1939-1975)'
Clara Florensa (Universitat Autònoma de Barcelona)

Experiments in Twentieth-Century Agricultural Science (1)
Lecture Room 4

Organiser: Giuditta Parolini
Commentator: Jonathan Harwood

'Environmental interference and the hereditary touchstone: the design and management of agricultural experiments in Cambridge, 1920-1950'
Dominic Berry (University of Leeds)

'The role of statistics in field experiments'
Giuditta Parolini (Berliner Zentrum für Wissengeschichte/Technische Universität Berlin)

'Engineering a chilly reception: experiments in prolonging the life of horticultural produce, 1917-1930'
Paul Smith (University College London)

Policy, Health, Environment
Boardroom

Chair: John Clark

'Who defines medical research policy? Patients, politics and the case of Chronic Fatigue Syndrome/Myalgic Encephalomyelitis'
Andrew Black (University of Manchester)

'World dynamics: neo-Malthusian ecology, 1948-1972'
Matthew Holmes (University of Leeds)

'Climatometry, climate change and the UK government response'
Jon Agar (University College London)

Technology and Communication (1)
Seminar Room 4/5

Chair: Sean Johnston

'Technological convergence and transatlantic communication: a case study of Ireland, 1850–66'
Adrian James Kirwan (National University of Ireland, Maynooth)

'Generating public trust in Greenwich Observatory Time in late nineteenth-century Britain'
Yuto Ishibashi (Kyoto University)

'Vítkovice Ironworks and the Rothschild family (1891-1914): contracts, patents and new technologies applied in ship production for the Habsburg monarchy'
Aleš Materna (University of Ostrava)

Friday 4 July
Academic session 4
16.00–18.00

Early Modern Travellers
Lecture Room 3

Chair: Karin Tybjerg

'George Strachan's Arabic Euclid manuscript'
Gregg De Young (The American University in Cairo)

'The assembled dodo: making and using a flightless monster in early modern natural history'
Natalie Lawrence (University of Cambridge)

'The facts of the matter? Natural knowledge of mountains in early modern Europe'
Dawn Jackson Williams (University of St Andrews)
‘British travellers and the sublime volcano: science, faith and aesthetic in feudal Sicily of the eighteenth century’
Gabriele Mulè (Independent scholar)

“‘Big Science’ in the field: experiments, expertise and policy on badgers and bovine TB”
Angela Cassidy (King’s College London)

Concluding roundtable

Puting Nutrition Science in its Place:
New Sites and Practices in Late Nineteenth-Century Physiology
Boardroom

Organisers: Elizabeth Neswald and Agusti Nieto-Galan
Chair: Elise Smith

‘Hunger artists in the public sphere: the fasting contest of Giovanni Succi and Stefano Merlatti in Paris, 1886’
Agusti Nieto-Galan (Universitat Autònoma de Barcelona)

‘Nutrition science and dietary surveys in the late nineteenth century’
Elizabeth Neswald (Brock University, Ontario)

‘Nutritional knowledge in transit: “artificially digested foods,” physiology and the commercial sphere in late nineteenth-century Britain’
Lisa Haushofer (Harvard University)

Maternal and Infant Health
Seminar Room 4/5

Chair: Sally Frampton

‘Examen obstetricum – midwifery and obstetrics in early modern Vienna’
Sonia Horn (University of Vienna)

‘Alexander Gordon, puerperal fever, and empiricism in eighteenth-century medicine’
Henry Kreuzman (The College of Wooster)

‘The apotheosis of Semmelweis and late nineteenth-century interest in public hygiene’
Constance E. Putnam (Independent scholar)

‘Don’t Kill the Baby’: maternal advice literature in Canada and England, 1920-1940’
Gwenith Siobhan Cross (Wilfrid Laurier University)

Experiments in Twentieth-Century Agricultural Science (2)
Lecture Room 4

Organiser: Giuditta Parolini
Chair: Gregory Radick

‘From breeding experiments to stem cell research: animal genetics in Edinburgh and the cloning of Dolly the sheep’
Miguel Garcia-Sancho (University of Edinburgh)

‘Constructing animal welfare science: ethics, experiment and discipline-building’
Andrew Gardiner (University of Edinburgh)

Technology and Communication (2): The Twentieth Century
Seminar Room 6

Chair: Aileen Fyfe

‘Keeping the lights on: oral histories and the development of the British electricity supply system from nationalisation to privatisation’
Thomas Lean (British Library)

‘Modernism and the motorways: public contestation of the future of transport (1945-1963)’
Cameron Roberts (University of Manchester)
“Choose the one that makes the best noise”: selling computer technology in the age of mundanity
James Sumner (University of Manchester)

“American machines are the greatest”: popular representations of computer technology and the growth of an American computer culture
Hannah Grenham (University of St Andrews)

Saturday 5 July
Academic session 5
09.00–11.00

Interdisciplinary Approaches to Early Science and Medicine
Lecture Room 3

Chair: Jennifer Rampling

‘Assyrian technical procedures and the language of alchemy’
Eduardo Escobar (University of California, Berkeley)

‘The dissemination of Greek science in the Near East: the case of Claudius Ptolemy’s Tetrabiblos’
Bojidar Dimitrov (Bayerische Akademie der Wissenschaften)

‘All in the mind: brain, soul, and mental disorder in the fourth century CE’
Jessica Wright (Princeton University)

‘Ancient traditions in foreign medieval cultures: early formulators negotiating medicine’
Mujeeb Khan (University of Cambridge)

Creating ‘Useful Knowledge’: British Oceanic Mapping, 1700-1900
Medical Sciences, Seminar 1

Organiser: Georgina Rannard
Chair: Sarah Easterby-Smith

‘Public charts and public service: hydrographic argument in the nineteenth century’
Megan Barford (University of Cambridge)

‘Empire and “useful knowledge”: charting the British Atlantic world, 1660-1720’
Georgina Rannard (University of Edinburgh)

‘From description to theory: how coral reefs changed nineteenth-century hydrography’
Alistair Sponsel (Vanderbilt University)

Agriculture, Science and Politics
Lecture Room 4

Chair: Yang Haiyan

‘Humphry Davy and the Board of Agriculture’
Frank A.J.L. James (Royal Institution)

‘Political natural history? Francesc Darder and the acclimatization movement in Catalonia around 1900’
Oliver Hochadel (Consejo Superior de Investigaciones Científicas)

‘The curious case of George Compere, the “parasite theory” and the economic entomologists in Australia, 1900-1910’
Edward Deveson (Australian National University)

‘Between science and politics: Portuguese biologists’ differentiated stances towards Lysenkoism’
Pedro Ricardo Fonseca (University of Coimbra)
Adapting Medical Techniques and Technologies  
Boardroom

Chair: Simon Chaplin

‘Classifying the patient: individuality and therapeutic bloodletting in late nineteenth-century medicine’  
*Eli Anders (Johns Hopkins University)*

‘Syphilisation and its discontents: experimental inoculation and the search for immunity against syphilis in England, 1860-1880’  
*Anne Hanley (University of Cambridge)*

‘Geoffrey Keynes: medical savant-connoisseur and literary bibliographer’  
*Gerald Kutcher (Binghamton University)*

Science and the Unknowable  
*Medical Sciences, Seminar 2*

Chair: Amanda Rees

‘Reconciling science and religion: Herbert Spencer, the “Leader,” and the unknowable’  
*Federico Morganti (’Sapienza’ Università di Roma)*

‘Estranged bedfellows: borderland science, Eastern Orthodoxy and calendar reformation in twentieth-century Greece’  
*Kostas Tampakis (National Hellenic Research Foundation)*

‘A mind-reading girl, psychophysical energy, and altered states in fin-de-siècle Russia’  
*Katya Mishuris (University of Michigan, Ann Arbor)*

‘Finding meaning in digital data: physics in the news, 1885–1925’  
*Vivien Hamilton (Harvey Mudd College)*

Saturday 5 July  
Academic session 6  
11.30–13.00

Mathematics in the Nineteenth and Twentieth Centuries  
Boardroom

Chair: Isobel Falconer

‘C.-V. Mourey’s single science of algebra and geometry’  
*Elizabeth Lewis (University of St Andrews)*

‘Ferdinand Rudio – a historian of mathematics’  
*Stefanie U. Eminger (University of St Andrews)*

‘Developing astrodynamics at the JPL from ellipses to numerical integration’  
*Allan D. G. Olley (Independent scholar)*

New Horizons and Roads Well Travelled: An Open Discussion of the History of Science, Technology and Medicine in World War One  
*Medical Sciences, Seminar 1*

Organiser: Michael Weatherburn

Roundtable participants:
*Graeme Gooday (University of Leeds)*  
*Sabine Clarke (University of York)*  
*Michael Weatherburn (Imperial College)*

Science Policy in Britain  
*Medical Sciences, Seminar 2*

Chair: Simone Turchetti

*Catherine Herfeld (LMU Munich)*
‘The project has been cancelled by the Cabinet, but we are still receiving invoices’: the changing power of the Treasury in scientific decision-making? 1964–71’
Stuart A. Butler (University of Manchester)

‘1972 and All That: the Rothschild Report – a memorable event in the history of government’s relations with the science community and its aftermath’
Miles Parker (University of Cambridge)

**Science on Screen**
*Lecture Room 4*

Chair: Felicity Mellor

‘Van Leeuwenhoek – The Movie: cinema as agent of national identity and scientific heritage’
*Mieeneke te Hennepe (Museum Boerhaave, Leiden)*

‘Fear of Freud: psychiatry, psychoanalysis and movie censorship in the US and UK, 1930-1968’
*David A. Kirby (University of Manchester)*

‘Lights, camera, miracle: the aesthetics of wonder and religious science in Irwin Moon’s film series *Sermons from Science*’
*William R. Macauley (University of Manchester)*

**Editorial and Commercial Practices at Philosophical Transactions, 1750-1914**
*Medical Sciences, Seminar 1*

Organiser: Noah Moxham
Chair: Gowan Dawson

‘For the sole use and benefit of this Society’: the institutional takeover of the *Philosophical Transactions* and its aftermath, 1750-1827’
*Noah Moxham (University of St Andrews)*

‘*Philosophical Transactions* and the book trade in 1828 and 1908’
*Aileen Fyfe (University of St Andrews)*

‘Editing the *Philosophical Transactions* in an age of professionalization and specialization, 1854–1911’
*Julie McDougall-Waters (University of St Andrews)*

**Saturday 5 July**
*Academic session 7*
14.00–15.30

**Natural Philosophy in Medieval and Early Modern Cambridge: A Reappraisal of Manuscript Culture and Knowledge Production**
*Lecture Room 3*

Organiser: Anna Marie Roos
Chair: Bruce Moran

‘Francis Willughby (1635–72): the chymical culture at Trinity College, Cambridge’
*Anna Marie Roos (University of Lincoln/University of Oxford)*

‘Natural philosophy in seventeenth-century Cambridge: a tale of three notebooks’
*Richard Serjeantson (Trinity College, Cambridge)*

‘Alchemy at Cambridge – a collective perspective’
*Anke Timmermann (Darwin College, Cambridge)*

**The Science of Management**
*Medical Sciences, Seminar 2*

Chair: Jon Agar

‘Scientific management at work: Charles Bedaux, Liberal technocrats, and the triumph of scientific management in Britain, 1920-50’
*Michael Weatherburn (Imperial College)*
‘Facilitating the growth of ergonomics: the role of government-funded industrial human factors research, 1947–1957’
Roland Edwards (University of Manchester)

‘De-militarising management science and “Settling down in Civvy Street” after World War II’
Alice White (University of Kent)

Colonial Medicine and Public Health
Boardroom

Chair: James Poskett

‘Investigating snakes in Company India: experiments, anecdotes, and antidotes’
James R. Hall (University of Cambridge)

‘“The door to the Frontiersman's heart”: medical intervention on British India's hostile Afghan border’
Zujaja Tauqeer (University of Oxford)

‘Colonial medical knowledge and its limits in Mozambique at the turn of the twentieth century’
Rosa Williams (University of the Free State)

50 Years of Horizon (1)
Lecture Room 4

Organiser: Tim Boon
Chair: David A. Kirby

‘An oral history of Horizon’
Jean-Baptiste Gouyon (Science Museum Research Associate)

‘Absence and alienation in Horizon physics’
Felicity Mellor (Imperial College)

‘The go-betweens: the changing role of anchor men, reporters and presenters in science TV documentary’
Tim Boon (Science Museum)

Saturday 5 July
Academic session 8
16.00–18.00

Newton and Newtonianism
Medical Sciences, Seminar 1

Chair: Anna Marie Roos

‘Corpus Newtonicum: reconstructing Isaac Newton’s working methods’
Cornelis J. Schilt (University of Sussex)

‘A priority case – who was the first to teach Newton?’
Peeter Müürsepp (Tallinn University of Technology)

‘The reception of Newtonianism in eighteenth-century Rome’
Daniele Macuglia (University of Chicago)

‘Constructing Newton – biography and the historiography of science’
Tom Bunce (Durham University)

Sites of Science in the Eighteenth and Nineteenth Centuries
Lecture Room 3

Chair: Hasok Chang

‘Public science at the Society for the Encouragement of Arts, Manufactures and Commerce’
Matthew Paskins (University College London)

“Raptures, transports, and surprising flights of fancy”: British cultures of ballooning and the Scottish Enlightenment’
Caitlin Doherty (University of Cambridge)

‘The East India Company and scientific practice in Imperial London, c. 1815–51’
Jessica Ratcliff (Yale-NUS College)
“Glasgow is our laboratory”: metropolis, province and philosophical engineering, c. 1840s–1900
Ben Marsden (University of Aberdeen)

Communicating (with) Hearing Loss, 1840–1950
Medical Sciences, Seminar 2
Organiser: Graeme Gooday
Commentator: Richard Noakes

‘Amplification with ambivalence: the varied fortunes of early electric hearing aids’
Graeme Gooday (University of Leeds)

‘Amplifying historical voices’
Coreen McGuire (University of Leeds)

“Medresco”: the pre-NHS origins of state-sponsored auditory assistance’
Sean McNally (University of Leeds)

Laboratory Medicine and Life Sciences
Boardroom

Chair: Miguel Garcia-Sancho

‘Henry H. Cheek: a transformist at Edinburgh University Medical School, 1826–32’
Bill Jenkins (University of Edinburgh)

‘The reception of the cell theory in nineteenth-century French biology: a comparison between Paris and Strasbourg’
Laurent Loison and Marion Thomas (SAGE, University of Strasbourg)

‘Economies of limitation: Jacques Loeb’s mechanistic conception of energy’
Rebecca K. Wright (Birkbeck, University of London)

‘From pathological collections to biobanks: medicine as a collection science’
Karin Tybjerg (Medical Museion, University of Copenhagen)

50 years of Horizon (2)
Lecture Room 4

Organiser/chair: Tim Boon

Documentary screening of Horizon to complement the earlier panel session.

Sunday 6 July
Academic session 9
09.00–11.00

Early Modern Natural Philosophy
Lecture Room 3

Chair: David Beck

‘The mind in motion: Margaret Cavendish, organic materialism, and the mobility of thought’
Anne M. Thell (National University of Singapore)

‘The concept of “action at a distance” and proper philosophical language in late seventeenth-century England’
Irene Goudarouli (University of Athens)

“Systems or Nothing”: Physiologia and the History of Science, 1500-1700
Liza Blake (University of Toronto)

‘Elements of interdisciplinarity in early modern historical writing: the use of “auxiliary sciences” in early modern antiquarian historiography’
Lydia Janssen (FWO-Vlaanderen/KU Leuven)
Visual Culture of Nineteenth-Century Science
Lecture Room 4

Chair: Ben Marsden

‘Kaleidoscopic vision: David Brewster and the art of seeing things’
Iwan Rhys Morus (Aberystwyth University)

‘J. D. Forbes, curve plotting and visual culture’
Isobel Falconer (University of St Andrews)

“Sunspot mania”: Kew Observatory and the North British group in Victorian science’
Lee T. Macdonald (University of Leeds)

‘Tupman’s travels: a transit expedition in caricature’
Rebekah Higgitt (University of Kent)

The International Geophysical Year: Historical Legacies and New Historiographical Approaches
Medical Sciences, Seminar 1

Organiser: Elena Aronova (MPIGW)
Chair/commentator: Jon Agar

‘Do projects become institutions? The International Geophysical Year and the origins of America's biggest kind of science’
Roger D. Launius (National Air and Space Museum, Smithsonian Institution)

‘A very national Geophysical Year? The IGY in Italy’
Simone Turchetti (University of Manchester)

‘What we can learn from the correlation of IGY stations with overseas U.S. military bases: visualizing the military connections of the IGY’
Gregor Halfmann (Max Planck Institute for the History of Science)

‘Race’, ‘Ethnicity’ and Research on Human Genetic Variation, 1930s-Present
Boardroom

Organiser: Ageliki Lefkaditou
Chair/commentator: Gregory Radick

‘Scandinavia and the international scientific controversies on race 1930-1960’
Jon Rayne Kyllingstad (Norwegian Museum of Science and Technology)

‘Continuity and discontinuity: Greek physical anthropology, 1920s-1950s’
Ageliki Lefkaditou (University of Leeds/University of Oslo)

‘Historical dimensions of researchers' responsibilities’
Hallvard Fossheim (National Committee for Evaluation of Research on Human Remains, Norway)

Science at School
Medical Sciences, Seminar 2

Chair: Matthew D. Eddy

‘Scientific education in eighteenth-century schools’
Jo Elcoat (University of Leeds)

‘Object lessons go to school’
Melanie Keene (Homerton College, Cambridge)

‘The diseases of scholars: trans-Atlantic medicine and American schools, 1760-1850’
Rebecca R. Noel (Plymouth State University)
*Hannah Kershaw (University of Manchester)*

**Sunday 6 July**
**Academic session 10**
**11.30–13.00**

**Roundtable: Should the History of Science Have Relevance?**
*Lecture Room 3*

Organiser: Fern Elsdon-Baker
Chair: Sally Horrocks

Roundtable participants:

*Hasok Chang (University of Cambridge)*
*Sabine Clarke (University of York)*
*Fern Elsdon-Baker (Coventry University)*

**Citizen Science: Constructing Nineteenth Century Scientific Communities**
*Lecture Room 4*

Organisers: Gowan Dawson and Geoff Belknap
Chair: Jonathan Topham

‘Citizen Science on the rocks: palaeontology and psychometry in the reconstruction of prehistoric monsters’
*Gowan Dawson (University of Leicester)*

‘Citizen Science, Citizen Medicine’
*Sally Frampton (University of Oxford)*

‘Illustrating Citizen Science – the use of images in nineteenth-century periodical culture’
*Geoffrey Belknap (University of Leicester)*

**Sex and Medicine**
*Medical Sciences, Seminar 2*

Chair: tbc

‘Titillation and generation: pornography and medical knowledge from the late-seventeenth to the mid-eighteenth century’
*David Beck (University of Warwick)*

‘Understanding female pleasure: physicians and the anatomy of women in nineteenth-century France’
*Aude Fauvel (University of Lausanne)*

‘Re-use and re-design as principles of the development of laparoscopic surgery: innovation through novel instruments in gynaecology’
*Ramona A. Braun (University of Cambridge)*

**Science across Borders**
*Medical Sciences, Seminar 1*

Chair: Roger D. Launius

‘Why Europe won the Space Race: cooperative governance, the STEM-industrial complex, and the birth of the European Space Agency (1975)’
*Scott Schorr (University of St Andrews)*

‘The Arab world’s final frontier: Sultan Al-Saud and transnational space science’
*Jörg Matthias Determann (Virginia Commonwealth University in Qatar)*

‘Min Chueh Chang: a transnational reproductive biologist’
*Yang Haiyan (Peking University)*
Abstracts for Themed Sessions
(alphabetical by title)

Citizen Science: constructing nineteenth-century scientific communities

Organisers: Geoffrey Belknap and Gowan Dawson (University of Leicester)
Chair: Jonathan Topham (University of Leeds)
Presenters: Gowan Dawson, Sally Frampton, Geoffrey Belknap

How did lay audiences participate in scientific practice? The session brings together different sites of scientific production and communication in the nineteenth century in order to understand how audiences and actors came to participate in the construction of science. Mobilizing the concept of ‘Citizen Science’ this session will propose the initial research for a larger project which over the next four years will investigate the multiple categories and vectors though which citizens came to participate in scientific practice.

Communicating (with) hearing loss, 1840–1950

Organiser: Graeme Gooday (University of Leeds)
Chair: Richard Noakes (University of Exeter)
Presenters: Graeme Gooday, Coreen McGuire, Sean McNally

Historians of communication have devoted attention mostly to fully hearing people (e.g. Sound Studies) or to Deaf people (e.g. studies of sign language, or deaf education). With the exception of Mara Mills, less attention has been given to the partial hearing loss experienced by roughly one sixth of the population. Our session recovers the range of communicative strategies historically adopted by ‘hard of hearing’ adults who sought to engage with the hearing world. We focus partly on their responses to the telecommunications ‘revolution’ that brought both opportunities and challenges for (problematically) technologized hearing. Sayer examines Victorian practices of lip-reading, letter-writing and use of acoustic hearing horns, followed by Gooday’s exploration of troubled attempts to adapt amplification techniques from radio and telephony to hearing aids, concluding with McGuire’s survey of how the interwar General Post Office and its disaffected hard of hearing subscribers both innovated in amplified telephony.

Creating ‘useful knowledge’: British oceanic mapping 1700–1900

Organiser: Georgina Rannard (University of Edinburgh)
Chair: Sarah Easterby-Smith (University of St Andrews)
Presenters: Megan Barford, Georgina Rannard, Alistair Sponsel

This panel will discuss efforts to chart British territories in the eighteenth and nineteenth centuries. It aims to develop histories of science of non-European spaces, whilst recognizing that communication across geographical zones was a reality of European imperial history. Furthermore, it aims to broaden our understanding of ‘utility’, recognizing that it was multi-faceted. It was, at times, an aim in public science, a justification behind state or private projects to produce knowledge, as well as a function of knowledge that enhanced human control over nature in order to enable other activity. The papers consider different contexts that enabled the creation of charting information, and address the role of differing and sometimes conflicting forms of expertise in producing and collating knowledge. Indeed, the motor behind the accumulation of some hydrographic information and practice appears to have entirely non-human. Overall, the panel will extend our understanding of the intersection of imperial spaces with European knowledge production.

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Editing the history of science

Organisers: Floris H. Cohen and Jennifer Rampling
Roundtable participants: Floris H. Cohen (Isis), Jon Agar (BJHS/BJHS Themes), Jennifer Rampling (Ambix/ Sources of Alchemy and Chemistry), Iwan Morus (History of Science)

How are history of science journals and learned societies responding to the opportunities and challenges of a changing publishing landscape? For the first time since leaving Belgium due to the outbreak of the First World War, Isis has returned to Europe for five years. One idea behind the move is the wish of the History of Science Society to strengthen its international connections. The new editor, H. Floris Cohen, will discuss how the move may affect the cultivation of the history of science in Europe, and the UK in particular, drawing on his conversations with counterparts in other European cities. Jon Agar (who hands over to the new BJHS editor, Charlotte Sleigh, at the end of 2014) will explore the opportunities and issues opened by a new BSHS journal. BJHS Themes, which Jon will edit, will be an open access, annual, edited collection, chosen through competition and free for authors. Jenny Rampling will consider the process of expanding a specialist journal, illustrated by the recent move of Ambix from three to four issues per year. The expansion has been accompanied by the launch of an annual supplement, offering critical editions of source texts – Sources of Alchemy and Chemistry. And as History of Science moves from Wales to the Netherlands (under the editorship of Lissa Roberts) at the end of the year, outgoing editor Iwan Rhys Morus reflects on his experience at the helm during a period of unprecedented change in journal publishing, and how we still need to face up to the challenge of metrics.

Editorial and commercial practices at Philosophical Transactions, 1750-1914

Organiser: Noah Moxham (University of St Andrews)
Chair: Gowan Dawson (University of Leicester)
Presenters: Noah Moxham, Aileen Fyfe, Julie McDougall-Waters

While important scholarship in recent years has demonstrated the fragility and unstable identity of the early Philosophical Transactions, there has been relatively little focus on its subsequent history. How, when and why the journal settled into new forms, editorial models, and commercial practices, whether those changes were the product of shifting attitudes inside and outside the Royal Society or a driver of them, how it continued to be received, and how it adjusted to an increasingly diverse and competitive market and to new forms of communication, are all questions that have largely gone unanswered. This panel investigates key aspects of scientific journal publishing far beyond the foundation of Phil. Trans., including the editorial changes wrought by the Royal Society’s takeover of the journal in 1752, and how the new procedures were understood and exploited by contemporaries; how editing and reviewing worked in practice; and how the journal’s finances fared amidst changing commercial pressures.

Experiments in twentieth-century agricultural science

Organiser: Giuditta Parolini (Berliner Zentrum für Wissensgeschichte/Technische Universität Berlin)

Panel 1: Field experiments in agricultural science

Commentator: Jonathan Harwood (University of Manchester)
Presenters: Dominic Berry, Giuditta Parolini, Paul Smith

The history of experimentation in the twentieth century will remain incomplete until agricultural experiments are taken fully into account. Plant and animal experiments, often complementary and interrelated in agricultural science, and the study of the environment deserve attention for their contributions to twentieth-century research cultures and experimental practices, not to mention their relevant implications for the economy and public policy. Yet, experimentation in agricultural science has not been investigated systematically. Session 1 will focus on the first half of the twentieth century and address a paradigmatic category of agricultural experiments, the field trials with crops and horticultural products. It will examine the scientific status of these experiments, the role played
Statistics in their design and analysis, the convergence of scientific practices, economic interests and consumers' satisfaction in the experiments on the low temperature conservation of fruits and crops.

The concluding commentary will reflect upon the issues raised by the papers and readdress them towards animal experimentation introducing the themes of Session 2.

**Panel 2: Animal experiments in agricultural science**

Chair: Gregory Radick (University of Leeds)

Presenters: Miguel Garcia-Sancho, Andrew Gardiner, Angela Cassidy (with concluding roundtable)

During the second half of the twentieth century, animal experiments in agricultural science have been reshaped by the availability of new genetic technologies, the emergence of ethical issues and their increased importance for the development of public policies concerning animal and human health. The session will address such transformation investigating the effect of recombinant DNA technologies on animal breeding, the role of experiments in building animal welfare science, and the failure of animal experiments to provide clear-cut evidence for policy making on bovine TB. In the closing roundtable the panel participants will have the opportunity to fill in a gap in the current literature addressing the ‘big picture’ of experimentation in agricultural science. Building on the sessions’ contributions, which are complementary for topic (plant/animal) and time frame (first and second halves of the century), the participants will be able to examine both historical and historiographical issues of experimentation in twentieth-century agricultural research.

**50 years of Horizon: special session and screening to mark the 50th anniversary of Britain’s most influential science TV series**

Organiser: Tim Boon (Science Museum)

Chair: David A. Kirby (University of Manchester)

Presenters: Jean-Baptiste Gouyon, Felicity Mellor, Tim Boon

In Britain, no television science series has been more influential than *Horizon*, with more than 1100 editions, each one viewed by millions of people. If we are to understand the place of science in British postwar culture, we need to pay attention to such a substantial body of work, and to understand its content and form. *Horizon’s* 50th birthday falls this year, on 2 May. This vantage point provides a perfect opportunity to begin to look at its influence over this highly significant period in the history of science, technology and medicine.

A session of papers will be followed by a special screening of *Horizon*.

**The International Geophysical Year: historical legacies and new historiographical approaches**

Organiser: Elena Aronova (Max Planck Institute for the History of Science)

Chair/commentator: Jon Agar (University College London)

Presenters: Roger D. Launius, Simone Turchetti, Gregor Halfmann

The panel’s focus is the history of the International Geophysical Year (the IGY, 1957-8), one of the largest cooperative international undertakings in the natural sciences. The panel will probe the new approaches to assess the history of this important scientific endeavor, by focusing on the national contexts that have been outside of the scholars’ attention so far (Turchetti), by exploring the institutional legacies of the IGY and its political ramifications (Launius), by probing the visualization as a tool to generate new questions (Halfmann), and by exploring the legacy of the IGY in the non-geophysical sciences (Aronova). The purpose of this panel is to provide a much-needed comparative dimension to our understanding of the historical legacies of the IGY, and generate new reflection on how to assess this legacy.
The mathematical and the Baconian sciences revisited: traditions of French physical science during the eighteenth and nineteenth centuries

Organiser: Daniel Jon Mitchell (University of Cambridge)
Chair: John R.R. Christie (University of Oxford)
Presenters: Michael Bycroft, Stephen T. Irish, Daniel Jon Mitchell

The transition from the Ancien Régime to the Napoleonic era is rightly regarded as a crucial period of transformation in the physical sciences. New institutions and political structures in France mixed with an Enlightenment "quantifying spirit" to bring a variety of new sciences into being, which necessitated a radical reconfiguration of the boundaries of natural knowledge. This panel seeks to supplement and re-evaluate this picture by examining continuities in traditions of experimental physics, chemistry, crystallography, and mineralogy from the eighteenth to the nineteenth centuries. Contributors engage, variously, with cross-disciplinary debates between Claude Louis Berthollet and René-Just Haüy over chemical combination; a long tradition of "mineralogists-physiciens" at the Jardin du Roi and the post-Revolutionary Muséum d'Histoire Naturelle; and the persistence of qualitative practices of experimental physics well into the nineteenth century. These biographical, institutional, and disciplinary approaches, we propose, reveal continuities on different levels whilst allowing for radical change at others.

Natural philosophy in medieval and early modern Cambridge: a reappraisal of manuscript culture and knowledge production

Organiser: Anna Marie Roos (University of Lincoln)
Chair: Bruce Moran (University of Nevada)
Presenters: Anna Marie Roos, Richard Serjeantson, Anke Timmermann

With a focus upon previously unexamined manuscripts, this panel analyses the production, circulation, and pedagogical impact of natural philosophical knowledge at the University of Cambridge in the late medieval and early modern period. We will provide a fresh thesis about the dynamics of the impact of the 'new philosophy' in England and also elucidate the chymical culture at the University.

Nature repurpos'd: recycling ideas, images, objects and spaces in early modern Europe

Organiser: Jennifer Rampling (Princeton University)
Chair: Anke Timmermann (Darwin College, Cambridge)
Presenters: Jennifer Rampling, Tillmann Taape, Bruce Moran, Simon Werrett

This session asks how the objects of early modern natural knowledge – particularly those associated with alchemy and chemical medicine – were recycled and repurposed by successive users. The practicalities faced by many early modern people in obtaining books, materials, and working space challenge attempts to draw formal distinctions between learned and craft knowledge, and spatial, temporal and disciplinary boundaries. Panellists will explore the blurring of these boundaries by showing how techniques, apparatus and theoretical explanations were adapted to the needs and pursuits of various practitioners; how woodblocks supplied illustrations across a range of print genres; and how household spaces doubled as sites for natural philosophical pursuits.
New horizons and roads well travelled: an open discussion of the history of science, technology and medicine in World War One

Organiser: Michael Weatherburn (Imperial College, London)
Chair: Graeme Gooday (University of Leeds)
Roundtable participants: Graeme Gooday, Sabine Clarke, Michael Weatherburn

As we enter the centenary of the Great War, many historians from numerous disciplines have been seeking new avenues of historical research, and revisiting old debates with new questions in mind. The aim of this open discussion is to discuss themes from the recent historiography of science, technology, and medicine in World War One. Is it too focused on any particular aspect of the war? What remains unexplored and why? What long-standing consensuses can we challenge and how? This discussion will draw on the collective knowledge of the audience and will cover as many topics as possible in the time available. Minimal time will be spent on presentations by panel members, and maximum audience participation will be encouraged. To facilitate a discussion as open, fluid, and brisk as possible, we will gather topics and questions in advance.

People, place and things: locating the history of technology

Organiser: Alison Hess (Science Museum)
Roundtable participants: Alison Hess, Simon Naylor, Klaus Staubermann

Place has long been at the heart of intellectual debate within disciplines such as geography, history, local studies, sociology and many more. How is place experienced, constructed, viewed? How does it interact with ideas of landscape? How does living in place affect your sense of self? This panel will explore the importance of place to the history of technology beyond its relevance to heritage. Considering places of production can open up new lines of enquiry and highlight previously unexplored links. Equally it could be argued that mass-produced technologies are so ubiquitous that where they were produced has lost its relevance. We seek to instate place as a legitimate field of enquiry in the history of technology. Key questions include:

- What is the relationship between technology objects and their place of production/ function?
- What are the legacies and myths surround large scale technological sites?
- How does the heritage industry present stories of industry and technology within a local setting?
- Is technology now associated with placelessness?
- Do ideas of place open up new networks around the design, manufacture and consumption of technology?
- What role does place play in historic collections of technology?

Putting nutrition science in its place: new sites and practices in late nineteenth-century physiology

Organisers: Elizabeth Neswald (Brock University, Ontario) and Agustí Nieto-Galan (Universitat Autònoma de Barcelona)
Chair: Elise Smith (University of Oxford)
Presenters: Elizabeth Neswald, Agustí Nieto-Galan, Lisa Haushofer

In the late nineteenth century, the study of nutrition moved from its early space of European physiology laboratories to the study of human nutrition and diet in increasingly diverse sites and situations. While these sites served as testing grounds for the new nutritional knowledge and its authority, they also modified and expanded its methods and strategies. The papers in this session reflect on how the practices of nutrition physiology were affected by this expansion on three case studies: moving from the laboratory to the field in American dietary surveys, from the university to the public arena through the study of performing fasting artists, and from the centre to the periphery in the Brazilian Experimental Physiology Laboratory. The session aims to contribute to the recent historiography of physiology which, beyond the laboratory-centred experimental turn, focuses on the heterogeneity of scientific practices and their circulation in new sites and local contexts.
'Race,' 'ethnicity' and research on human genetic variation, 1930s-present

Organiser: Ageliki Lefkaditou (University of Leeds/University of Oslo)
Chair/commentator: Greg Radick (University of Leeds)
Presenters: Ageliki Lefkaditou, Jon Røyne Kyllingstad, Hallvard Fossheim

The overall aim of the session is to investigate the interactions between societal and scientific processes in the establishment of concepts of “ethnicity” and “race” in physical anthropology and human population genetics, examine the relevant cultural and societal implications, and contribute to the normative discussions about these implications. The first two papers discuss physical anthropology and population genetics research around the mid-twentieth century in two different contexts, Scandinavia and Greece, focusing on the key role of the scientists involved in conceptualizing notions of “ethnicity”, “populations”, and “race”. The third paper explores how changing methods in DNA typing have shaped and in turn have been shaped by narratives about evolution, prehistory and migrations. And finally, paper four reflects on the ethical issues arising from such research, and especially on the responsibilities emerging from the complex relationships between researchers and designated groups.

Semantic history of ‘thinking about science’ in the twentieth century

Organiser: Robert Bud (Science Museum, London)
Chair: Eric Schatzberg
Presenters: Benoît Godin, Désirée Schauz, Sabine Clarke, Robert Bud

The idea that there is such a ‘thing’ as pure science, or indeed a single entity under the rubric of ‘science’ has long been questioned. This session is however dedicated to the social reality of these categories attested by their semantic reality. The benefits of a greater emphasis on names and their history are exciting for researchers and the approach provides a new way of illuminating the subjects of the history of science. The papers will share work currently underway in three countries: Canada, Germany and Britain on thinking about such science issues in the twentieth century. The session may also serve to link up others separately pursuing such work and to share opinions on the benefits of such approaches as ‘Conceptual History’. Bringing together papers by researchers active in this field it will be one of the first such sessions held in Britain.

Should the history of science have relevance?

Organiser: Fern Elsdon-Baker (Coventry University)
Chair: Sally Horrocks (University of Leicester)
Roundtable participants: Hasok Chang, Sabine Clarke, Fern Elsdon-Baker

This panel will discuss the question of whether historians of science should concern themselves with the wider relevance of their research, both within academia and outside it. In other words, how important is it for historians to consider work with scientists, policy makers, the media or other groups? Specifically the panel will consider such questions as: What are the groups that historians of science might engage with? What is the value of this sort of intervention or conversation? What models of engagement are appropriate? Is a concern with relevance a threat to the character and course of historical research? Or is it an opportunity? And what would a Public History of Science look like?
Abstracts for Individual Papers  
(alphabetical by presenter)

**Alison Adam**  
*Sheffield Hallam University*  
'Autobiography and the history of forensic science in the twentieth century'

The first half of the twentieth century was crucial for the consolidation of forensic science as a distinct discipline (or set of disciplines) in the UK, therefore it is surprising that its history has been relatively neglected. In 1900 the term forensic science was barely used in the UK. By 1950 England and Wales had a Metropolitan laboratory and a network of regional forensic science laboratories. Nevertheless, opportunities to understand the working lives and careers of scientists recruited to these laboratories are limited. They were 'middle ranking' civil servants and did not leave the manuscript archives that earlier and more illustrious scientists produced. However, alongside the autobiographies of their better known, high profile, forensic pathologist contemporaries, whose cases often figured prominently in contemporary media, a number of forensic scientists from the UK and from its colonies, did produce an autobiography. Arguably, there are more of these than autobiographies of comparable scientists in other scientific disciplines of this period. Such was, and indeed still is, the selling power of anything relating to crime and murder that 'forensic autobiographies' were worth writing and publishing. These biographies are variable in quality. They are overly focused on murders and sensational crimes and the inexorable role of science in the pursuit of justice. Nevertheless, they offer a rare insight into the work and professional lives of 'middle ranking' scientists of this period and how such scientists wished to portray their professional lives, an insight which is rarely available for other scientific professions.

**Jon Agar**  
*University College London*  
'Climatology, climate change and the UK government response'

This paper examines the first encounter, in the 1970s, by branches of the UK government with the possibility of anthropogenic climate change, specifically global warming. The event is interesting for several reasons. First, it is a case study of how governments look forward and address changes on a timescale that exceed those typical of politics. ('Address' here covers many activities from awareness, understanding of causes and consequences, identification of policy options, policy choices, and so on.) Second, it is a case study of the roles of expertise and evidence in government. Experts had to advise on the scientific plausibility of claims about climate change. Evidence was seen to be present, missing, inadequate and persuasive at different times to different people. The key science here was climatology, which was a specialty with uncertain, underfunded and occasionally even hostile patronage in the UK. Third, this is a study of how the highest levels of UK government first encountered what may well be seen as the defining issue of late industrial society. In it we will see the emergence of both proponents and sceptics. At least two surprising sceptics are revealed.

**Eli Anders**  
*Johns Hopkins University*  
'Classifying the patient: individuality and therapeutic bloodletting in late nineteenth-century medicine'

Many physicians today hold out the hope that 'personalized medicine' represents a path forward for targeting effective therapies and eliminating ineffective ones. Few, however, agree on precisely what factors comprise the 'personal' in personalized medicine: Diet and habits? Genetic individuality? Environmental factors? Still fewer recognize the long history of such questions, and of the attention to individuality as a key element of clinical expertise and judgment. While today bloodletting is remembered as the epitome of discredited medical practices—precisely the thing that forward-looking therapeutic methodologies seek to avoid—this paper argues that debates about venesection in the late nineteenth century were a significant site of epistemological contestation regarding the importance of individuality and therapeutic specificity. Physicians argued over which characteristics (age, place, habits, and temperaments) indicated bloodletting, and whether social changes such as urbanization had rendered patients too feeble to be bled. The rise of laboratory sciences such as bacteriology heightened, rather than
detracted from, this attention to the qualities of individual patients as a means of establishing therapeutic expertise and guiding medical practice. Using the example of bleeding in pneumonia, I show that discovery of the disease's bacterial etiology in the 1880s did not resolve the dispute over whether bloodletting was effective; it merely shifted the discussion to how therapy could best be tailored to address the interaction between bacteria and an individual patient. This paper puts today’s interest in personalized medicine into historical perspective by tracing how notions of individuality inflected late nineteenth-century therapeutic debates.

**Alexi Baker**  
*University of Cambridge*  
‘Jane Squire: class, gender, and religion in the search for the longitude’

Jane Squire was the only woman who openly participated in the British ‘search for the longitude’ and sought one of the large rewards which Parliament established in 1714. Modern scholars have largely dismissed her, as they too often have other ‘longitudinarians’ or ‘projectors’, as being poorly educated and mentally disturbed. However, her complex proposal is the work on longitude which is most often found in libraries and collections across the nation, and her religious motivation for producing it was not unusual for the early modern period. Squire’s fascinating life took her from affluence in Yorkshire to involvement in high-stakes but potentially lucrative projects in London, including diving for maritime wrecks. These investments and public and legal opposition to her Catholicism resulted in her being sent to debtor’s prison for some harrowing years, before she emerged and reinvented herself as a dedicated longitudinal. Her experiences reveal much about the interplay of class, gender, and religion in early modern pursuits centred upon mathematics and technology. The projector’s ardent Catholicism and her gender contributed to the most painful experiences of her life and to some of her difficulties with gaining a hearing for her scheme. Yet her religion, gender, and socio-economic class also helped her to make connections with specific intellectuals, longitude actors, and potential patrons including the Pope. Squire’s efforts to contact the Commissioners of Longitude further represent a vital source on the decades during which those officials slowly transitioned from being independent actors to a regularly-sitting science funding Board.

**Megan Barford**  
*University of Cambridge*  
‘Public charts and public service: hydrographic argument in the nineteenth century’

The Hydrographic Office of the Admiralty was, in the 1830s and 40s, one of the major surveying institutions of the British Empire. It was responsible for producing the sea charts which were provided to the Royal Navy and sold by agents in port towns across the country. At the end of a period of extended financial crisis, however, and during a period of governmental reform and expansion, asserting the importance of hydrography meant invoking different variations of the word public. In discussions between surveyors at sea and the Office in London it became a keyword in discussions over finesse in engraving; in a monthly periodical coming out of the Office it became a way of allying hydrography with projects of useful knowledge; in letters sent to London there was ambivalence around how far public letters might also be publishable letters. At a time when in studies of popular science much work is being done to acknowledge the complexity of publics, this examination of Hydrographic Office shows how multivalent were the ideas of public around a state surveying project.

**David Beck**  
*University of Warwick*  
‘Titillation and generation: pornography and medical knowledge from the late-seventeenth to the mid-eighteenth century’

This paper explores the relationship between medical knowledge and erotica/pornography in England from the late-seventeenth to the mid-eighteenth centuries, discussing issues of female desire, theories of conception and above all the role of the orgasm. In the seventeenth century prevailing medical opinion, drawing on a line of authority running back to Galen, was that the release of both the male and female seeds was required for procreation. As a result of this medical necessity for female orgasm, this paper
argues, pornography focused on female as well as (or, even more than), male pleasure. By the mid-eighteenth century, though, a number of transitions in sexual and anatomical theory which together conspired to render female orgasm a pleasurable, but ultimately inconsequential, part of sexual activity- in one of the early signposts of what Thomas Laqueur would term the ‘two sex’ model focusing on the biological differences between the sexes. As Karen Harvey has demonstrated, the eighteenth century also saw the stress on female orgasm in erotic literature give way to the championing of the male- the erotic began to describe “hierarchies of potency and pleasure, and in both male bodies enjoyed the privileged position.” This paper hopes to tease out some of the relationships between the medical and the erotic, through a series of close textual analyses- and argues that the erotic, like other literary forms, can shed light on the wider impact and dissemination of transitions in medical knowledge.

Geoffrey Belknap
University of Leicester
‘Illustrating Citizen Science – the use of images in nineteenth-century periodical culture’

How did illustrations affect both the content and how that content was read in nineteenth century periodicals? More specifically, how were illustrations utilized within the particular genre of the natural history periodical, considering this was a genre that was enmeshed in questions of the collection, organization, description and dissemination of information about nature. This paper will describe an initial examination of the scope of illustrations and illustrative techniques used by natural history periodicals between 1840 and 1890. A key element in this investigation concerns the relationship between the production and reproduction of illustrations by the individual authors and the editors of journals, and their relative reception within the natural history community. Within this study, illustrations will be understood not only as visualizations of scientific proof, but also as a conduit for participation in natural history investigation by various audiences. While the broader goal of the project is to understand the value of images as objects of public communication when placed in the periodical press, this paper will present an initial foray into understanding the value and meaning placed on illustrations within natural history periodicals as tools for illustrating scientific proof and as a method for audiences to participate in science and scientific debate.

Dominic Berry
University of Leeds
‘Environmental interference and the hereditary touchstone: the design and management of agricultural experiments in Cambridge, 1920–1950’

This paper will attempt to identify what, if anything, has been and remains distinctive about agricultural experimentation. There are a wide variety of experiments that attempt to answer agriculturally motivated questions, much that is simply chemical, physical and biological. However this paper will focus on what might be considered the quintessential agricultural experiment: the field trial. On the one hand, field experiments are traditionally thought of as unruly, unscientific affairs. This is how they are portrayed in James Scott’s Seeing Like a State (1998), a book that has been highly influential in a number of different disciplines. On the other, agricultural scientists have themselves often defended these very same experiments, as Helen Tilley (2011) has pointed out, as if anything “more real and true than laboratory analyses.” This paper will examine these opposing views by focussing on the work conducted by Cambridge based agricultural botanists in the early twentieth century. In particular, it will address their hunt within fields for the “genetic touchstone,” a point of correlation between two phenotypic traits that might open paths to better breeding.

Geoff Bil
University of British Columbia
‘From ethnoscience to ethnology: indigenous plant knowledge in Imperial context’

By the late nineteenth century, science had become ensconced as an arbiter of cultural authority in the extra-European colonial world. In reciprocal measure, Europeans consigned indigenous knowledge to the realm of ‘primitive superstition’ destined for cultural extinction. My paper examines this phenomenon with reference to botany in metropolitan Britain and New Zealand over the course of the long nineteenth
century. Botanists throughout this period used Māori knowledge of the less Europeanized parts of the colony to collect and classify flora. From the mid-1860s, however, observers like the botanist Berthold Seemann began to downplay the botanical value of Māori plant knowledge in favor of its utility for ethnology — both in mapping Pacific migratory pathways of descent from an ostensible point of geographical and cultural origin, and in qualitative assessment of indigenous conceptions of nature in relation to their ‘civilized’ European counterparts. I treat this relationship between marking plants and measuring peoples as a metrological one – in its simultaneous promotion of both a metropolitan- centered imperial collecting and classifying enterprise, and an anthropological frame of reference according to which metropolitan botany held sway over indigenous, putatively ‘subjective,’ ways of knowing. My analysis also attends, however, to the fundamental weakness in this metrological framework: the Māori knowledge and peoples entailed in New Zealand botany but obscured by such ethnological abstractions, and the variously ambivalent, dissonant and performative nature of these concealments.

Andrew Black
University of Manchester
‘Who defines medical research policy? Patients, politics and the case of Chronic Fatigue Syndrome/Myalgic Encephalomyelitis’

In recent years historians and sociologists have examined the role of patients and activists in the politics of healthcare. The patient movement has its origins in the 1960s and 1970s, a period that saw Western culture increasingly critical of scientists, practitioners and experts more generally. Both in Britain and the United States ‘patient choice’ and ‘consumer demand’ have come to inform the policies of successive governments. Examining the response of the British Medical Research Council (MRC) to patients with Chronic Fatigue Syndrome (CFS) (also known as Myalgic Encephalomyelitis (ME)) this paper explores the impact of these changing cultures on medical research policy. As will be shown, the qualities that enabled the CFS/ME movement to achieve institutional change (access to the political and scientific sphere, a supportive media, and a wide socioeconomic demographic) suggest that while the patient movement has empowered some, it has presented barriers to others. Offering a uniquely British perspective, this paper seeks to move the activist narrative beyond the United States. In doing so it contrasts George Pickering’s vision of the MRC fifty years ago “as a source of independent opinion in which both Government and the public can have confidence” with one today which is increasingly under pressure from a more critical and powerful public.

Liza Blake
University of Toronto
“‘Systems or Nothing’: Physiologia and the History of Science, 1500-1700’

This paper will make a philological and historical argument and a polemical argument. The philological argument will trace the rise and fall of the early modern concept of physiologia. Physiologia, or physics, was a philosophy of substance and of the basic makeup of the material world, as well as a larger system of related concepts. I will argue that before, and even long after, the rise of early modern science, physics (plural) proliferated in the sixteenth and early seventeenth century; to think natural philosophy was to invent, reinvent, combine, and reinterpret physics. Daniel Garber has noted that the early modern impulse to ground one’s ideas in a physical system petered off around the 1660s and 1670s. I will argue that there are two reasons for this decline: first, changing understandings in the history of medicine, which decoupled the study of medicine from the study of the natural world as a whole; and second, arguments by Francis Bacon and his followers, especially Robert Boyle, that defined the possibility of the rise of science primarily by imagining the end of physics-making. In the end, I will argue polemically that returning to sixteenth-century understandings of physiologia immediately preceding the scientific revolution will help us see that the early modern period, both before and after the rise of science, was for the most part a period of physics-makers rather than a period of scientists. This argument helps us redefine the role historical literatures can and must plan in the history of science.
Since the first post-war broadcasts, on screen proxies for the viewer have had particular significance within the grammar of science TV. The series Eye on Research (1957-1961) established a successful mode in which the reporter (first Robert Reid, then Raymond Baxter) had a very prominent role. In the establishment and early years of Horizon (1964-), there was a premium on the selection of ‘anchor men’. Later, for many decades, the emphasis fell on the narrator as authoritative mediator in the more ‘heavyweight’ strands. More recently, we have seen an efflorescence of different kinds of human mediation, including ‘personality’ scientists including Brian Cox and (broadly) scientifically-trained serial presenters (such as Michael Mosley) as well as the occasional behind the camera auteur (Adam Curtis). This paper will argue that science documentaries, because of the peculiar cultural status of science, provide a particularly fruitful context for the examination of this significant, and contested, aspect of television documentary grammar.

Ramona A. Braun
University of Cambridge
‘Re-use and re-design as principles of the development of laparoscopic surgery: innovation through novel instruments in gynaecology’

Developing early laparoscopic surgery in the 1940s-70s involved re-purposing known instruments and procedures. This paper investigates the kinds of technology transfer that took place in the clinics of pioneering doctors in Paris and in the North of England. Innovation in laparoscopic surgery was only possible in ‘safe spaces’ shielded from the public eye and from hospital and legal authorities, and also not suffering from lack of money: infertility diagnosis and treatment in particular flourished mostly with doctors whose income was significantly enhanced through private practice carried out alongside their hospital duties. With patients effectively sponsoring new procedures, these physicians felt confident to experiment with material innovations, new techniques and tools. This paper describes how innovations in surgery took place in a specific temporal-spatial setting that would be impossible today, namely instances of re-design and re-use of medical devices and instruments. Re-design here means re-working and transforming the material substance of an instrument: changing its shape or size, adding or removing components – or using only one element of an assembly. Re-use is characterized by the re-purposing of an item through a change in the script of use: either the habit or custom of use or the point of application, for example the organ it is applied to. Both forms differ through investment or lack of engineering or manufacturing work applied to the tool. These two are crucial for the development of laparoscopic surgery in gynaecology in the 1940s-70s.

Robert Bud
Science Museum, London
‘Making sense of modernity: the categories of pure and applied science in the public sphere of early twentieth-century Britain’

This paper explores the history of twentieth century ideas about the architecture of science as part of the discourse of the public sphere. Such discourse characteristically took place through cartoons, polemical editorials in mass market newspapers, radio broadcasts and letters to the newspaper rather than amongst intellectuals. The first report of DSIR emphasised that it used the term ‘applied science’ because this was expected by businessmen. I will argue that an older language was deployed in a new context, framed by the conflicting unease and excitement felt about the importance of science in the aftermath of the First World War. The terms ‘pure’ and ‘applied’ were used to negotiate the cultural concerns of the public rather than the ambitions of administrators. Even the key expressions of Julian Huxley expressed in Scientific Research and Social Needs, later seen to be seminal about science policy were first voiced on the wireless in a BBC series intended to shape public attitudes. The discourse of the 1930s was shaped both by concerns about the German threat and the concentration on rearmament, and by socialism articulated by the Russians at the 1931 Science Museum conference. The paper concludes with reflections on how, in the early cold-war era, the language and meanings accumulated in the 1930s were in turn adopted by managers of science with new concerns.
In this paper I will examine three biographies of Isaac Newton and discuss how particular methods and biases used in reconstructing his life can both distort significantly not only the picture of the man that is presented, but also later scholarship. Due to Newton's iconic status in the history of science, writers wishing to promote a particular view of the history, nature, aims, or significance of science can utilise Newton’s authority by adopting – or, in some cases, developing – particular forms of biography. Biographers can construct a picture of Newton in which it is implied that the great man himself would have agreed with whatever positions they hold, thus apparently lending themselves a powerful ally. This approach characterises the first two biographies I will examine: David Brewster's *Memoirs of the Life, Writings, and Discoveries of Sir Isaac Newton (Edinburgh, 1855)* and Louis Trenchard More's *Isaac Newton: A Biography* (New York, 1934). The third biography, Frank E. Manuel's *A Portrait of Isaac Newton* (Cambridge, Mass, 1968) is a different beast. It is not a portrait that casts Newton in a particular light in order to support the biographer’s particular agenda, but it is deeply entwined with its historiographical methodology – Eriksonian psychobiography – in a way which shapes the whole work.

It is often reasonably assumed that a major factor in the cancellation or retardation of scientific and technological projects is Treasury intransigence. Whilst the Treasury is certainly dominant in much decision making this paper will show that departments successfully cast themselves as ‘experts’ in order to reverse or negate the effects of policy changes. Examining the case of the small satellite launching vehicle, Black Arrow, this paper highlights the power struggles which accompanied decisions to cancel or limit scientific projects. The Treasury quickly acted to stop the project, but were initially unsuccessful as a number of departments supported the project for “unfathomable, intangible, scientific benefits.” The Sterling Crises of 1966-72 changed the decision-making environment dramatically. The Treasury were tasked with improving ‘immediate’ accounting and forward planning, and took Black Arrow as its first technological cost-benefit analysis. With pressures on budgets across the board departments were less keen to support the project, and the Cabinet decided to cancel the project in 1966, and again in 1967 and 1968, as unexpected support from a variety of non-expert departments kept the project alive. It took four further cost-benefit analyses (heavily weighted), a Select Committee hearing, and a change of government for the Treasury to finally cancel what it regarded as an ‘indestructible’ project. Whilst it may be incorrect to assume that the Treasury was the arbiter of government funds in the 1950s and 60s, by 1968, the increasing importance of forward planning in a hostile financial environment ensured that this was the case.

The Wellcome Trust’s Research Resources scheme has funded two consecutive projects, based at Edinburgh University Library Special Collections, to preserve, catalogue and make available archival and printed material relating to the development of animal genetics in Edinburgh. The collections span nineteenth century zoological, veterinary and agricultural studies to the establishment of the Institute of Animal Genetics, the Animal Breeding Research Organisation, the Poultry Research Centre and, latterly, the Roslin Institute. Consisting of institutional records and the personal archives of individual scientists, the collections are a portal into the complex, dynamic and ever-evolving nature of animal genetics research. This paper will explore the various ways in which these collections intersect with one another to illuminate multiple scientific histories, focusing on the surprising and the unusual. Scientific data within the collections provides an insight into various working and experimental practices over time, as well as presenting unique issues for curation and use. Likewise, the substantial correspondence and personal libraries reveal much about the intellectual contexts within which scientists have operated over
time. The collections are also rich in detail about the social, artistic and even musical aspects of the animal genetics community in Edinburgh, representing a territory of scientific history yet to be fully chartered. Finally, an examination will be made of the importance of collaboration between curators and researchers for context and understanding as these collections are made fully available for the first time.

Michael Bycroft  
*Max Planck Institute for the History of Science*

"‘Les Minéralogistes-Physiciens’: physics at the Jardin du Roi from Charles Dufay to Antoine-César Becquerel"

Existing histories of French physics in the eighteenth century are dominated by the Académie Royale des Sciences and by the changing relationship between experiment and mathematics. This talk draws attention to a different institution – the Jardin du Roi – and to a different relationship – between experimental physics and mineralogy. From the 1720s to the 1780s the Jardin was the centre of a programme of experimental research on the optical, thermal and electrical properties of minerals that involved some of the leading scientists of the day. The members of this tradition included individuals who are usually thought of as physicists or astronomers (such as Charles Dufay and Alexis-Marie de Rochon), others who are usually thought of as naturalists (such as Louis-Jean-Marie Daubenton and Georges Buffon), and two who are rarely thought of at all (Etienne-Dutour de Salvert and Mathurin-Jacques Brisson). This tradition of ‘minéralogistes-physiciens’ did not disappear in 1793, when the Jardin du Roi became the Muséum National d’Histoire Naturelle. Instead it flourished in the research of René-Just Haüy and, later, in a professorial dynasty begun by Antoine-César Becquerel. A focus on mineral physics at the Jardin and the Muséum reveals unexpected continuities between pre- and post-Revolutionary science in France.

Miquel Carandell Baruzzi  
*Universitat Autònoma de Barcelona*

‘Controversial archaeology as entrepreneurship: Pedra Furada and the Brazilian First American (1979-2009)’

In 1986 the Brazilian-French archaeologist Niède Guidon published an article in *Nature* about her findings in the Pedra Furada rock shelter in the Serra da Capivara National Park in the northeast of Brazil, an isolated and poor region of the country. Guidon pushed back the arrival of the earliest inhabitants of South America to 32,000 years ago, twice as much as the oldest accepted presence of modern humans in the Americas. Although not unique, this controversial claim was widely reported in magazines and newspapers. Despite fierce criticisms of this claim, Pedra Furada became the site of the ‘First Americans’ in Brazil and also in some countries such as France, where Guidon had studied and was employed. At the same time, Guidon and her team tried to bring tourism and education to Capivara in an attempt to fight its isolation, improve the locals’ living standards and preserve its natural wonders. They built a Museum “do Homem Americano,” constructed a little airport, a university department and so on... A recent book published in French portrayed Guidon as “mother of the poor.” In this paper I want to show how Guidon’s archaeological research, her popularization effort and her entrepreneurship were bound together by a single narrative that sought funding and public attention as well as acceptance of this controversial claim. Guidon’s roles as conservationist, philanthropist, entrepreneur and even politician, could not be detached from her role as a highly controversial archaeologist.

Angela Cassidy  
*King’s College London*

“Young Science” in the field: experiments, expertise and policy on badgers and bovine TB

While scientific and veterinary knowledge have often played important roles in shaping animal health policy, the case of bovine TB control in the UK is one in which knowledge of and experimentation in the field has been of particular importance. Since badgers were first discovered to carry bTB in the early 1970s, the question of whether to cull them to control infections in cattle has been the subject of a protracted public controversy. Following the recommendation of Prof. John Krebs that a “scientifically based experimental trial” be carried out to test the effectiveness of badger culling, the Randomised Badger Culling Trial (RBCT) was commissioned in 1998 by the incoming Labour government. Probably
the largest field experiment ever conducted in the UK, the RBCT sought to recreate the conditions of a
randomised controlled trial across approximately 100km$^2$ of the South West of England. Despite
widespread expectations that the RBCT would provide the necessary evidence to resolve the controversy,
its findings have instead been widely contested and reinterpreted, while arguments over badger culling
have become increasingly polarised. This paper will explore the particular difficulties of establishing field
experimental knowledge about this complex and politically contested issue. The science of badger/bTB
cuts across a broad range of disciplines and the RBCT recognised this by employing an explicitly
multidisciplinary research design. This design, alongside conflict between disciplinary agendas, the
unexpected contributions of people and organisms to the experiment, and the continuing rhetorical
appeal of ‘sound science’ have all contributed to the problem of establishing reliable knowledge in this
case.

Sabine Clarke
University of York
‘Modernity, mobility and modernization: ‘fundamental research’ in a new vision of colonial development,
1940-1960’

Recent work has considered the meanings of terms such as ‘fundamental research’, ‘pure science’ and
‘applied science’ as historically situated terms. Whilst science policy may aim to determine and fix the
meanings of terms such as ‘fundamental research’ an analysis of discourse about science in other
locations often reveals the fluid and unstable meanings of terms such as ‘fundamental research’. This
study of Colonial Office documents considers some of the meanings afforded to the term ‘fundamental
research’ in the context of claims for the necessity for new laboratories in the colonies after 1940.
‘Fundamental research’ is at one level, an underdetermined term in this material; there is little attempt in
these documents to correlate ‘fundamental research’ with a particular category of scientific activity.
Instead the power and utility of the term resides in its rhetorical uses. It functions in this discourse at a
number of levels, two of which are considered here: the idea that a focus on ‘fundamental research’ may
help address the political need of restoring the credibility of imperial government action; and the place of
‘fundamental research’ in the Colonial Office vision of modernity. An expansion in ‘fundamental research’
in the British Colonial Empire was said to place development on a firm footing and also allow the colonies
to participate in the international project of scientific advance. The case of Trinidad in particular will be
examined as an interesting case study.

Arik Clausner
University of St. Andrews
‘“The Minor Horrors of War”: insects, the British Empire, and the First World War’

In the early 1910s, political, imperial, and scientific interests sought to expand the African Entomological
Research Committee, with its limited geographic purview, into a new organisation for collaborative
‘imperial’ entomological research in the British Empire. This resulted in the 1913 establishment of the
Imperial Bureau of Entomology (IBE), charged with: surveying significant insect threats in the colonies;
providing identification services; and disseminating abstracts of relevant publications from across the
globe. However, the outbreak of the First World War in the following year presented a number of
significant challenges for the new organisation. Directly affecting the work of the IBE were the difficulties
of continued wartime operations, which included the threat of budget cuts, key staff lost to mobilisation,
and the disruption of scientific networks both within and beyond the Empire. Yet despite these
difficulties, work continued and the IBE emerged from the war in a particularly strong position. Indeed,
the wartime publication of A.E. Shipley’s popular The Minor Horrors of War highlights the emergence of
imperial and applied entomology as a ‘public science.’ Using the IBE as a case study, this paper will
analyse the impact of the First World War on science and the Empire, with a particular focus on how
changing relationships between the territorial components of the Empire influenced scientists and their
research both domestically and in the overseas territories. Through this analysis this paper will also aim
to shed new light on changing perceptions of science, disease, environment, and the Empire during the
Great War.
During the first half of the twentieth century, health departments in both Canada and England were concerned with improving national health and decreasing maternal and infant morbidity and mortality rates. To this end, medical professionals in both countries produced letters, pamphlets, and books written to provide expectant parents with medical advice for pregnancy, delivery, and the first year of the infant's life. While both Canada and England were ostensibly focused on improved maternal and infant health, the publications suggest marked differences in the ideal model for healthcare. In Canada, national publications promoted the professional dominance of physicians and excluded midwives and community support. Mothers were taught that pregnancy and childrearing were fraught with risk and that safety was only possible under the watchful eye of the physician. In contrast, publications produced in England placed the same emphasis on the necessity of healthcare but openly attempted to dissuade mothers from the notion that pregnancy and childrearing were fearful activities. This paper compares and contrasts maternal advice literature from England and Canada to illustrate how such publications promoted political and professional healthcare agendas. An analysis of the distribution rates and responses from mothers demonstrates the influence of publications. Canada and England had similar medical concerns in the 1920s and 1930s, but during this period childcare practices and the medicalization of childbirth diverged drastically. Comparing advice literature shows how opposing healthcare policies can originate from common origins and highlights how medical practice intersected with gendered and professional politics.

Gowan Dawson
University of Leicester
‘Citizen Science on the rocks: palaeontology and psychometry in the reconstruction of prehistoric monsters’

The renowned capacity of palaeontologists to reconstruct strange prehistoric creatures from just fragmentary remnants of their fossilized remains, which Georges Cuvier himself had invested with a prophetic, quasi-Scriptural rhetoric of resurrecting the dead, had distinctly supernatural connotations that were especially appealing—as well as potentially empowering—to plebeian audiences. During the 1860s, William Denton, a self-taught geologist from Darlington who fled the religious dogmatism of Britain for the intellectual liberty of the new world, and his American wife Elizabeth became convinced that the “science of psychometry will shed new light upon many extinct animals” by enabling its adherents, regardless of their lack of scientific training, to evoke more detailed visions of the creatures than were possible even for Cuvier from “fossil specimens” that were “placed upon the forehead, and held there during the examination.” In promoting this tactile form of paleontological clairvoyance, the Dentons’ drew attention to the similar supernatural interests of experts like Louis Agassiz and paleontological disputes that remained unresolved, creating a form of citizen science that empowered both women and autodidacts, and even afforded them the authority to offer advice (albeit unsolicited) to elite practitioners.

Gregg De Young
The American University in Cairo
‘George Strachan’s Arabic Euclid manuscript’

George Strachan, an early Scottish orientalist who travelled extensively in the Eastern Mediterranean, Persia, and India at the beginning of the seventeenth century, left only one noteworthy legacy – his personal collection of Arabic and Persian manuscripts. About 1621, Strachan sent a consignment of 61 manuscripts from Isfahan to Aleppo, the first stage of their journey back to Europe. Today, 25 of Strachan’s manuscripts have been located in the Vatican Library and a further 12 have been identified in the Biblioteca nazionale Vittorio Emanuele III (Naples). Only one, Naples III.F.31 (a Persian treatise on spherical astronomy by Naṣir al-Dīn al-Ṭūsī along with two short Persian tracts on arithmetic) deals with mathematical topics. Now a second mathematical manuscript – an Arabic version of the Elements – once owned by Strachan has been identified in the Majlis Shūrā Library (Tehran). Based on internal evidence, the treatise belongs to the Ishāq-Thābit branch of the Arabic transmission – the sole surviving translation
version. It is followed in the codex by an anonymous "commentary" (more precisely, a summary) which appears to have been copied by the same hand. In this paper we describe the serendipitous discovery of the manuscript and assess its importance to the history of Euclidean geometry in general and the Arabic transmission of the Elements in particular.

Jörg Matthias Determann  
*Virginia Commonwealth University in Qatar*  
‘The Arab world’s final frontier: Sultan Al-Saud and transnational space science’

For much of the twentieth century, studies on the history of the natural sciences in the Middle East have focused on the region’s pre-modern scientific heritage. Yet, increasingly, scholars have also investigated the role of science in the modern Middle East. However, while these scholars have provided valuable insights into the social and political dimensions of science, they have focused on science in specific nation states, such as Egypt and Iran. Little research exists on the transnational development of science in the modern Middle East, even though science has been one of the most transnational human activities. This paper responds to this lack of literature by investigating one of the most global fields of modern knowledge production: astronomy and space science. Astronomers from different nations have long cooperated in studying Earth’s ‘single sky.’ At the same time, expensive space science ventures have long relied on contributions by multiple member states. This paper demonstrates the Arab contribution to these transnational ventures. I focus on the cases of Farouk El-Baz, the Egyptian-born head of NASA’s astronaut training, Sultan bin Salman Al-Saud, the first Arab and Muslim astronaut, and the Qatar Exoplanet Survey, which has discovered planets such as Qatar-1b and Qatar-2b. Drawing on these cases, I argue that the Arab world has contributed to global science not just in pre-modern periods, but also in modern and contemporary times.

Edward Deveson  
*Australian National University*  
‘The curious case of George Compere, the “parasite theory” and the economic entomologists in Australia, 1900-1910’

Australia at Federation, 1901. Six conjoined British colonies building a national economy and identity, but one, Western Australia, ambivalent about the union. Agricultural development remained central to the success of all colonial settler societies, and most of the new states by then had a dedicated department and a Government Entomologist to contribute to the ‘progressive agriculture,’ based on scientific practice. They were unified in their approach to the role, that of Economic Entomology, which was as much educational and political as scientific. The first entomologists were mainly native-born, self-taught naturalists without formal qualification. Others were co-opted from colonial museums. The exception was George Compere, a Californian hired by the Western Australian Department of Agriculture in 1901 as the ‘travelling entomologist.’ And travel he did, scouring all parts of the globe for the next decade, searching for parasites of pest insects. Compere’s unscientific methods and propagandist style, his zealous claims for the ‘parasite theory’ and his own successes created conflict with his counterparts in the eastern states. It also led to the dismissal of his first assistant, Frederick A. Lowe, only months after he was appointed from England. Compere was hired amid the acclimatisation fervour and prospects of the ‘heyday of biological control.’ The decade-long blind defence of Compere by the agricultural bureaucracy in Western Australia owed something to that faith, the individuals who first hired him, and also to the secessionist foment, fuelled by the media, which contributed to a lasting hiatus in entomological exchanges with the east.

Bojidar Dimitrov  
*Bayerische Akademie der Wissenschaften*  
‘The dissemination of Greek science in the Near East. The case of Claudius Ptolemy’s *Tetrabiblos*’

The dissemination of Greek scientific and philosophical texts in the Near East was one of the major prerequisites for their subsequent reception in the West during the Middle Ages. Claudius Ptolemy’s *Tetrabiblos* represents an astrological pendant to the astronomer’s *Almagest*. From Late Antiquity until well into the Renaissance, the *Almagest* and the *Tetrabiblos* were the authoritative works on astronomy and astrology in both East and West. The very fact that the treatises were composed by one and the same
author illustrates how closely these two disciplines were intertwined prior to the emerging of modern science. Astrology was a phenomenon of substantial cultural significance which exerted lasting influences on the civilisations of the Near East and the Mediterranean. It constituted a central feature of the Abbasid Caliphate’s early imperial ideology and was among the first branches of Greek knowledge the famous Baghdad translation movement sought to assimilate. While the scale of this movement was certainly unprecedented, it built upon a long tradition of Graeco-Syriac translation. Therefore, it was often intermediate Syriac versions, not the Greek originals, that initially came to be translated into Arabic. Unfortunately, a great deal of the scientific literature once available in Syriac has been lost. Fragments of a Syriac translation of the *Tetrabiblos* are preserved in a Paris manuscript (BnF Syr. 346). The extant text provides a rare opportunity for the reconstruction and analysis of the *Tetrabiblos*’ dissemination in the Near East.

**Caitlin Doherty**  
*University of Cambridge/Science Museum*  
“‘Raptures, transports, and surprising flights of fancy’: British cultures of ballooning and the Scottish Enlightenment’

This paper contextualises the atmospheric chemistry of the late-eighteenth century within the work of central figures of the Scottish Enlightenment and argues that the scientific expertise necessary for experiments in aerostatic flight were uniquely available to balloon-enthusiasts in the cultural milieu of Edinburgh and Glasgow. The balloon flights of Vincenzo Lunardi and James Tytler will be used as case studies to interpret both David Hume’s notion of the human body as an instrument and Adam Smith’s account of empathy and sensibility. The relationship between the dissenting communities of English chemists, lead notably by Joseph Priestley, and the religious and pedagogical environment of the Scottish Enlightenment will be introduced to further the idea that the balloon was an instrument, model and location for radical scientific practices in the mid-1780s. The extensive use of sensory accounts in records these experimental flights will be shown to demonstrate the aeronauts’ attempts to investigate human nature and behaviour in an equally rigorous manner to experimental philosophy’s investigation into the natural world. Separated from the sights of others, the activities of the aeronauts were concealed behind clouds whilst the balloons were in flight. By viewing the balloon as a site for the performance and production of scientific knowledge, we can see how aerostatic globes managed to be both open and closed spaces at different moments in their flights, and according to different perspectives.

**Roland Edwards**  
*University of Manchester*  
‘Facilitating the growth of ergonomics: the role of government-funded industrial human factors research, 1947–1957’

In response to the post-war balance of payments crisis Attlee’s Labour administration viewed the application of human factors research as a viable means of raising individual productivity and as a way to ‘humanise’ the workplace. Successive Conservative administrations saw this research as a way of maintaining productivity and ensuring harmonious industrial relations. This presentation discusses the work of the three key government committees that defined, managed and exploited industrial human factors research, and also helped to facilitate the growth of ergonomics. It highlights the role that the Medical Research Council and the Department of Science and Industrial Research played in these committees. The study demonstrates that industrial human factors was a contested area with tensions being generated between Sir George Schuster, the chair of the Committee on Industrial Productivity Human Factors who was a keen advocate of social sciences and Sir Frederic Bartlett of the MRC who had been developing his own view of industrial psychology and was vehemently opposed to social science. It is concluded that Bartlett sought to marginalise social science and retard the growth of ergonomics to preserve his vision of industrial psychology in the face of the institutional fragmentation of psychology. Despite his actions government funded research did facilitate conditions for the growth of ergonomics as a discipline, and social science was not marginalised. It is, however, not possible to quantify the impact that the research had on raising levels of productivity or enhancing industrial relations, but suggests that any impact was small.
Jo Elcoat  
*University of Leeds*  
'Scientific education in eighteenth-century schools'

Scientific instruction was offered in many schools across Britain in the eighteenth century, but little is known of the curriculum and pedagogy followed. In this paper I examine numerous scientific schoolbooks published between 1740 and 1800, the period in which a scientific schoolbook market emerged, and outline the range of approaches offered in their pages. Building on the analytical frameworks outlined by Alice Waters and Robert Mayhew, in their respective studies of astronomy and geography textbooks, I divide these into three distinct but overlapping types: experimental, mathematical and polite. In each case I outline the general characteristics of each method before moving onto to a more detailed examination of one schoolbook in each genre. I conclude by arguing that scientific instruction in schools served a multiplicity of purposes, and was supported by a variety of curricular and pedagogic choices, none of them mutually exclusive. Its multivalent character meant that scientific subjects could, and did, appear in both traditional curricula and modern syllabuses and in neither case were either its polite or utilitarian functions entirely ignored.

Stefanie U. Eminger  
*University of St Andrews*  
'Ferdinand Rudio – a historian of mathematics'

Ferdinand Rudio (1856-1929), professor of mathematics at the Federal Polytechnic in Zurich, is best known as initiator and first general editor of Leonhard Euler’s *Opera Omnia*. However, his interest in the history of mathematics extended beyond Euler’s works; he published a number of biographies of mathematicians as well as treatises related to the history of the problem of squaring the circle. For this he produced his own translations of original texts, most notably those by the Greek mathematician and philosopher Simplicius. Rudio wrote with a view to spark interest in the history of mathematics not only among mathematicians, but also the general public, and to provide schoolteachers with resources. The talk will focus on Rudio’s publications to this effect.

Eduardo Escobar  
*University of California, Berkeley*  
'Assyrian technical procedures and the language of alchemy'

In 1938, the Assyriologist and archaeologist Reginald Campbell Thompson first presented his findings on “Assyrian Chemistry of the Seventh Century BC” to the newly founded Society for the Study of Alchemy and Early Chemistry in London. Based on cuneiform tablets from Nineveh that he had deciphered in the earlier part of that century, Thompson formulated a list of lexical entries for chemical terms occurring in the Akkadian language; these terms, he believed, indicated the historical beginning of chemistry in Mesopotamia. This presentation will survey the principal corpus of Thompson’s study, a series of texts with instructions for making glass. In addition to their lexical interests in natural materials, and their practical instructions for making glass, the texts invoke birth demons and antediluvian sages. As historical documents, the tablets also provide contextual evidence for a social and intellectual interest in technology during seventh-century BC. I will argue that as objects created by and for a rarified community of scribes, the texts are to be read as demonstrations of scribal virtuosity rather than practical chemical manuals representative of ancient technical practice. Within the proposed framework, Assyrian glass-making texts are not incipient or anticipatory to the history of chemistry. They are, instead, epistemic objects rooted within seventh-century cuneiform culture, and their aim is ultimately linguistic. In this view, the texts are substantially more ‘alchemical’ than ‘chemical.’ But if this is so, can alchemical hermeneutics from later history elucidate our understanding of Assyrian technical literature?
Maurizio Esposito  
*University of Santiago*  
'The rhetoric of genes: Utopian promises of a pragmatic science, 1930-2000'

Knowledge about genetics has been frequently associated with very convincing 'prophecies' of the future. This talk briefly reports and discusses some of these rhetorical prophecies that, from H. J. Muller to J.C. Venter – therefore from genetics to genomics – have characterized the history of genetics. It will be shown that there has been an interesting relation between reductionist notions of the gene – as a hereditary unit, chemical information or a functional DNA segment – and the ambitious promises of biopolitical intervention. In particular, it will be argued that part of the historical success of genetics (and the metaphor of the gene as a code or recipe) lies in the powerful rhetorical strategies that have connected the germinal matter with startling biotechnological improvements. Finally, it will be shown that the scientific promises of many geneticists were not mere tactics of scientific popularization. Indeed, very often, the border separating science for the specialists and its translations for the public has faded.

Isobel Falconer  
*University of St Andrews*  
'J. D. Forbes, curve plotting, and visual culture'

When, on 4 July 2012, experimental evidence for the Higgs boson was announced, it came in the form of a curve with a blip, immediately understood by everyone in the audience. Yet 190 years earlier, in 1823, the practice of curve plotting was so unusual that S. H. Christie felt it necessary to explain not only the meaning of the curve for magnetic variation that he presented in the *Philosophical Transactions* but also, in detail, the process of defining the axes, representing the data as dots, and drawing the curve. Tilling identifies a step change in the ubiquity of curve plotting among scientists, initiated with the work of J.D. Forbes, Professor of Natural Philosophy at Edinburgh 1833-1859 and subsequently Principal of United College at the University of St Andrews. In a series of papers from 1834 onwards, he used graphs both to present and to analyse observational results on topics relating to heat, meteorology, and glacial flow. Based on an investigation of Forbes' notebooks, this paper will discuss the role of curve plotting in Forbes' science, his practices in plotting, the influences on his use of curves, and his promotion of the method through teaching and association with the Royal Society of Edinburgh. It situates Forbes' work in the burgeoning visual culture of the nineteenth century, the development of physiological optics, and of what Kemp has termed 'non-style' in scientific imagery.

Aude Fauvel  
*University of Lausanne (IUHMSC)*  
'Understanding female pleasure: physicians and the anatomy of women in nineteenth-century France'

In our medicalised world where everything seems to be known about the cartography of the human body, from the localisation of its lesser bone to that of every gene of its genome, the knowledge of female genitalia remains surprisingly fragmentary. For, although physicians have a clear view of the organs involved in the gestational process, they still know very little about the anatomy and the physiology of female pleasure: to give one example, the first sonographic study of the clitoris was only carried out in 2007. This rare example of medical unawareness constitutes a clear instance of ‘agnotology’ (Nancy Tuana), where instead of producing science, the scientific and medical milieu coalesced to produce ignorance, the question of women’s pleasure being long-considered an improper issue in the societies that gave birth to modern medicine. In this paper, I wish to re-examine this history of the (non)-science of female pleasure by analysing how the first gynaecologists addressed the topic in nineteenth-century France, a country where the history of the discipline is relatively under-explored. I will show that if in France the discovery of the automatic nature of ovulation led certain specialists to disregard the question of women’s orgasm around the 1860s, this attitude was, in fact, far from being shared by all specialists. In contrast to what has been said, many nineteenth-century French gynaecologists actually had an acute interest in the anatomy and the mechanisms of the female orgasm, an element which sheds a different light on the medical history of sexuality.
Francoist communication policy was deeply concerned about what should or should not reach the wide public. A strong control and censorship apparatus was built to enforce its rules. On the other hand, a small intellectual elites talking about botanical, genetic or zoological issues was not a thing to fear. In closed door sessions, scientists could still meet avoiding regime control but public talks or newspapers did not have this opportunity. Every public lecture had to be previously authorized and a government delegate would attend it in order to watch out the rules were followed. Likewise, every written text had to go through censorship before being published. In this context, evolutionism was a taboo for the new established and strictly Catholic Francoist regime due to its associations to materialism, liberal-thinking, antireligious ideas, and to the previous republican regime which lost the Spanish civil war against Franco. First, the Regime aimed to erase evolutionism from the public sphere: from libraries, textbooks, curricula, newspapers and from all sort of cultural manifestations. But scientists, as small elite of learned men, chosen by the Regime after the Civil War, could still work on issues related to it, and even discuss about it in their closed door meetings. In this paper I will analyze the difficulties of preserving such boundaries of knowledge and how they changed over the course of the dictatorship. Political and religious strategies, scientific needs, public awareness and journalism logic played a role in the appearance and maintenance of different versions of evolution at different levels.

Pedro Ricardo Fonseca

University of Coimbra (Portugal)

‘Between science and politics: Portuguese biologists’ differentiated stances towards Lysenkoism’

This presentation aims at providing a comprehensive view of the differentiated stances of Portuguese biologists towards Lysenkoism during the twentieth century. I will present a comparative analysis of the positions assumed by three prominent twentieth-century Portuguese biologists that showed interest in Lysenkoism: the agronomist and director of Portugal’s national agronomic station António Câmara (1901-1971); the cytologist and geneticist Aurélio Quintanilha (1892-1987); and the physician and botanist of the University of Porto Américo Pires de Lima (1886-1966). The cited biologists, who held different political and ideological views, expressed different reactions towards the appearance and endurance of Lysenkoism over the years. António Câmara initially expressed high hopes that vernalisation (if true) could benefit the future of agriculture, but his expectations turned into disappointment and grief as the members of Trofim Lysenko’s (1898-1976) school refrained from presenting full details of the way they carried out their experiments and he became aware that Nikolai Vavilov (1887-1943), one of Câmara’s main references in his cytological studies of wheat, had become a victim of Lysenkoism. Aurélio Quintanilha gained widespread international recognition as a lifelong opponent of Lysenkoism, publicly challenging the soviet delegations at the VIIth International Botanical Congress in Stockholm (Sweden) in 1950, and again at the Xth International Congress of Genetics in Montreal (Canada) in 1958. Américo Pires de Lima, albeit highly critical of the intromission of politics in science, believed nonetheless that Lysenkoism could finally confirm the scientific validity of a lifelong long-cherished belief of his: the inheritance of acquired characters.
between researchers and designated groups relate to and partly depend on the historical dimension of that same relationship. In some cases, ‘science’ or ‘research’ has been a central instrument in defining and controlling the relevant groups. This makes it pertinent to speak of a collective responsibility on the part of science in certain contexts. In my presentation, I will analyse which factors are relevant to such a historically bounded responsibility, and, not least, what a notion of collective responsibility in this case amounts to.

Sally Frampton  
*University of Oxford*  
‘Citizen Science, Citizen Medicine’

In Britain today ‘citizen medicine,’ it might be argued, is in full throttle; patient groups play a key role in most major medical organisations, while internet forums allow the general public to share experiences of illness. It seems the changing landscape of the mass media and the possibilities of online participation have precipitated significant changes in how people experience their health and illness. The dichotomy of the professional and non-professional still exists in medicine, but challenges to these boundaries are located at the tap of a search into Google. It is tempting to think of these trends as hyper-modern, but in the nineteenth-century the boundaries were equally uncertain, something that has been somewhat occluded by established historical narratives. My research aims to re-define our understandings of nineteenth-century medicine by considering interaction between expertise and lay medical knowledge, and in particular, how periodicals might have facilitated this. By doing so I also offer a new assessment of the relationship between medicine and science through the lens of public participation. Did the apparent shift towards ‘scientific’ medicine, for example, further divide the medical profession from the public? Ultimately I seek to draw out the complexities that were present in categories that are assumed to be clear-cut – ‘public,’ ‘professional,’ ‘expert’ – in the context of a rapidly changing society and a community of medical men anxious to professionalise themselves, how were these defined?

Aileen Fyfe  
*University of St Andrews*  
‘Philosophical Transactions and the book trade in 1828 and 1908’

Scientific journals are now seen as important sources of income for their publishers and sponsoring societies; and Henry Oldenburg certainly had hopes of profit when he started the Phil. Trans. Yet, for most of its history, Phil. Trans. did not make a profit for the Royal Society, nor was it required to do so. For the Society, the circulation of natural knowledge was a desirable goal in itself, and in the late eighteenth century, this was what Fellows principally paid their subscription fees for. This paper will examine two episodes in the commercial history of Phil. Trans. in the long nineteenth century. It will reveal how the Society's ideals stacked up in practice against the desire for a printer skilled in dealing with scientific material and the costs charged by such a printer; and also against the behaviour of unruly authors, who expected expensive illustrations, or insisted on making extensive alterations in proof. By the end of the nineteenth century, the Society had established more rules for authors, and had become notably more concerned about the cost of the journal.

Miguel Garcia-Sancho  
*University of Edinburgh*  
‘From breeding experiments to stem cell research: animal genetics in Edinburgh and the cloning of Dolly the sheep’

In this talk, I will present the early results of a project on the history of animal genetics in Edinburgh, addressing the establishment of the first breeding organisations during the mid-twentieth century up to the cloning of the sheep Dolly, in 1996. My focus will be upon how the original goals of the first animal breeding institutions were transformed with the arrival of recombinant DNA technologies in the early 1980s. I will compare work at two institutions based in the University of Edinburgh: the Animal Breeding Research Organisation (ABRO, created in 1945) and its successor, the Institute of Animal Physiology and Genetics Research (IAPGR), formed in 1986 as a consequence of the strategic restructuring of laboratories run by the UK Agricultural and Food Research Council. Whereas ABRO was the result of public policies to improve the performance of agriculture after World War II, the IAPGR sought to
facilitate the introduction of genetic engineering techniques and find new horizons for animal genetics research. Consequently, in contrast with the previous breeding experiments to improve animals, the IAPGR established a research programme on the expression of therapeutic proteins in the milk produced by transgenic cattle. This led to the foundation of a biotechnology company, PPL Therapeutics, which provided the cells from which Dolly was cloned at a new Edinburgh-based institution, the Roslin Institute. After 1996, when the cloning experiments concluded, the technique was applied to the production of stem cells, which were used for treating human disease rather for enhancing animal farming.

Andrew Gardiner

*University of Edinburgh*

‘Constructing animal welfare science: ethics, experiment and discipline-building’

The twentieth century brought about great changes to livestock practices driven by science and technology. For example, the post-war ‘medicalisation’ of bovine reproduction transformed the traditional dual-purpose milk cow into a specialised, high-yielding machine, requiring constant attention (in terms of diet, general management and medical interventions) to maintain extraordinarily high yields. Egg and chicken meat production was reconfigured into intensive factory systems which redefined the term ‘farm.’ This industrialisation of agriculture began to be questioned on ethical grounds from the 1960s, following publication of Rachel Carson’s *Silent Spring* and then Ruth Harrison’s *Animal Machines*. Within the public sphere, the evolving agricultural science and technology was problematized by developing notions of animal welfare and sentience. Beginning in advocacy and animal rights, the issues were subsequently framed in experimental contexts in the new discipline of animal welfare science, which occupied a discursive space between science, ethics and public policy. One problem faced by the emerging discipline was how to engage with scientific experiment in a meaningful way in order to address value-laden questions surrounding animal welfare in agriculture. This paper provides an historical overview of the emergence of animal welfare science as a discipline, and considers how experiment was invoked to try to answer ethical questions concerning our relations with animals on the farm.

Benoît Godin

*INRS, Quebec*

‘Basic research and innovation: The “new” semantic pair’

In recent years, historians have started to study the semantics of diverse concepts of science: natural science, basic research, applied research, technology, ‘popular’ science. This paper adds one more concept to the list: innovation. While the concept of basic research (pure research, fundamental research) originates from natural scientists, technological innovation comes from social theorists. The phrase ‘technological innovation’ emerged after 1950. Innovation stresses application, *versus* mere scientific discovery. Technological innovation emerged as a category because in discourse, action and policy, it was useful to include a large number of people and activities (than science or basic research). Innovation is a process, from the generation of an idea to its application, from theory to practice. In this sense, innovation is a counter-concept to science – and more particularly to basic research – as a dominant cultural value of the twentieth century. The theorists of the twentieth century have made of basic research and (technological) innovation a semantic pair. The twentieth century brought in a new pair or dichotomy: (basic) research/innovation. Technological innovation sprang from a conflict between science (for its own sake) and society, or its aspiration to action. The contrast is no longer internal to science, one between types of research, but between research and society. Innovation is contrasted to research, particularly basic research, in society’s name. Research has to be useful to society – through the market. Innovation is a culture of openness – a total process that include different people (including users) and activities – rather than one of closure (elitism) and boundaries.
Graeme Gooday  
*University of Leeds*  
'Amplification with ambivalence: the varied fortunes of early electric hearing aids'

The electrical hearing aid was one of many late nineteenth century battery-powered gadgets that were mass-produced by the mid twentieth century. The history of audiology has thus treated the adoption of amplification techniques from telephony and radio as inevitable solutions to the conversational challenges of hearing loss. Yet such a technocratic story does not account for the widespread rejection of early hearing aids by users who often reverted to traditional options of lip-reading or acoustic hearing horn. My paper maps this story by looking at the initial impact of the 'acousticon' by the Alabama-born engineer Miller Reese Hutchison. The Danish-born Princess Alexandra used this device at her coronation alongside King Edward VII in 1903, thereby enabling to hear and respond to the crucial constitutionally binding vows. Although Hutchison became a minor celebrity, his device was not widely used and he soon abandoned the field. Later devices used the radio valve after its 1904 patent expired, for example, the Marconi table-top Otophone in 1923: although welcomed by the medical profession and sold exclusively by the reputedly Hawksley hearing aid company, this too was not widely taken up. My paper thus concludes by analysing how *The British Deaf Monthly* evaluated the merits of numerous new electrical hearing aids commercially produced after World War 1. In the By the late 1920s assessment of whether these devices were fraudulent, let alone efficient, was taken over by the National Institute for the Deaf, eventually publishing lists for its membership of 'approved' hearing aids.

Irene Goudarouli  
*University of Athens*  
'The concept of "action at a distance" and proper philosophical language in late seventeenth-century England'

During the so-called scientific revolution many scholars were independently occupied with the development of a proper philosophical language. This was traditionally characterized as 'universal language movement' or 'artificial language movement.' According to this historiographical view the 'movement' was flourished in the middle of the seventeenth century and decayed before the end of the same century, since it failed to materialize its ideas. On the other hand, many historians agreed that this kind of a coherent intellectual group of scholars with common characteristics, ambitions and intellectual agendas has never existed, let alone to hold the title of a movement. The goal of this paper is to investigate what exactly proper philosophical language may have been as well as the roles that it may have played in the intellectual life of the early modern period, with a special emphasis on how it might interfere with the under-formation features of the emerging new philosophy. By focusing on late seventeenth-century England, I will try to reach an answer on how and why have the concept of *action at a distance* claimed to become part of the proper philosophical language, while in the middle of the century it was supposed to be absurd, or even dangerous? In other words, is it historiographically accurate to assert that this general trend towards a proper philosophical language has failed?

Jean-Baptiste Gouyon  
*Science Museum, London*  
'An oral history of Horizon'

This year marks the 50th anniversary of the BBC series *Horizon*. As part of the celebrations, the Science Museum Research and Public History Department, in partnership with BBC History, have realised a series of oral history interviews with key protagonists of the history of the series. All the surviving editors of the programmes from 1969 to 2000 will have been interviewed, as well as prominent producers. In parallel, some research was conducted with members of the audience for the programme. This talk will offer a digest of what was learned from this oral history project.
From the 1970s onward, the United States witnessed a rapid increase of interest in computer technology among the general public. As the personal computing industry matured, a broader culture of computing developed on a popular level, as more Americans interacted with this technology in their homes and workplaces. Simultaneously, American popular culture increasingly engaged with the idea of computing, frequently adopting or incorporating images of computer technology as plot points or symbols. From cyberpunk science fiction to popular television shows like *All in the Family*, the spectrum of popular culture reflected a growing awareness of and interest in computers among the American public. At the same time, it can be argued that such cultural representations also operated as an important point of reference about computers for ordinary Americans, and consequently helped to shape the direction of the emerging culture of personal computing within the United States. This paper seeks to examine this infiltration of images of computer technology into popular culture, and will consider how far this trend may be linked to broader changes in attitudes towards computing among the general American public. It will examine how computer technology was represented in popular culture and identify the particular themes that emerge in such representations, interpreting these within the context of the wider movement towards computerization and the growth of a domestic computing culture in the United States.

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Gregor Halfmann

*Max Planck-Institute for the History of Science*

‘What we can learn from the correlation of IGY stations with overseas US military bases: visualizing the military connections of the IGY’

Following World War II, geosciences have benefited from unprecedented financial and logistic support from the military. At the same time, geophysics experienced unprecedented international cooperation, as the case of the International Geophysical Year 1957/58 (the IGY) can demonstrate. I will explore these two central features of the IGY -- its military agenda and its internationalism -- through visualization. This work is part of a team project at the Max Planck Institute for the History of Science aimed at the visualization of the IGY data collection around the globe. In my paper, by identifying U.S.-sponsored IGY stations located in the same sites or in close proximity to overseas military bases of both the Second World War and the Cold War, I will provide a visual argument for the close link of global scientific and military presence to U.S. containment policy. In the second part of my paper I will reflect on this new visual angle on the military’s advocacy of open scientific cooperation on the one hand, and secrecy and competition on the other. With a focus on oceanography, I will apply a post-structuralist approach of Gilles Deleuze and explore the possibility of a perspective on geoscientists’ mostly asymmetrical relations to state and military, as well as to the scientist’s subject matter, the ocean. Deleuze’s realist ontology of dynamical processes and multiplicity can offer a wide range of historical interpretations and connections, which I will exemplify in my paper.

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James R. Hall

*University of Cambridge*

‘Investigating snakes in Company India: experiments, anecdotes, and antidotes’

English East India Company military surgeon, Patrick Russell, conducted a series of experiments involving dogs and Indian snakes over several years in 1780s Vizagapatam, which ultimately appeared in his enormous and acclaimed book, *Account of the Indian Serpents* (1796). Contemporaneous with Russell, several other Company servants were reporting their own explorations of potential antidotes to snake venoms in the journal of the newly-established Asiatic Society of Bengal, the *Asiatick Researches*. The object of these experiments and of the book was to assist medical officers in distinguishing venomous from harmless snakes, inspire further research into a neglected area of natural history, and highlight the impotence of extent modes of treatment in serious cases. The information gleaned from experimentation with snakes was discussed in the context of diverse and conflicting anecdotal accounts of humans bitten by snakes. The range of experiences reported provided no room for consensus or feelings of confidence that snakes were ‘known.’ This paper considers Russell’s rationale for his work, his earlier European
influences, and the relative weight given to these experiments in comparison with the numerous human case studies he acquired. It examines the agency of the dogs and considers their standing with respect to hydrophobia. It also provides a micro-study of the physical and social limitations of a research environment. Both snakes and dogs proved to be challenging and reluctant experimental participants. Incidents of snake-bite, induced and ‘natural,’ proved to be far from straight-forward and were beset with doubts.

Vivien Hamilton
Harvey Mudd College
‘Finding Meaning in Digital Data: Physics in the News, 1885–1925’

A search for ‘physics’ in the New York Times digital archive pulls up an article reporting on the arrest of two fortune-tellers in 1914, one of whom is quoted saying that “the conditions in peoples lives are due to the laws of physics ...” (May 15, 1914 “Fortune Tellers Trapped by Women”). Here, in a piece that has nothing to do with physics, we find an offhand appeal to this science as fundamental. The laws of physics, according to this woman, govern the fabric of our lives. Furthermore, she appears to be relying on the cultural authority of physics to bolster the legitimacy of psychic phenomena. But how was this cultural authority shaped and maintained? What did readers of the New York Times know about physics in the early twentieth century? This paper will present preliminary findings from an analysis of the incidence of the words ‘physics’ and ‘physicist’ in the New York Times and The Times (London) over the 40 year period from 1885 to 1925. Following recent scholarship on popular science, I do not view this press coverage as a pale reflection or distortion of major moments in the professional world of physics. Media coverage of physics actively shaped a particular cultural identity for this branch of science, and these full text digital archives offer the possibility of a richer understanding of the public life of physics in this time period. However, these archives also present particular challenges and I will reflect on strategies for managing and making sense of this vast store of (potentially) quantifiable data.

Anne Hanley
University of Cambridge
‘Syphilisation and its discontents: experimental inoculation and the search for immunity against syphilis in England, 1860-1880’

In 1867 James Lane and George Gascoyen, surgeons to the London Lock Hospital, compiled a report on those cases treated at the hospital by the new and controversial process of syphilisation. Pioneered in the 1840s by the French clinician, Joseph-Alexandre Auzias-Turenne, syphilisation required “the repeated inoculation of syphilitic matter in persons” already suffering from a constitutional syphilitic infection. The process of syphilisation was commenced by making three punctures on either side of the chest and then inserting infective matter that was taken from a primary syphilitic ulcer or from the artificial sores produced in a person already undergoing syphilisation. Each of the twenty-seven male and female patients subjected to this procedure received between 102 and 468 inoculations. It was hoped that these inoculations, if performed correctly and repeated with sufficient frequency, would produce local and general immunity against reinfection. The proposed paper examines the theory and practice of syphilisation and the responses of the English medical profession to these experiments. Although conducted against the backdrop of the Contagious Diseases Acts, these experiments have been largely forgotten by history. Yet they are an important case study of how the medical profession understood venereal disease and what they thought of those who were infected. They demonstrate the ways in which knowledge claims and clinical practices moved between national medical communities. These experiments are an important example of how venereological knowledge was built up among English practitioners at a crucial moment on the cusp of the bacteriological revolution.

John G. Hatch
Western University
‘Framing relativity: artistic glimpses of Einstein’s theory’

In 1919 came the first experimental evidence supporting some of the predictions made by Albert Einstein’s Theory of Relativity. Soon after, and largely because of this experimental validation, Einstein became a new cultural hero whose name would frequently find its way into the popular press. The arts
embraced him as well. Numerous references are made to Einstein and his ideas in a variety of different contexts. Hannah Höch and Theo van Doesburg both claimed Einstein as a Dada; the Russian artists Naum Gabo and El Lissitzky incorporated some key components of Einstein’s theory into their work; the Expressionist architect Erich Mendelsohn created a unique observatory dedicated to Einstein; and the Polish painter Władysław Strzeminski adopted Relativity as a model in his critique of a number of his contemporaries. This paper examines some of the innovations in the arts brought about by the interest in Einstein’s Theory of Relativity, as well as examining some of the reasons surrounding this interest, inquiring as to what it was about his work that appealed to so many artists working in the 1920s and 30s.

Lisa Haushofer
Harvard University

‘Nutritional knowledge in transit: “artificially digested foods,” physiology and the commercial sphere in late nineteenth-century Britain’

Historians of science have recently examined the routes and means by which knowledge travels, and how it is shaped when ‘in transit’ from one site to another. Yet the role of commercial products in the transmission and transformation of nutritional knowledge remains poorly understood. This paper examines the transfer of physiological knowledge about nutrition and digestion into the commercial sphere. In particular, I examine the research collaboration between William Roberts, a physician, and Frederick Baden-Benger, a pharmaceutical chemist, on so-called “digestive ferment” in the 1880s in Britain. Baden-Benger went on to develop a commercial product which capitalized on this physiological research. ‘Benger’s Food,’ a so-called “artificially digested food,” embodied new ideas about digestion, the body and nutrition. It contained digestive enzymes, and was intended for nourishing the body in case of illness, in old age or in infancy. Using letters written to the company, as well as company advertisements and medical and pharmaceutical publications, I examine how the physiological knowledge transmitted through these products was transformed ‘in transit’: how it was carefully negotiated between the scientific, the medical, and the commercial sphere by the producers, and how it was received, resisted, and transformed by the users of the product. I argue that the shift to the commercial sphere provided a platform for participation by new groups of actors in nutritional knowledge, and allowed for the boundaries of nutritional expertise to become blurred.

Catherine Herfeld
LMU Munich


This paper departs from the observation that in its axiomatic version, rational choice theory has traveled between different research sites, became specified through different mathematical formalisms, and occupied distinct epistemic functions in the various social sciences it was used. Since its development in 1940s, it was applied to prescribe rules of proper behavior, as representation of behavioral hypotheses, and as measurement device to capture individual values. New modifications of rational choice theory did not fully replace old versions of it, which forbids the historical reconstruction of its journey as a continuous process of progressive knowledge production and suggests a more nuanced account that can ultimately explain the different versions of rational choice theory currently used in the social sciences. In this paper, I aim to shed light specifically on this process by focusing on the relationship between economics and the so-called ‘behavioral sciences movement.’ Contrasting the history of rational choice theory in economics, i.e. its origins, its modifications, and its uses with its development in the other behavioral sciences reveals a complex process of theory formation and modification shaped by various epistemic purposes that rational choice theory occupied in the distinct disciplines; by the different institutional contexts within which it was further modified; and by the methodological commitments of social scientists who applied rational choice theory for their disciplinary purposes. The claim defended is that rational choice theory in its various manifestations was largely a product of this process, which required balancing between different scientific goals, epistemic commitments, specific problems, as well as political and economic goals that set the boundaries of scientific progress. Jacob Marschak’s biography serves as a common thread guiding us through those research sites that appear relevant for tracing the emergence of rational choice theory in the period between 1955 and 1964.
Rebekah Higgitt
University of Kent
‘Tupman’s travels: a transit expedition in caricature’

In 1874 George Lyon Tupman, a Lieutenant in the Royal Marine Artillery, led one of five expeditions organised by the Royal Observatory, Greenwich, to observe the transit of Venus. Tupman's contribution, which also entailed several years' worth of calculating work, is well known. So too is his expedition to Hawai'i, his correspondence and diaries having been retained among the Observatory’s archives. Historians such as Jessica Ratcliffe and Michael E. Chauvin have discussed Tupman’s experience in Hawai'i, including physical discomfort, the movement and setting up of instruments and relationships with locals, and the military and imperial contexts of the transit expeditions. Although the known documentary, visual and artefactual sources for the expedition are rich, what has not previously been seen are two volumes of caricature drawings by Tupman that document his experience. Some of the drawings mirror photographs taken before and during the expeditions, adding to the layers of analysis of reproduction and repurposing of transit expedition imagery discussed by Ratcliffe and Geoff Belknap. Other drawings, however, show scenes that were not or could not have been depicted in official or promotional accounts. This paper will explore what this informal, visual and humorous evidence can add to our knowledge of the expedition. In addition, the close links between the drawings and written sources provides an exceptionally good opportunity for analysis of a typical nineteenth-century genre of humour that is familiar but - with the exception of specific cases such as Martin Rudwick on Henry De la Beche - largely under-analysed.

Oliver Hochadel
Consejo Superior de Investigaciones Científicas
‘Political natural history? Francesc Darder and the acclimatization movement in Catalonia around 1900’

Francesc Darder (1851-1918) was a major actor in the fin-de-siècle scientific culture of Barcelona. The Catalan naturalist dealt with animals both alive and dead in numerous ways: as a veterinarian and taxidermist, as the director of the Barcelona zoo and as a well-connected propagator of introducing new species of animals to boost Catalonia's economy. This paper will focus on Darder's acclimatization program. The zoo, founded in 1892, was tellingly called Parque zoológico de aclimatación y naturalización. Around 1910 Darder launched a 'pisciculture' program to 'repopulate' the Catalan waters. The popular 'festa del peix' (fish feast) in smaller towns in Catalonia located at lakes and rivers was strongly supported by the political authorities. Darder also published a host of 'practical guides' that advised city dwellers how to raise their own rabbits, pigeons and poultry at home. The acclimatization movement (with respect to animals) was at its height in the 1850s and 1860s. Yet at around 1900 it had long been in decline. It had not lived up to its promise to provide national economies with meat, raw materials for clothes and so on. Why did Darder try to revive this agenda? This paper proposes a political reading of the Catalan acclimatization movement. Although hardly ever made explicit the idea behind this 'applied' natural history was to alleviate the rampant social tensions of the time, in short to provide food for the poor – and rebellious – workers of Barcelona, at the time a 'divided city' torn apart by class conflicts.

Matthew Holmes
University of Leeds
‘World dynamics: neo-Malthusian ecology 1968-1978’

Overlapping discussions of contemporary food production and environmental sustainability were striking during the 1960s and 1970s. Critical examinations of global agriculture often incorporated themes as diverse as strategic power, social construction and population control. The political, economic, social and environmental were combined into a single monolithic system, the understanding of which was considered vital for the future survival of humankind. This paper will begin by examining key text representative or indicative of perceived crises, including Paul Ehrlich's The Population Bomb (1968) and Barry Commoner's The Closing Circle (1972), examining the interplay of subjects and themes between them. Contemporary analysis of and solutions to food security and agricultural sustainability (for example Fellow of the Royal Society Kenneth Blaxter's 1977 article "The Options for British Farming" and Harvard historian Donald Fleming's 1969 "On Living in a Biological Revolution") will then be examined.
for similar crossovers. The paper shall attempt to demonstrate that the overlapping content of these fears were the result of developing ideas of an ecologically and economically integrated world system. These ideas arose from three identifiable developments. Firstly, the concept of 'spaceship earth' portrayed the world to the public as an isolated and fragile planet. Secondly, ecological beliefs envisioned the planet as held in a system of checks and balances, the upset of which could result in devastating consequences. Finally, economic and political integration through institutions such as the EEC was equated with global political and economic instability if global food security or environmental integrity was compromised.

Sonia Horn
University of Vienna
‘Examen obstetricum – midwifery and obstetrics in early modern Vienna’

Examen obstetricum is the title of the recently rediscovered textbook for midwives and surgeons, published by the Vienna professor Paul de Sorbaith in 1681. It was written in Latin and translated into German by his student and later professor Franz Stockhammer. Examen obstetricum also means ‘examination of midwives.’ Since 1643 midwives were licensed by the doctors of the medical faculty of the University of Vienna after Elisabeth Haidin, an influential midwife had asked them to examine her and her colleagues. Shortly afterwards she suggested to enrol her apprentice, so that her four-year training would be documented. As a consequence this became usual for all apprentices and midwives became members of the medical faculty, enjoying the privileges of the civitas academica. In my paper I will put the Examen obstetricum in the centre of my reflections and explain the organisational structures in which midwives worked in Vienna and how they were trained. The textbook was a relevant part of this education. The fact that it was written for midwives and surgeons is also represented in the collegia publica, theoretical and practical courses, that were attended by midwives, surgeons and students of medicine together. It deals with fertility, sexuality, conception, pregnancy, normal and difficult deliveries, including obstetrical interventions, breastfeeding and the care for the new-born. Considering this, it can be assumed that midwives and surgeons had very similar knowledge, though they had different responsibilities when attending deliveries.

Sally Horrocks
University of Leicester
‘Discrepancies become disturbing: changing attitudes towards women scientists and engineers in Britain during the late 1960s and 1970s’

Historians of women’s work have tended to paint a rather pessimistic picture of the impact of legislation such as the Equal Pay Act (1970) and the Sex Discrimination Act (1975) on women’s employment. They point towards the persistence of occupational segregation and low pay for women workers, and emphasise the limited inroads made by women into male dominated professions. This focus tends to obscure those changes that did take place and some dramatic shifts both in attitudes towards women’s employment and the opportunities available to them. This paper examines changes in women’s employment in science and technology, the public rhetoric and images around this and the experiences of women scientists themselves to argue that a much more optimistic assessment can be offered of this period than has tended to be the case. Although women continued to be heavily outnumbered by men, their numbers increased significantly. Perhaps more importantly, the relative absence of women came to be seen not as natural and inevitable, but as a problem that could and should be addressed.

Hsiang-Fu Huang
University College London
‘When Urania meets Terpsichore: an early nineteenth-century lecture on astronomy in the Lord Chamberlain’s Plays’

A manuscript titled Ouranologia (1826) is in the Lord Chamberlain’s Plays collection at the British Library. This manuscript is a lecture syllabus on astronomy written by a playwright Samuel James Arnold (1774-1852), and the author designated a comedian George Bartley (1782-1858) to deliver the lecture. Bartley’s astronomical lecture was performed annually during Lent at the English Opera House (today’s Lyceum Theatre) in London between 1820 and 1829. This show, however, was not an isolated case. In the
heyday of onstage astronomical lecturing during the early nineteenth century, various showmen exhibited the wonders of the universe in theatres and lecture-halls across Britain. These onions stage astronomical lectures were often accompanied by the transparent orrery – a large apparatus for scenic displays – invented and improved by the celebrated lecturer Adam Walker (c. 1730-1821) and his sons. The rivalry between astronomical lecturers was common, especially heated in the West End during Lent. As a rare extant account of a complete lecture of the kind, Arnold’s manuscript sheds light on the subjects, narrative and effects of these onstage astronomical lectures. What these nineteenth-century showmen tried to achieve was a predecessor of the modern planetarium: a show struggling to combine entertainment and instruction together with aesthetic and scientific appeal.

Allison Huetz
De Montfort University
'Capturing human emotion: François-Franck's archive at the Collège de France'

The study of human emotion is a long-term interest for artists and scientists since the beginning of the seventeenth century. Amongst other works, one can mention Charles Le Brun’s drawings, the photographs of Duchenne de Boulogne or the publication of The Expression of the Emotions in Man and Animals by Charles Darwin in 1872. However, it is important to add another name to this long list of historical figures: Nicolas Charles-Emile François-Franck, a French physiologist and assistant to Etienne-Jules Marey, who gave a series of lectures about the expressions of emotion at the Collège de France between 1899 and 1904. I will explore his scientific research, through the study of teaching materials, consisting of approximately eight-hundred lantern slides. This collection was a long-lost part of his archive, now being rediscovered. It combines portraits of patients, actors, animals as well as reproductions of sculptures, paintings and ethnographic objects, thus creating a compelling visual assemblage. Therefore, I will study how François-Franck managed to gather this collection, in order to illustrate his theory. However, he projected these images, both as illustrations and proofs, which show how this collection engages a central epistemological issue of that time: the production of a model of ‘mechanical objectivity.’ In my presentation, I will argue that François-Franck’s use of photography contributed to the setting up of new methods of observation, in order to capture the flickering expressions of human emotion.

Agata Ignaciuk
University of Granada
"Today you can help her plan for a lifetime": early advertising of the contraceptive pill in the American Journal of Obstetrics and Gynecology'

This paper analyses advertisements of oral contraceptives published in the main US professional journal for gynecologists and obstetricians during the first years after this drug was introduced onto the markets. My sources comprise 74 advertisements of diverse brands of the pill published in AJOG between 1963 and 1971. My analysis of iconography and texts of these advertisements focuses specifically on gendered representations of doctors, women and patient-doctor relationship. The pill, a contraceptive method of unprecedented efficacy which could be used independently of coitus, was to be prescribed by doctors and used under medical supervision, and its advent culminated the process of medicalization of birth control in the US. Pharmaceutical companies employed a variety of strategies to attract doctors’ attention and encourage them to prescribe this new contraceptive, frequently representing the doctor as indispensable advisor for women who wanted to control their fertility. The advertising and marketing campaigns of the pill played an important role in normalizing the idea of family planning, while universally transmitting the idea of doctors’ control over the patients, their bodies and reproductive decisions.

Stephen T. Irish
University of Cambridge
'The Berthollet-Haüy controversy: definite proportions in chemistry and crystallography'

Claude Louis Berthollet (1748-1822) and René-Just Haüy (1743-1822) were colleagues and close contemporaries who enjoyed favour and professional success under different political regimes. Both flourished in the institutions of Napoleonic France. But historical discussions structured by period and by discipline do not usually connect them. Haüy was a crystallographer who presented himself as an
innovator and the founder of a new science. Berthollet was a chemist associated with the great debates of Lavoisier's 'Chemical Revolution' who sought to consolidate and systematize chemical theory as the science progressed. He is also remembered for his later debate with Proust on the subject of definite proportions, which he denied. But before this famous exchange Berthollet had objected to similar ideas as they appeared in Haüy's work. Haüy's crystallography had postulated definite proportions as part of his concept of the 'integrant molecule.' This talk will describe the 'Berthollet-Haüy controversy,' using it as a locus from which to consider longer trends in the history of chemistry. Haüy's work was rooted in older chemical ideas from the middle of the eighteenth century. By contrast, Berthollet's difficult but original (later) ideas about chemical combination, while emerging from affinity chemistry, established the foundation for work on chemical equilibrium carried out later in the century. Historians have identified many of the relevant facts in both cases, but the juxtaposition can illuminate complex disciplinary relationships between different physical sciences in this period.

**Yuto Ishibashi**  
*Kyoto University*  
'Generating public trust in Greenwich Observatory Time in late nineteenth-century Britain'

In the middle of the nineteenth century the Royal Observatory in Greenwich launched the time signalling service throughout Britain. While recent studies have stressed the occasional failures of the service and errors involved in standard time electrically disseminated by the national observatory, this paper examines the various roles played by George Biddell Airy, the seventh Astronomer Royal, and his collaborators in an attempt to generate the public trust in the service despite those drawbacks. In reconsidering the time signalling in this way, the paper argues that the reliability of standard time they distributed was improved through time measurements and experiments, maintenances of the telegraph wires as well as electrical and horological devices and public relations that included disseminations of knowledge on how standard time was defined and communicated. This study also seeks to shed light on the role of the users whose observations of the accuracy of time signals were gradually perceived by the Greenwich astronomers as an important means by which they could detect errors and failures.

**Dawn Jackson Williams**  
*University of St Andrews*  
'The facts of the matter? Natural knowledge of mountains in early modern Europe'

Did you know that all mountains are hollow? That a volcano is a mountain that has become filled with lava? That if a mountain loses its 'natural feeders' – i.e. the rivers and streams flowing over it – it therefore runs the risk of filling with fire, and transforming into a volcano? These statements are of course not 'known' today, running, as they do, contrary to the discoveries of modern geology. They were, however, tenets of general knowledge held by scholars in Europe during the late seventeenth century, if not earlier. This paper will discuss the range of 'natural knowledge' held regarding mountains in early modern period, and in so doing will present a case for a new way of thinking, talking, and writing about knowledge and knowledge-making in the past. It is common to see historians writing about past scholars 'thinking' or 'believing' something when past knowledge does not correlate with the current scientific fact. However, 'knowing' signifies a very different mental experience to 'thinking' or 'believing': many scholars knew mountains to be hollow; a few thought that they post-dated the Flood; and some believed them to be both beautiful and useful. Utilising the early modern history of 'mountain knowledge' as a case study, this paper will argue that, instead of emphasising the disjuncture between past and present knowledge, it is far more important to use such terminology to accurately represent the relationship between a past group or individual and the thing being known, thought, or believed.

**Frank A.J.L. James**  
*The Royal Institution, London*  
'Humphry Davy and the Board of Agriculture'

The Board of Agriculture and Internal Improvement, to give its full name, was established in 1793 at the start of the war against France and was wound up in 1822. There is only a limited historical literature on the activities of the Board. Thus it is not clear what was its overall significance, if any, in affecting
agricultural practice and production, especially as a number of extraordinarily wealthy landowners, such as the Duke of Bedford or the Earl of Egremont invested significant resources of their own in attempts to improve agriculture. Throughout its existence the British government contributed annually the substantial sum of £3000 to maintain it and for much of that time the Board had its offices in Sackville Street, a prestigious address just off Piccadilly in central London. In its early years the Board arranged extensive surveys of agriculture in Britain. The resulting volumes, each of several hundred pages, were mostly published on a county by county basis for England, but more by regions for Scotland and Wales. It also employed Humphry Davy (from the nearby Royal Institution) to deliver an annual course of lectures from 1803 to 1812 which resulted in his *Elements of Agricultural Chemistry* (1813). This paper will examine not only the roles that Davy played at the Board, but also his relations with the leading agricultural improvers of the day such as Bedford and Egremont, but also others such as Arthur Young and Thomas Bernard.

**Annie Jamieson**  
*University of Leeds*  
"Erroneous assumptions regarding genes" in the twentieth century

The twentieth century has been called the 'century of the gene' and some have argued that this emphasis on the power and potential of DNA has led to a 'tyranny' of one gene-one trait determinism. We are told that twenty-first-century genomics, with its emphasis on the complexity and interactivity of the genome, will rescue us from this detrimental determinism. In this paper I will argue that we need not have waited until the sequencing of the human genome and consequent developments in our understanding of the gene in order to develop a more sophisticated and less deterministic understanding of genetics. I will show that there was a strong, though largely neglected, thread of interactionism (both gene-gene and gene-environment) running through twentieth-century genetics, from the biometrical perspective in the first years of the century, epitomised by W.F.R. Weldon, through the work of Hermann Muller, Nobel Prize-winning geneticist (whose 1911-12 manuscript provides the title for this paper), to the social biology of Lancelot Hogben in the 1940s, and beyond. I will explore how these authors reconciled their strong commitments to Mendelian principles with an even deeper belief in the importance of interaction to present a much more flexible and nuanced view of the nature and range of action of the gene than is commonly attributed to the period, and how intellectual and conceptual developments, like the New Synthesis, the rise of 'environmental eugenics,' or the bio-social programme of, for example, Julian Huxley and J.B.S. Haldane, contributed to their views.

**Lydia Janssen**  
*FWO-Vlaanderen/KU Leuven*  
'Elements of interdisciplinarity in early modern historical writing. The use of “auxiliary sciences” in early modern antiquarian historiography'

In early modern Europe, a new, 'antiquarian' branch of historiography developed which differed significantly from traditional historical writing. One of its most striking and innovating features undoubtedly was the deployment of 'auxiliary' disciplines, ranging from textual criticism and linguistics to geography and natural sciences. Besides the historical events, early modern 'antiquarian' writers included in their national histories elaborate discussions on a broad range of topics, such as geography, culture and the flora and fauna of the region under discussion. These fulfilled a vital role in the development of a new kind of 'scientific' historiography, which based its narrative no longer exclusively on older historical texts, but sought to provide a more solid, 'scientific' base to its argumentation. A combination of a thoroughly critical treatment of the available textual sources and more 'material' evidence provided by the examination of objects and comparative studies on linguistics and customs was used to provide the historical narrative with a more objective 'scientific' foundation. In this presentation, I wish to explore this 'interdisciplinary' dimension of early modern 'antiquarian' historiography through the critical analysis of a number of early modern works of national historiography. After presenting an overview of the scope of their 'interdisciplinarity', I will try to provide better insight into the functions which these 'auxiliary' disciplines fulfilled in historical writings. Furthermore, I will interpret these findings within the broader intellectual landscape of early modern Europe.
It is well known that the transformist theories of Jean-Baptiste Lamarck and Geoffroy Saint-Hilaire had gained a number of converts in medical and university circles in Edinburgh during the 1820s. The best known of these is Robert Grant, who famously praised Lamarck to Charles Darwin during his time as a student in Edinburgh. James Secord has also made a strong case that Robert Jameson, professor of natural history at the University of Edinburgh, 1804–54, had transformist sympathies. However, another noteworthy transformist figure in Edinburgh in this period has so far gone largely unremarked. Henry H. Cheek was a medical student at the University from 1826 to 1831. He was therefore a contemporary of Darwin, and they were both members of the Plinian Natural History Society and the Royal Medical Society of Edinburgh. Along with his friend and fellow medical student William Francis Ainsworth, Cheek edited a short-lived journal, the *Edinburgh Journal of Natural and Geographical Science* (1829–31). It was in this journal that Cheek published a number of papers relating to the transmutation of species, including a detailed summary of his transformist views entitled "Suggestions on the relation between organized bodies and the conditions of their existence" (April 1830). In the same year Cheek also read a transformist essay "On the varieties of the human race" to the Royal Medical Society. In this paper I will seek to explore the nature and sources of Cheek’s transformism and put them in the context of the Edinburgh of the period.

Melanie Keene
*Homerton College, Cambridge*
‘Object lessons go to school’

“There are certain so-called ‘object lessons’ that come upon me like the repetition of a hideous dream... I know what the questions will be, I know what the children will answer, and I know what is coming next. ...I see the fatal apparatus got ready, the black-board and the chalk, and the picture-card, or the object – the ‘camel’ or the ‘lump of coal’... I am told (or rather the children are told) that the object before them is ‘opaque,’ or ‘tangible,’ or ‘transparent,’ or what not... and all this is carefully written on the blackboard and the words repeated by the children, and so on till the fatal twenty minutes have expired.”

A school inspector of the 1870s was not impressed by object lesson teaching. By then a central – even routine – mode of elementary scientific instruction, this kind of pedagogy was evidently a farcical exercise for both teacher and pupils. But only a few decades before, such explorations of common things had been celebrated as the most novel and effective way of entraining young minds and bodies with vital skills and knowledge. How had lessons on objects transformed from an innovative practice to an accepted – even boring – mode of teaching? In this paper I will explore British and American elementary science education in the second half of the nineteenth century, as I use surviving lesson guides, reports, and material artefacts to analyse what happened when object lessons went to school.

Hannah Kershaw
*University of Manchester*

The representation of HIV/AIDS to children and young adults presented a unique problem for health educators and policy makers. Institutions previously tasked with quietly educating adults about sexual health, or children about ‘the facts of life,’ were thrust into the awkward and publicly prominent new role of sex educators to the nation by the AIDS crisis. Institutions such as the Health Education Authority, British Medical Association and Family Planning Association were well placed to produce up-to-date and authoritative adult education materials on HIV/AIDS as the public health message evolved from one of nebulous risk to more explicit messages on safer-sex. However, the complex and difficult task of representing the sexual aspects of the illness and its prevention to children proved significantly more challenging. Potential educators’ attempts to produce coherent and comprehensive HIV/AIDS education material for children were stymied by anxiety over presenting children with explicit content; prohibitions
against the inclusion of any content on homosexuality; battles for jurisdiction over the moral and sexual health education of children; and a pervasive sense of urgency. Nonetheless a wide variety of educational material was produced in these inauspicious circumstances including several 'AIDS Games.' Through exploring some of the variety of AIDS games produced by sexual health educators for children, this paper demonstrates how these complex difficulties were manifested and overcome by educators and producers alike.

Mujeeb Khan
University of Cambridge
'Alert traditions in foreign medieval cultures: early formulators negotiating medicine'

The Ayurvedic, Chinese, and Greek medical traditions have all been objects of historical, practical, and theoretical study from their earliest beginnings. Two of these, Chinese and Greek medicine, flourished in cultures peripheral to their initial creation. In fact, the Greco-Arabic translation movement in the Islamic world coincided with the Japanese acquisition of Chinese medicine in Japan. By the tenth century, both civilizations had produced early formulators of medicine in Tanba-no Yasuyori (Japan) and Abū Bakr al-Rāzī (the Islamic world). Despite their place within the larger traditions of Chinese and Greek medicine, Yasuyori read the Chinese tradition in Sinitic (kanbun – a method of reading literary Chinese in classical Japanese) and al-Rāzī read its Greek counterpart in Arabic. In this way, both participated in traditions disjointed linguistically, temporally, and geographically. However, the works of both are considered central to each tradition, including their later manifestations. Tanba-no Yasuyori's Ishinpō (Heart of Medicine) and al-Rāzī’s medical works, especially his Shukūk ʿalā Jālīnūs (Doubts on Galen), provide ample evidence for their medical methodology as well as their approach to and use of each tradition. This paper situates both historically by analyzing their changes and reformulations of ancient traditions. Moreover, through a comparative perspective, it sheds light on similarities, and the lack thereof, in the reformulation and recomposition of medicine by these two figures. This paper, therefore, also shows how these early medical formulators of the Hellenized Islamic world and Sinicized Japan, while explicitly working within the parameters of these foreign medical traditions, implicitly normalized them.

David A. Kirby
University of Manchester
'Fear of Freud: psychiatry, psychoanalysis and movie censorship in the US and UK, 1930-1968'

Before 1968, movie censor boards dictated which aspects of science they considered appropriate and which scientific subjects they considered indecent, immoral or offensive. This paper uses material from the archives of the Production Code Administration (PCA), the Catholic Legion of Decency (LOD) and the British Board of Film Censorship (BBFC) to explore how filmmakers crafted stories about psychiatry and how religious groups attempted to control these scientific narratives through censorship. While the sexual aspects of Freudian theories concerned these organizations, their anxiety over psychiatry extended more broadly to questions related to the nature of the soul, free will, demonic possession and the concept of criminal insanity. Movies such as Bewitched (1945) and Shock (1946) reveal a tension between the PCA and the psychiatric community over how movies should depict the ‘certainty’ of psychiatric explanations. In contrast, the BBFC was vigilant in censoring any film that even hinted at a negative portrayal of mental illness; a position that was put to the test in the case of The Snake Pit (1948). This paper also examines how the LOD’s censure of psychiatric themes in cinema changed after Pope Pius XII’s 1953 address to the International Congress on Psychotherapy and Clinical Psychology acknowledged modern psychology and psychiatry as consistent with Catholic Doctrine. Although the Church came to accept certain psychiatric explanations, the LOD’s censorship decisions for post-1953 films such as Freud (1962) and The Mind Benders (1963) reveal how the Catholic Church continued to be conflicted about the moral implications of psychiatric narratives.
Adrian James Kirwan  
*National University of Ireland, Maynooth*  
‘Technological convergence and transatlantic communication: a case study of Ireland, 1850-66’

This paper shall address the convergence of two technologies: steam-powered ships and telegraphy. A primary concern in the application of steam to transatlantic shipping was the rapid relaying of information between Britain and North America. In 1856 the first successful transatlantic telegraph cable failed within weeks of being laid. In preparation for this cable telegraph networks had been developed on both sides of the Atlantic. In North America the telegraph network was extended to the Newfoundland coast to receive the new cable, while in Ireland ongoing telegraph development had connected the west coast to mainland Britain. While the transatlantic submarine cable quickly failed the expansion of the telegraphic network in North America and on the British Isles meant that correspondence times could be halved by the incorporation of this technology alongside steamships. Telegraphic messages could be relayed to Ireland’s west coast from where they would be transferred by packet steamer to Newfoundland for transmission throughout the North American telegraph network. This paper shall elucidate the part that technological convergence and state intervention played in the introduction of a primary concern in the application of steam to transatlantic shipping was the rapid relaying of information between Britain and North America. In 1856 the first successful transatlantic telegraph cable failed within weeks of being laid. In preparation for this cable telegraph networks had been developed on both sides of the Atlantic. In North America the telegraph network was extended to the Newfoundland coast to receive the new cable, while in Ireland ongoing telegraph development had connected the west coast to mainland Britain. While the transatlantic submarine cable quickly failed the expansion of the telegraphic network in North America and on the British Isles meant that correspondence times could be halved by the incorporation of this technology alongside steamships. Telegraphic messages could be relayed to Ireland’s west coast from where they would be transferred by packet steamer to Newfoundland for transmission throughout the North American telegraph network. This paper shall elucidate the part that technological convergence and state intervention played in the introduction of a packet station on the west coast of Ireland. It shall seek to understand the role that the state played in providing a parity of commercial intelligence essential for the continued success of British enterprise. In addition Ireland’s and Newfoundland’s position within the empire and the perceived importance of imperial security shall be investigated.

Henry Kreuzman  
*The College of Wooster*  
‘Alexander Gordon, puerperal fever, and empiricism in eighteenth-century medicine’

This paper examines Alexander Gordon’s (1752-1799) arguments that puerperal fever (childbed fever) is an infectious disease, situates his theory of the etiology of the disease in relation to competing theories, and finally argues that he exemplifies the shift during the 18th century to an empirically approach to clinic medicine. Gordon was the physician for the Public Dispensary during the 1789-1792 epidemic of puerperal fever in Aberdeen; he treated most of the women who became ill and recorded data surrounding each case. First, the paper presents a mapping of each case of puerperal fever on the 1789 Milne map of Aberdeen and examines how Gordon appealed to the geographic distribution of cases of puerperal fever as evidence against the miasma theory. Secondly, it analyzes how Gordon argued that the facts surrounding the time of the onset of the disease supported his theory that it is an infectious disease. Third, it explores the detailed records that Gordon kept as the chief physician for the dispensary, and how he used these records to support the conclusion that puerperal fever is infectious and carried from patient to patient by midwives and physicians. Finally, the paper examines Gordon's argument that the correlation between the number of cases of puerperal fever and erysipelas (i.e., a recognized infectious fever) also supported his conclusion. The paper concludes by aligning these ‘empirical’ arguments from Gordon’s 1795 Treatise with the ideas he expressed in unpublished manuscripts about the nature of medicine and by relating his views to others in the eighteenth century about the etiology of puerperal fever and nature of medicine.

Gerald Kutcher  
*Binghamton University*  
‘Geoffrey Keynes: medical savant-connoisseur and literary bibliographer’

In this talk I will investigate the closely intertwined relationship between the medical and literary efforts of the late-Victorian/Edwardian educated Geoffrey Keynes (1887-1982). During the 1920s and 30s, Keynes was the first surgeon to seriously challenge conventional radical surgery for breast cancer using instead radium insertions alone and later radium combined with a conservative form of surgery. Keynes’ efforts were framed in publications and at meetings in highly rhetorical language admonishing surgeons for ‘mutilating’ their patients. Simultaneously, Keynes was an avid book collector and highly touted literary bibliographer celebrated for his development of the ‘humanised’ bibliography, which extended beyond determining the serial history of a literary work to include a writer’s personal history in order to elucidate their intellectual development. He produced over twenty such bibliographies from William Blake to Sir Thomas Browne and William Harvey. In modern scholarship, Keynes’ literary and surgical
efforts are invariably viewed as separate endeavours: in medical accounts he is portrayed as a pioneer pointing the way to the fall of the radical mastectomy some fifty years later, while in literary accounts he is credited as an early developer of biographical bibliographies. I will argue, however, that his literary work was not separate from but deeply intertwined with his medical practices, each partaking of unique but related (in John Pickstone’s term) “ways of knowing.” Rather than pointing the way to the future, Keynes should be viewed as an exemplar of medical savant-connoisseurs of the interwar period.

Jon Røyne Kyllingstad
Norwegian Museum of Science and Technology
‘Scandinavia and the international scientific controversies on race, 1930-1960’

In the late nineteenth and early twentieth centuries, it was generally held by physical anthropologists that Southern Scandinavia was the core area of the ‘Nordic’ (or ‘Germanic’) race. The concept of a superior Nordic/Germanic race was a key idea in the racial ideology of the Nazis, but in the 1930s was met with increasing critique both in the English-speaking world and in Scandinavia. The controversy on the Nordic race helped giving rise to a scientific anti-racist discourse that became internationally dominating after World War II. This was reflected in two UNESCO-declarations on race in the early 1950s. This paper looks at Scandinavian scientists’ involvement in these controversies on race, and how this affected their way of conceptualizing and delineating ‘ethnicity,’ ‘populations,’ and ‘race’ (including the ‘Nordic/Germanic race’) in their studies of Scandinavian populations before and after World War II. An important figure is Gunnar Dahlberg, head of the Swedish State Institute for Racial Biology from 1935. In opposition to his predecessor at the institute, the Nazi-sympathizer Herman Lundborg, Dahlberg dismissed the idea of the superior Nordic race, and became involved in the UNESCO declarations on race. Dahlberg claimed that the racial dogmas of the Nazis and their likes were based on a ‘typological’ concept of race, which had become scientifically outdated with the rise of population genetics and the new synthesis in biology. I will discuss the question of continuity and discontinuity between interwar racial anthropology and the type of population genetic studies Dahlberg advocated.

Roger D. Launius
National Air and Space Museum, Smithsonian Institution
‘How do projects become institutions? The International Geophysical Year and the origins of America’s biggest kind of science’

The International Geophysical Year (IGY, 1957-8), was an international scientific project to expand greatly knowledge of the Earth from its geomagnetism to its climatological processes to its geological evolution, but at a fundamental level it was a product of a specific set of circumstances created by the global confrontation of the Cold War. Two major IGY initiatives undertaken by the United States began as projects in this environment, but also because of that environment quickly turned into institutions requiring constant funding and attention, in no small measure because of their geopolitical nature. The first was the project initiated to undertake exploration and scientific investigation of Antarctica. American research stations established or expanded as a result of the IGY almost immediately grew into a broad-based, expensive, and sophisticated scientific enterprise that has been maintained ever since by the National Science Foundation as much for international political reasons as for the science involved. The second project-to-institution initiative emerging from the IGY was the launching of scientific satellites and the creation of the National Aeronautics and Space Administration to oversee this activity. The agreement to place into orbit scientific satellites to support the efforts of the IGY set in motion a succession of decisions aimed at the establishment of what became a large and expensive organization now more than 50 years old. Again, it was created because of the unique circumstances of the Cold War and has been sustained despite those changed circumstances. This paper explores this transition from project-to-institution using these two examples.
Natalie Lawrence
*University of Cambridge*
'The assembled dodo: making and using a flightless monster in early modern natural history'

After the dodo was first described by Dutch sailors landing on the Island of Mauritius in 1598, tales of its strange form and plentiful flesh were rapidly brought back to Europe and included in travel publications. By the 1680s or 90s, during the Dutch occupation of Mauritius, the bird became extinct. Though very few whole birds or dodo parts were ever brought to Europe, the dodo was a popular subject in seventeenth century natural history works and in a range of other genres. This paper will examine how naturalists in Europe assembled a dodo creature from an array of second-hand information and dodo parts. It will look at how these 'dodo particulars' were stabilised into persistent descriptive tropes that were transmitted between publications, and the emblematic roles that these images played. In particular, one of the earliest descriptions of the animal in Charles L'Ecluse's *Exoticorum libri decem* (1605) and the later use of the animal in Jacob de Bondt's *Historiae naturalis et medicae Indiae Orientalis* (1658) will be explored. Historical orthodoxy would suggest that bizarre animals such as the dodo were a challenge to the classical structures that early modern naturalists used. However, this case demonstrates that not only did naturalists not have difficulty in characterising and assimilating strange creatures like the dodo, but that such monstrous beings were very valuable entities, both economically and conceptually.

Thomas Lean
*British Library*
'Keeping the lights on: oral histories and the development of the British electricity supply system from nationalisation to privatisation'

The development of electrical power networks is a classic, indeed formative, theme in the history of technology. Technological systems approaches have laid bare the interaction of network builders, advancing technology, and local political, legalislative and socio-economic contexts in the development of national electrical supply systems. Elsewhere, the cultural history of electricity use has also attracted much attention. However, apart from 'great men,' such as Tesla, Westinghouse, and Edison, historians have paid little attention to the people who helped to shape the development and operation of electrical supply industries. In this paper I explore the development of the electricity supply system in Britain from nationalisation in the 1940s through to privatisation in the 1980s and 1990s, from the points of view of people within it, recorded as part of The British Library National Life Stories collection *An oral history of the electricity supply industry*. I dwell not only on the perspectives of system builders, such as planners and technologists, but also the operational staff tasked with keeping the lights on, opening up new perspectives on the role of labour relations, organisational freedom and constraint, and factors such as public service in the history of power networks. Through this I explore the relationship between the operational and social history of the industry with its development, and how issues such as an organisational mantra of 'keeping the lights on,' can be invaluable to understanding organisational change, technological 'progress,' such as new power station building, and the response of the industry at times of crisis, such as 1984 miner’s strike.

Jung Lee
*Needham Research Institute, Cambridge*
'Mutual transformation of Colonial and Imperial botanizing? The intimate and remote collaboration between Chung Tyaihyon and Ishidoya Tsutomu in Colonial Korea'

This paper examines the mutually transformative collaboration between a Japanese forester Ishidoya Tsutomu(1891-1958), at the colonial forestry department, and his Korean subordinate Chung Tyaihyon(1883-1971). It seeks to re-examine the complex meaning of mutuality in colonial knowledge interaction, so far mostly discussed in the context of European colonialism, with this case of non-European empire of Japan and its culturally and naturally close colony of Korea. Chung’s collaboration with Ishidoya for colonial tutelage was initiated under Japanese imperial dominance of Korea, putting Chung’s career at the mercy of Ishidoya. Yet several factors increased Ishidoya’s reliance on Chung. First, Ishidoya, as a settler expert, tried to advance his scientific career with his colonial research. Second, they came to share a common opponent at the imperial center, Nakai Takenoshin(1882-1952), who
monopolized the scholarly investigation of Korean flora based on their inputs without proper acknowledgement. Third, they co-discovered the knowledge tradition that Japan and Korea 'shared.' Their alliance for local knowledge greatly transformed the two. Chung came to lead Korean-only botanizing while Ishidoya changed his career to a herbalist based on traditional medicine. Although this transformation may seem symmetrical and even 'anti-imperial,' it was only very limitedly so. While fully delineating their mutual transformation, this paper highlights the asymmetry of power that was never secure yet persistent in their interaction. It argues that the insecurity of power and the importance of indigenous agency in colonial knowledge interaction, a recent focus in the field, should be rebalanced with this analytical attention to the asymmetry of power.

**Ageliki Lefkaditou**
*University of Leeds/University of Oslo*

‘Continuity and discontinuity: Greek physical anthropology, 1920s-1950s’

During the years of political and social turbulence that followed the Greek War of Independence (1821-1832), the idea of a linear continuity between ancient and modern Greeks provided the much-desired unity, and at the same was used to introduce the country to other nations and reinforce its claims to sovereignty. Greek physical anthropology, following the example of historical, archaeological and literary studies, actively contributed in constructing, consolidating and promoting this view. But Greek physical anthropology was also closely linked to the international disciplinary context. During its first years in the late-nineteenth century, it was closely affiliated with the French anthropological tradition of producing numerous craniometric measurements. After the 1920s, though, and mainly due to a change in the people in charge, it became much more closely associated with German physical anthropology and racial psychology. As the overarching questions and aims remained the same, new research and narrative strategies appeared. By examining scientific publications, public speeches, newspaper articles, and even literary contributions, along with changing institutional settings, political ideologies and cultural understandings, the paper explores the close entanglement of science, culture and the state. Thus, the paper engages with issues of continuity and discontinuity on two levels: a) the biological, or other, mechanisms invoked to discuss issues of continuity, purity and miscegenation among the Greek populations, and b) the effects of changing theories, tools and practices on the conceptualization of race and Greek racial and national identity in the period considered.

**Elizabeth Lewis**
*University of St Andrews*

‘C.-V. Mourey’s single science of algebra and geometry’

I propose to discuss the innovative and far-reaching mathematics of the elusive Frenchman, C.-V. Mourey. In 1828 Mourey published some of his results relating to the difficulties presented by the theory of algebra; in a book published in Paris under the title, *La Vraie Théorie des quantites negatives et des quantites pretendues imaginaires.* Seeking algebraic reform, Mourey had set out to discover a new set of definitions and fundamental principles as a basis for algebra. To this end he developed a theory of directed lines, which constituted a single science of algebra and geometry; and, as an application of the theory, he gave a proof of the fundamental theorem of algebra. My intention is to reconsider Mourey’s motivations and to re-evaluate his mathematics. Of real interest, aside from the mathematics, is the issue of the total absence of biographical information on Mourey: for the past 186 years Mourey has remained an unknown to historians of mathematics. A portion of the talk will focus on this issue.

**Laurent Loison and Marion Thomas**
*SAGE, University of Strasbourg*

‘The reception of the cell theory in nineteenth-century French biology: a comparison between Paris and Strasbourg’

In this presentation, we will analyse two different approaches to interpreting the cell theory in France in the nineteenth century. In Paris, Charles Robin (1821-1885), Professor of Histology at the Faculty of Medicine, opposed not only the idea that the cell is the unique elementary building block of life, but also Virchow’s seminal ideas about cell formation. In contrast, Emile Küss (1815-1871), Professor of physiology at the Faculty of Medicine in Strasbourg, was pivotal in promoting the cell theory. Based on a
study of medical textbooks and an examination of the research work and experimental practices of Robin and Küss, we want to stress the differences between their interpretations of the cell theory. It appears that both of them were strongly in favour of the use of the microscope for physiological and anatomical research. Thus we conclude that the differences are not to be traced to divergent techniques but rather to differing philosophical and metaphysical contexts. This will lead us to take in to account the fact that Robin was a loyal disciple of Auguste Comte, while Küss was committed to the tradition of natural philosophy. By looking at two French researchers and teachers working in physiology in the middle of the nineteenth century, our study helps to fill a gap in the historiography which until now has focused almost exclusively on research on cell theory in Germany and in Britain.

William R. Macauley  
*University of Manchester*  
‘Lights, camera, miracle: the aesthetics of wonder and religious science in Irwin Moon’s film series *Sermons from Science*’

After working as a travelling Christian evangelist in the late 1930s, California pastor Irwin Moon formed a partnership with the long-established Moody Bible Institute of Chicago. Under the auspices of the Institute, Moon preached his *Sermons from Science* to large audiences using live scientific demonstrations to illustrate Christian principles. Moon and his colleagues also established a film production company Moody Science Institute (1945-1996) and made 39 educational films in the *Sermons from Science* series. The films depict spectacular scientific ‘experiments’ and highly detailed observations that serve two primary purposes. Firstly, to promote a sense of wonder at the intricate beauty of the natural world and, secondly, to render nature as cinematic spectacle that revealed the handiwork divine intelligence. The films were conceived and promoted as incontrovertible evidence of an omnipotent God, according to the Christian doctrine of creation. I argue that *Sermons from Science* portray scientists and scientific work using stereotypes from entertainment media, notably film and television. Further, Moon and his colleagues developed animation, film, and cinematographic techniques to create less familiar sequences to convey the notion that modern science offers unprecedented views of the natural world that necessitate a religious explanation. The filmmakers deployed aesthetics of wonder and cinematic spectacle to equate empirical scientific observations with evidence of a divine Creator. The history of *Sermons from Science* also reveals how film has not only been used to produce and communicate factual knowledge, but also as a rhetorical tool for legitimating religious claims under the guise of rigorous.

Lee T. Macdonald  
*University of Leeds*  
“‘Sunspot mania’: Kew Observatory and the North British group in Victorian science’

The project begun in 1859 at the British Association’s Kew Observatory to take regular photographs of sunspots gives some interesting insights into what Crosbie Smith termed the ‘North British’ group of natural philosophers, as well as into the origins of research into Sun-Earth connections. This paper attempts to throw light on a hitherto under-appreciated member of the group, John Welsh, the superintendent of Kew Observatory from 1852 until his early death in 1859, after which the better-known Balfour Stewart took over. In particular, I use archival evidence to demonstrate Welsh’s hitherto undiscovered role in the origins of the Kew solar photography programme and argue that he was an example of Steven Shapin’s ‘invisible technician’ in Victorian science. In addition, I show how the research methods employed by both Welsh and Stewart related to those of their teacher, James Forbes. I argue that the Kew sunspot programme was not, as has been suggested, an example of a new type of public astrophysical observatory that sprang up in the nineteenth century but in fact was more an extension of the privately-funded research led by Morrell and Thackray’s ‘gentlemen of science.’ Both Welsh and Stewart had to work within constraints imposed not only by some of these ‘gentlemen’ but also by geophysicist and Royal Artillery officer Edward Sabine’s drive for geomagnetic data. I examine how a conflict of priorities between Stewart and two traditional sources of science patronage – the private gentleman and the military – led to Stewart’s resignation from Kew.
Daniele Macuglia  
*University of Chicago*  
‘The reception of Newtonianism in eighteenth-century Rome’

Presenting the first results of my dissertation work, my talk will trace the way in which Catholic mathematicians and natural philosophers operating in eighteenth-century Rome responded to Isaac Newton’s (1642–1727) ideas on gravitation and on the nature of light. In a period characterized by remarkable tensions existing between the imposition of Newtonian science and the orthodoxy of the Catholic tradition, Rome was the main gateway through which Newtonianism entered the Catholic world, as well as the formal seat of the Roman Inquisition—one of the most powerful institutions of cultural control at that time. With the precise intent to appropriate the new science and to modify it, the Church engaged a group of ‘enlightened Catholics’ to understand what Newtonianism was really about. Paradoxically, however, these enlightened scholars exploited the Holy See’s networks to get in touch with some of the major scientific centers on the continent, and they made contributions to the eventual spread of Newtonianism throughout the Italian peninsula. Relying on the support offered to them by some vertexes of the Catholic Church, this group of people tried to show that science and religion did not actually contradict each other, and ended up commencing an effective renewal of the cultural substrate of the entire Italian scenario. My talk will focus on precise instances of the Church’s intention to limit, control or modify the dissemination of Newtonianism in the Catholic world, and on the way the enlightened scholars initiated, in the Italian peninsula, a well-defined strand of Enlightenment thought.

Ben Marsden  
*University of Aberdeen*  
‘Glasgow is our laboratory’: metropolis, province and philosophical engineering, c. 1840s – 1900

This paper reconsiders the relationship of the ‘North British’ city of Glasgow to engineering industry. There are many existing studies of science in cities of industry and, as Jack Morrell long ago, reminded us, having a developed industrial base was not a sufficient condition for a city to spawn scientific institutions. The situation is further complicated if we apply distinctions of metropolis and province. Edinburgh might be at the same time a central metropolis to which Scottish and other specialists flocked while, viewed from London, it seemed more provincial. Despite the cultural cliché of the Scottish engineer, Scotland had in the mid nineteenth century no equivalent to the London-based Institution of Civil Engineers: men of practice unwilling to relocate virtually or actually to London made do with the differently heterogeneous forums of the Scottish Society of Arts and the Royal Society of Edinburgh. Against this backdrop Glasgow appears as a second city: ‘second city’ of the empire; a ‘second city’ in Scotland to Edinburgh which was itself, perhaps, a ‘second city’ within Britain to the London metropolis. It was not in Edinburgh but in Glasgow, then, that an ‘Institution of Engineers in Scotland’ met from 1857. The origins and agendas of the IES remain relatively unexplored, despite the survival of detailed records of its formative period. This paper considers those origins, especially in relationship to the Institution of Mechanical Engineers and the BAAS, and its agendas, especially in connection with local industrialists shipbuilders, publishers and academics – who, in an early manifesto, insisted that for a new breed of philosophical engineers, ‘Glasgow is our laboratory.’

Aleš Materna  
*University of Ostrava*  
‘Vítkovice Ironworks and the Rothschild family (1891–1914): contracts, patents and new technologies applied in ship production for the Habsburg monarchy’

This study analyzes shipbuilding production by the Vítkovice Ironworks, which ranked among the most important manufacturing sectors for the company in the period 1891–1914. Vítkovice shifted its focus to the production of military hardware in response to increasingly tense international relations and new trends in warfare. For Vítkovice Ironworks Corporation was easiest to enter competition in the manufacture of armor plates for the construction of naval forces. This production fully met the business objectives of enterprise management, which was led from 1876–1893 by one of the best metallurgical experts of Austria, Paul Kupelwieser. He constantly acquainted with technological innovations in steel production in the European steel industry centers (Sheffield, Middlesborough, Essen) and the most important inventions applied in Vítkovice Ironworks. Through the transfer of information and monitoring
of technological development, that were obtained by Vítkovice ironworks in the period 1891–1914, Vítkovice succeeded to get a monopoly on the production of marine armored plates and marine armored turrets for the entire area of the Habsburg monarchy. Vítkovice Ironworks were also involved in the construction of dozens of battleships, cruisers and 4 dreadnought (the most famous of them was Viribus Unitis), which fought in the World War I. The study outlines the processes of shipbuilding production: the initial plans to make special armour plating for military purposes, the acquisition of the necessary expertise and know-how, the construction of manufacturing facilities, negotiations with the naval authorities, the production itself, and ultimately the commercial success generated from this sector. The author points out the importance of naval contracts for the Vítkovice Ironworks, both in commercial terms (military production was an exceptionally profitable line of business) and as a means of raising the company’s profile and prestige.

Julie McDougall-Waters
University of St Andrews
‘Editing the Philosophical Transactions in an age of professionalization and specialization, 1854–1911’

This paper considers how much the broad narrative of specialization and professionalization in science in the mid to late nineteenth century was reflected in the publishing of the Royal Society’s journal, the Philosophical Transactions. In 1854, the Cambridge mathematician and physicist George Gabriel Stokes began his secretaryship of the Royal Society. During his thirty years term, Stokes served alongside three consecutive co-secretaries in the biological sciences, and was assisted by two assistant secretaries. There was considerable room for delegation of Phil. Trans. responsibilities, yet Stokes clearly saw himself as ‘the editor’. After Stokes, the style of editing the journal changed, with the appointment of Arthur Rücker, and then Joseph Larmor, as secretary. When Larmor became secretary in 1901, he seems to have had less opportunity to stamp his own impression on it. He was faced with a scientific culture populated by commercial and specialist periodicals competing with Phil. Trans. on account of efficiency, efficacy, and readership. In this paper I compare the practices used by Stokes, Rücker and Larmor in the compilation of the Phil. Trans., and show how these were in many ways distinct owing to their differing experiences as scientists communicating in an increasingly diverse periodical and scientific market.

Coreen McGuire
University of Leeds
‘Amplifying historical voices’

Histories of technology have recently focused attention on the role that consumers play in shaping, refining and occasionally rejecting the technology they use. Through highlighting the contribution of these ‘users’ the sometimes reciprocal, sometimes problematic, relationship between developers and consumers of products becomes apparent. This relationship is further challenged in cases where communication itself is the problem. Thus in the early twentieth century, the growing use of new aural technology such as the telephone entailed that people with hearing loss were increasingly excluded from communicating. From setting up telephone systems in the 1880s, the British Post Office and telephone manufacturers made certain assumptions about the hearing capacities of telephone users that did not reflect the diverse auditory experiences of their subscribers. This paper explores these issues in the context of the Post Office telecommunications by questioning their apparent commitment to providing amplified telephones for hard of hearing subscribers after World War 1. Through considering the difficulties that exclusion from telephone use created in this time period (especially for businessmen) this paper looks at how people with hearing loss helped persuade the Post Office to develop their first amplified telephone apparatus in 1922. I further demonstrate that individuals with hearing loss directly influenced the creation of an improved amplified telephone in 1929, which also reflected increased domestic uptake of the telephone. Finally, I demonstrate that ‘deaf’ subscribers were a crucial influence on Post Office policy and conclude by reflecting on what this indicates about the nature of its institutional power.
Sean McNally  
*University of Leeds*  
"'Medresco': the pre-NHS origins of state-sponsored auditory assistance'  

Britain’s first state-manufactured hearing aid made its public debut in 1948, a service in the new NHS not hitherto documented by historians. The ‘Medresco’ was the product of a decade-long collaboration between two state bodies: the Medical Research Council and the General Post Office which had nationalized Britain’s telecommunications eighty years previously. Before the NHS, aural clinicians’ advice to the tens of thousands with surgically irremediable hearing loss had been to try lip reading, ideally assisted by auditory assistive hardware purchased from specialist high street stores. But commercial hearing aids based on recent telephone or radio amplification technology cost up to hundreds of pounds, so were typically beyond the pocket of all but the wealthiest. The ‘Medresco’ brought such technology within the reach of those who met the threshold of rigorous means-testing and audiological scrutiny at new regional NHS assessment centres. Nevertheless, the first hearing aids made by GPO engineers to MRC specifications were fraught with difficulties for their users. This paper traces the complexities of the MRC-GPO collaboration to explain four key aspects of the story: i) why production of the prototype Medresco began during the Second World War (1943), ii) why the hard of hearing community (e.g. as represented by the National Institute for the Deaf) were barely consulted, iii) how the fallibility and awkwardness experienced by many early Medresco users led to both mass disuse and many swift revisions to GPO designs, and iv) the angry response of private hearing aid manufacturers to their exclusion from the Medresco project.

Felicity Mellor  
*Imperial College, London*  
'Absence and alienation in *Horizon* physics'  

Despite a diversification in programme formats and styles in recent years, *Horizon*’s treatment of physics draws heavily on familiar stereotypes that portray physics as esoteric and otherworldly. Drawing on an analysis of several years of *Horizon* films, this talk will examine the tensions in television discourse about physics, paying particular attention to absence, alienation and accessibility. Despite the increased presence of women over its fifty years of broadcasting, I will argue that *Horizon* continues to construct a gendered representation of physics.

Sarah Louise Millar  
*University of Edinburgh*  
'Sampling the South Seas: examining the collection and interrogation of scientific specimens on mid-nineteenth-century voyages of Pacific exploration'  

This paper looks at the ship-board practice of collecting and analysing scientific specimens in the wider context of scientific investigation at sea. Previous work on the collection of specimens for scientific research has focused on the accumulation of terrestrial artefacts, after ships had reached land and naturalists and crew were allowed to depart the vessel. Less attention has been paid to the everyday practices of collection on board ship: to the instruments required, the people involved and their relationships one with another, and to the specific working conditions, scientific practices, and interpretative spaces of sea-going science. This paper considers the practices of collection, analysis, and interpretation during three voyages of exploration in the South Seas in the 1830s and 1840s: the French Pacific exploring expedition led by Dumont d’Urville in 1837-41; the United States Exploring Expedition led by Charles Wilkes in 1838-42 and the British Antarctic Expedition led by James Clark Ross in 1839-43. The paper examines the official expedition narratives, the scientific volumes and the private correspondence from officers and crew in order to interrogate the practice of science at sea at this time.
Katya Mishuris  
*University of Michigan, Ann Arbor*  
‘A mind-reading girl, psychophysical energy, and altered states in fin-de-siècle Russia’

The paper is an account of desire and failure to appropriate the supernatural and naturalize the elements of the unknown in turn-of-the-twentieth century Russia through a close study of one case and one phenomenon. The case is that of a young girl of 14, specially gifted with telepathic abilities, combining in her presence a “wondrous pathology,” partaking simultaneously in a world that is both miraculous and susceptible to neuropathic illness, physical weakness, and morbid sensitivity. My attempt in this paper is to eschew a spectrum of historiographical positions according to which turn-of-the-century scientists’ appropriation of the strange world of telepathy, mental suggestion and hypnosis is understood either as a triumph of science over occultism and religion or as a confrontation between two separate and fixed camps (either science or spiritism; either psychology or psychic research) one of which eventually wins, and the other looses. What is interesting about the case of a young girl, I contend, is that it problematizes and unsettles the habitual dyadic relationship of dominance, hierarchy and pathology, thereby opening up a space which brings into being a flexible movement of elements from elite culture and popular culture, the so-called margins of science and scientific center, the human and the natural sciences, the pathological and the supernatural.

Daniel Jon Mitchell  
*University of Cambridge*  

Unlike its counterparts in Britain or Germany, by the mid-nineteenth century the state-governed French Université consisted of an integrated system of secondary and higher education. Science professors undertook various formal roles as teachers, examiners, inspectors, and public lecturers. My paper examines the emergence post Franco-Prussian war of a discipline of French physics from this corps universitaire, at a time of heightened concern about France’s political, economic, and cultural position in Europe. I articulate a mainly institutional and pedagogical basis for a field of ‘French’ physics that grounds previous conceptions of a ‘French national style’. This will enable us to recast a body of comparative microstudies, whether framed in terms of local practice or a French national style, as different pieces in a disciplinary puzzle. I conclude by exploring ways of integrating these findings into the received view of the rise of the physics discipline. How, for instance, is the rise of a French physics discipline in the last quarter of the nineteenth century compatible with the supposed formation of the physics discipline in the first quarter? The answer, I propose, should be sought in a reconceptualization of Laplacian ‘physics’ and its relationships with mixed mathematics; the study of the concurrent creation of an institutionalized physics pedagogy; and a thorough appraisal of Victor Regnault’s influence on French physics. The results of this project may reveal some surprising historical continuities with the qualitative physics of the eighteenth-century.

Bruce T. Moran  
*University of Nevada, Reno*  
‘Preserving the cutting edge: woodblocks, visual knowledge, and recycling practices of botanical illustration in early modern Europe’

This paper will focus on the preparation, use, and reuse of woodblocks in the production of printed images of plants within two traditions of early modern herbals, each supporting distinct agendas within changing economies of curiosity. In one tradition, woodblocks cut for a project linking plant anatomy with medical alchemy organized by the Berlin physician and Paracelsian chemist, Leonhard Thurneisser (1531-1595/96) were rediscovered, reused and given a different purpose almost a hundred years later. In another, woodblocks (many still in existence) that were designed by Giorgio Liberale and Wolfgang Meyerpeck for the great herbal of Pietro Andrea Mattioli (1501-1577) appeared in numerous editions before and after Mattioli’s death and found renewed purpose in the eighteenth century in the *Traité des Arbres et Arbustes* (1755) of the French botanist, chemist, and enthusiast for applied science Henri Louis Duhamel du Monceau (1700-1782). My general focus will be upon instances of what Mary Morgan has referred to as “facts that travel embedded in artifacts and technologies.” The traveling facts in these cases
are material objects (woodblocks) that get used and reused, shared and acted upon, within various communities. As material objects of fact woodblocks not only constitute other obvious facts like printed images, but carry information about the technical knowledge, craftsmanship, and social practices needed to produce them. By studying surviving blocks themselves, and the instances of their reuse, I examine how the recycling of botanical woodblocks affected shared practices of visualization in the early modern era.

Federico Morganti
'Sapienza' Università di Roma
'Reconciling science and religion: Herbert Spencer, the “Leader,” and the unknowable'

The main purpose of this paper is to offer an account of Spencer’s attempt to reconcile science and religion as provided in his *First Principles* (1862). Moving from Mark Francis’s recent suggestion (*Herbert Spencer and the Invention of Modern Life*, 2007), Spencer’s thought on religion can be traced back to a movement self-labelled ‘New Reformation,’ arisen in the early 1850s among a group of radical thinkers gathered around the weekly *The Leader*, run by Thornton Hunt and Spencer’s close friend George Lewes. In particular, there are five aspects of the NR which apparently have informed Spencer’s thought: the emphasis on sentiment over reason; the idea of the ultimate inscrutability of the nature of God; a firm rejection of any anthropomorphic depiction of the deity; the idea that all forms of religiousness shared a common and essential element; the belief that the progress of religion, whether in humanity or in the individual, would eventually lead to the achievement of such purest core. It were these very elements which Spencer adopted in order to resolve what Victorians increasingly felt as an impendent conflict between science and religion. By thus accounting for Spencer’s religious thinking, it will be possible to address two main questions. The first concerns Spencer’s relationship with the old tradition of natural theology. The second concerns the reasons why he decided at all to begin his gigantic *System of Synthetic Philosophy* with a treatment of religion, despite the visibly naturalistic standpoint he was there arguing for.

Iwan Rhys Morus
Aberystwyth University
‘Kaleidoscopic vision: David Brewster and the art of seeing things’

In this paper I want to explore some of the relationships between the culture and practices of spectacle and sensation and the philosophy of vision during the early nineteenth century. To this end I will focus in particular on David Brewster’s invention of the kaleidoscope in 1818 and what we can learn from it. Brewster himself represented the kaleidoscope as the outcome of sustained research in optics and as an embodiment of his views on vision and optical misdirection. It was a scientific instrument, a device to titillate and educate the senses, and an item of industrial machinery. The kaleidoscope not only illustrated important optical principles and the ways in which artful arrangements of mirrors could mislead the eye, but appealed directly to sensation and offered a technology that could teach its users how to see properly. Brewster also proposed his novel instrument as a technology that could mechanize art (there are interesting parallels to be drawn between the kaleidoscope and Charles Babbage’s Calculating Engine). Looking at the kaleidoscope can therefore offer useful lessons about the place of vision in early nineteenth-century cultures of knowledge. This was an instrument that appeared to breach boundaries. Following the kaleidoscope around as it moved between cultures should help us get a better sense of the space occupied by science at the beginning of the nineteenth century.

Noah Moxham
University of St Andrews
"‘For the sole use and benefit of this Society”: The institutional takeover of the *Philosophical Transactions* and its aftermath, 1750-1827"

This paper argues that the *Phil. Trans.* in the second half of the eighteenth century, following the Royal Society’s assumption of financial responsibility for the journal and editorial control over its contents, does not represent a simple transition from individual to corporate editorship. As the private venture of successive Secretaries of the Society, *Phil. Trans.* had continually been identified with the Society’s activity
and occasionally mistaken for its official organ; and critical and satirical attacks on the journal in the early eighteenth century, including William King’s anonymous Transactioneer (1710) and John Hill’s Review of the Works of the Royal Society (1750) did not distinguish readily between the journal and the institution. I show how the Society’s new procedures, including blind ballots on submitted papers and (where necessary) expert peer review, were intended to deflect public criticism, both of the conduct of meetings and the contents of Phil. Trans., and move from this to argue that they effectively masked a fairly stringent system of editorial control, resting principally with the President and Secretaries. Examining in particular the conduct of Joseph Banks, PRS from 1778 to 1820, and Charles Blagden, his friend and colleague (SRS 1784-1797), I investigate how officers of the Society manipulated this new bureaucracy to reject certain papers out of hand and prioritise others or to impose revisions on the authors, and endeavour to show that one of the underlying stakes in the disputes over the Society’s leadership during this period was a struggle for editorial control over Phil. Trans.

Gabriele Mulè
Independent scholar

‘British travellers and the sublime volcano: science, faith and aesthetic in feudal Sicily of the eighteenth century’

In the eighteenth century, young noblemen, artists and literati manifested their passion for archaeology and scientific research in the phenomenon of the Grand Tour, a journey throughout Europe and Italy. Sicily was its southernmost destination, and the Etna volcano was, often, its crowning glory. In gruelling night-time excursions, British travellers climbed Etna and observed a natural phenomenon that stoked the conflict between science and faith in the European context: scientists, philosophers and theologians wondered about the interpretation of the holy scriptures in establishing natural history. Sicily, still feudal, and a seat of the Inquisition and of powerful religious congregations, was a place where travellers could experience the intensity of this conflict, exploring Etna and the political, economic, social order of the island, centuries-old and in transition towards a difficult modernisation supported by some enlightened Sicilians. With local superstitious guides and learned scholars, in a land where freedom of speech, expression, critique and investigation were limited, British travellers witnessed in their diaries and drawings the hidden revelations of some Sicilian ‘friends of truth,’ the spectacular eruptions of Etna, and its boundless panorama – a synthesis of physic and metaphysic experience in which the science-faith dichotomy surrendered to a luminous, unifying sense of beauty, a revelation of the Divine in Nature: in the shadow of clouds of ash, along lava rivers, and disturbed by rumbling tremors, these adventurous pioneers investigated (and described) the Sublime.

Peeter Müürsepp
Tallinn University of Technology

‘A priority case – who was the first to teach Newton?’

It is an interesting and persisting question who was the first to teach Newton’s method in a university setting. There are two main candidates. In the Anglophone world it is normally believed that the priority belongs to David Gregory, Professor of Mathematics at the University of Edinburgh. However, there is a hypothesis presented by Christina Eagles that there has been a misunderstanding, and David Gregory did not really teach the method at all. The other candidate is Sven Dimberg of the University of Tartu (Dorpat). It has been established that Dimberg included Newton’s method into his curriculum as early as 1693. If Gregory did not really teach the method, then Dimberg is perhaps the first who did so. Still, there is no conclusive proof in the case of Dimberg, in addition to which we do not know whether he really accomplished what he promised in his curriculum. It has been claimed that he was not even present in Tartu for the whole semester under question. This is the picture in general terms. I plan to concentrate mostly on the work of Christina Eagles on David Gregory, namely whether we really have reason to believe that there has been a misunderstanding concerning the authorship of a paper that has been attributed to David Gregory, but which was not actually written by him, but rather by his brother, James.
Elizabet Neswald  
*Brock University*  
‘Nutrition science and dietary surveys in the late nineteenth century’

In the late nineteenth century, physiological chemist Wilbur Olin Atwater developed a research program to study human nutrition and dietary practices under the auspices of the United States Department of Agriculture. The programme aimed to evaluate the nutritional health and food consumption of the American population. For over ten years under Atwater’s leadership, the human nutrition program utilized the infrastructure of the Agricultural Experiment Stations to chemically analyze American foodstuffs and conduct dietary surveys of groups as diverse as the Yale rowing crew, college women, the lumberman of the Maine woods and numerous racial and ethnic minorities and immigrant populations. In the process, Atwater turned nutrition science, itself still an emerging research specialty, into a field science and developed standard methods for gathering field information and consumption data. Combining laboratory studies with newer methods of social statistics, studies of food composition with surveys of food consumption, he developed a powerful tool for assessing dietary practices and comparing them with accepted dietary norms and standards. The data from these surveys, which largely looked at underprivileged populations, formed the basis for consumption recommendations promoted by public health and social welfare advocates, social reformers and home economists, as well as providing guidelines for feeding institutional populations such as prisoners and soldiers. Viewed as a corrective to laboratory studies, which could only assess needs in an artificial situation, the dietary surveys studied nutritional practices under the variable and often suboptimal conditions of daily life.

Agustí Nieto-Galan  
*Universitat Autònoma de Barcelona*  
‘Hunger artists in the public sphere: the fasting contest of Giovanni Succi and Stefano Merlatti in Paris, 1886’

This paper describes the public fasting contest of hunger artists Giovanni Succi and Stefano Merlatti in Paris, in 1886. For more than 30 days, Succi’s performance took place at the ancient hall of the Cercle de la Presse under the supervision of physicians, journalists and ‘curieux.’ Merlatti performed his fasting at the first floor of the Grand Hôtel de Paris and was also supervised by a commission of medical doctors, pharmacists, artists and even the well-known science populariser Victor Meunier. In their fight against public suspicion of fraud, hunger artists’ success in the marketplace relied on the scientific authority of physiologists, but also on other ‘lay’ audiences. Equally, debates on the causes of resistance to hunger strengthened doctors’ public visibility. As a result, public performances and medical supervisions were mutually beneficial for hunger artists’ and doctors’ professional interests. This case study sheds new light on the way in which public fasting shaped the nature and status of late nineteenth-century nutrition as an academic discipline. It contributes to recent historiographical trends which, beyond the laboratory-centred experimental turn, focus on the heterogeneity of scientific practices and their circulation in new sites and local contexts.

Abigail Nieves-Delgado  
*National Autonomus University of Mexico (UNAM)*  
‘The making of the Mexican face: “Caramex” and the history of criminal identification’

In 1993, three anthropologists from UNAM in Mexico City developed a computerized system for personal identification. This system is known as Caramex or “The Face of the Mexican.” The purpose of Caramex is to improve suspect identification by combining elements from a photographic base of Mexican ears, eyes, mouths, eyebrows, chins, and so on. Relying on Bertillon’s and Galton’s legacy and the twentieth-century anthropometric tradition, Caramex aims to achieve an accurate portrait for every possible Mexican offender. The system is currently used by the Mexican Police Department. Through an historical reconstruction of old and new anthropometric practices, the presentation shows how Caramex imposes traditional racial meanings to human variation. In constructing a set of predetermined facial features to represent Mexicans, the system reproduces particular human faces inspired from biological narratives of common origin and nationality. It will be argued that in reifying facial morphologies for representing Mexican ‘types,’ Caramex reintroduces an old form of typological thinking in contemporary scientific
Finally, it will be shown that, as previous racial classifications, Caramex relies on historical and theoretical assumptions about biological differences among human populations.

**Rebecca R. Noel**  
*Plymouth State University*  
‘The diseases of scholars: trans-Atlantic medicine and American schools, 1760-1850’

This paper grounds antebellum American school health reforms in trans-Atlantic medicine. American reformers who developed the school system also strove to use schooling to improve children’s health. They promoted gender-differentiated school exercise, healthier school buildings, and hygiene curricula, with new textbooks. Taking these reforms seriously means mapping their origins in wider trans-Atlantic medical culture. Several late Enlightenment scientific and medical developments influenced American school health. Public health turned to specific populations, including women and children. Chemistry warned about ventilation in confined spaces like schools. The Paris Clinical School’s disease specificity theories favored prevention over heroic therapeutics, while popular health reform contributed its own alternatives. Within that well-known medical scientific frame, historians have overlooked a concern of far older lineage among European physicians: that scholarly living endangers health. This fear took various forms from Plato through the Renaissance and into the Enlightenment. Swiss physician Samuel Tissot spread the alarm in his widely read *Essay on Diseases Incidental to Literary and Sedentary Persons* (1766). Extending education to more children would broaden the risk. Already, rapid urbanization and sedentary living were exposing a growing swath of the public to scholars’ pathogenic lifestyle. European physicians and educators confronted this challenge by the 1770s, Americans after 1825. In response, Europeans and then Americans reshaped schooling to pose a solution, not just a problem. This research focuses on the little-studied problematic of scholarly frailty in an era of expanding education—with implications for inactivity physiology today.

**Allan D. G. Olley**  
*Independent scholar*  
‘Developing astrodynamics at the JPL from ellipses to numerical integration’

In the early 1960s, the Jet Propulsion Laboratory at Caltech supported various scientists and engineers investigating the trajectories of object in space, in terms of space vehicles and in terms of celestial bodies. In this talk I discuss the wide variety of techniques explored by these researchers in the early to mid ‘60s. Drawing on the publications of the scientists and the internal reports of the JPL and the memoirs of some of the associated scientists, I catalogue some of the commonalities and differences in these approaches. Often properties of trajectory would be studied by means of the approximation of conic sections such as Kepler’s venerable ellipses. At the same time others worked to produce computer routines to perform numerical integration or worked on finding analytic solutions to such problems. I discuss the roots of these techniques in traditional celestial mechanics, ballistics, and other disciplines. I also discuss the constraints in factors such as computational resources that favoured some techniques over others at various points in time. I explore the legacy of the JPL’s studies for astronomy and space science. My exploration includes a comparison to the effects of the space program on observational astronomy that has been more thoroughly discussed in the secondary literature.

**Miles Parker**  
*University of Cambridge*  
‘1972 and All That: the Rothschild Report – a memorable event in the history of government’s relations with the science community and its aftermath’

From the 1960s, British Governments became concerned at the gap between policy thinking and burgeoning scientific discovery (e.g. in the 1968 Fulton Report on the Civil Service). In 1971, (Lord) Victor Rothschild, a driving, opinionated scientist with extensive industry and public policy experience, and head of Edward Heath’s new ‘Think Tank,’ the Central Policy Review Staff, reported to Government on “The Organisation and Management of Government R&D” and how government could become (in his words) an “intelligent customer” for research. Rothschild’s implicit model of ‘intelligence’ was that management of R&D by ‘customer’ Departments would bring understanding of research outputs. He
proposed transfer of applied science funds from Research Councils to Government Departments, providing each with a Chief Scientist as proxy customer for research to be commissioned on a 'customer/contractor' basis. The Government largely adopted his proposals in 1972. Though controversial at the time, the Rothschild reforms and the upheavals they brought (see e.g. Gummett, P. 1980, *Scientists in Whitehall* & Hennessey, P., 1989, *Whitehall*) are, in some instances, reversed and otherwise often forgotten; however, the Rothschild framework still defines important assumptions about Departmental relationships with the science community. I will explore the post-1980 history of the Rothschild reforms, the extent to which the Rothschild model accorded with actual practice, and the degree to which Government achieved 'intelligent customer' capability, contrasting an alternative approach to this goal, the 'science broker' model (e.g. Pielke, R. 2007 *The Honest Broker*).

**Giuditta Parolini**  
*Berliner Zentrum für Wissensgeschichte / Technische Universität Berlin*  
'The role of statistics in field experiments'

A consistent part of experimentation in agricultural research takes place in the fields of agricultural institutions or private farms. Unlike laboratory research in which the experimental set up can be artificially controlled, field trials are heavily influenced by complex environmental factors, such as weather conditions and soil fertility, and their results are therefore highly variable from season to season and dependent upon the geographic area under consideration. To make sense of such variability, since the beginning of the twentieth century statistics has been integrated in the design and analysis of field trials. The use of statistics in agricultural research has reshaped tools and practices of field experiments and promoted a division of labour between statisticians and experimental scientists. The paper will examine the Field Plots Committee created at the agricultural station of Rothamsted "to make sure that experiments are statistically and agriculturally sound" (H. V. Garner, 1962). Both statisticians and researchers took part in the Committee that managed the experimental work in the fields of the agricultural institution for several decades. The debates and negotiations that took place in the Committee meetings and the re-distribution of expertise that put statisticians in charge of the design of field trials and of the presentation of the results are here investigated. I will argue that statistics did not become a mere addition to the experimental life of the agricultural institution, but that it reshaped in depth the layout and implementation of field experiments in agricultural science.

**Matthew Paskins**  
*University College London*  
'Public science at the Society for the Encouragement of Arts, Manufactures and Commerce'

In recent years, historians (including Simon Schaffer, Larry Stewart, Thomas Broman and Jan Golinski), have told us a great deal about the public science of the eighteenth century. Spectacular, experimental, and oriented towards the market in public ways, it offered a distinct configuration of knowledge, demonstration, and various conceptions of practical utility. The members of the Society for the Encouragement of Arts, Manufactures, and Commerce, an economic and improving society founded in London in 1754, also used natural philosophy on behalf of what they saw as the public good. In this talk, I argue that the Society gives us a different take on the knowledge, practices and politics associated with public science, which has wider implications for how we should think about science during this period. Theirs was a radically different kind of public and a different kind of science than the picture which historians have given us. Public science at the Society involved other kinds of experimental sites – from workhouses to private homes, field trials and achievements in remote localities. It was focused, primarily, around agriculture. It was based on personal networks of patronage, which were opened to publicity. The Society’s committees always struggled to assert the superiority of their judgments over existing practice. All of this leads to a more dynamic view of what the public character of science entailed, than the standard story allows.
Ana Leonor Pereira  
University of Coimbra  
'Darwin in Portugal: the introduction of Darwin in Portuguese science and culture (1865-1914)'

The presentation aims at providing a comprehensive view of the introduction of Darwin in Portuguese science and culture between 1865 and 1914. Several Portuguese natural scientists acknowledged Charles Darwin's (1809-1882) evolutionary theory in the decades that followed the publication of *The origin of species* (1859), both inside and outside academia. Júlio Augusto Henriques (1838-1928) argued in favour of evolution by natural selection and applied the theory to the human species in two academic theses presented to Faculty of Philosophy of the University of Coimbra in 1865 and 1866. Thereon, a considerable number of academic theses on evolution were presented at the same institution, with many of them addressing several topics that were being debated by the international scientific community of the time. Francisco de Arruda Furtado (1854-1887), a self-taught Azorean naturalist, was a staunch defender and popularizer of Darwin’s evolutionary theory and maintained correspondence with the English naturalist in the early 1880s. Darwin was introduced into Portuguese culture by some of the most prominent figures of Portugal’s celebrated “Generation of the 1870s”: Antero de Quental (1842-1891); Teófilo Braga (1843-1924); Eça de Queirós (1845-1900); Oliveira Martins (1845-1894); and Ramalho Ortigão (1836-1915). These intellectuals produced outstanding and deeply innovatory texts concerning the new logic of life inaugurated by Darwin. For example, Quental strived to renew modern philosophical thought by incorporating evolutionary theory, while Braga updated Comtean positivism with evolution and elaborated a theory of history that highlighted the role played by natural selection and sexual selection in the historical process.

João Rui Pita  
University of Coimbra  
'The role of Júlio Augusto Henriques in the advancement of scientific knowledge at the University of Coimbra: natural history, botany and pharmacy'

The presentation aims at providing a comprehensive view of the role played by Júlio Augusto Henriques (1838-1928) in the advancement of scientific knowledge in Portugal, namely his contributions to Portuguese life sciences and pharmacy during the second half of the nineteenth century and the early twentieth century. Henriques inaugurated the defense of Charles Darwin’s (1809-1882) evolutionary theory in Portugal with two academic theses presented to the University of Coimbra: *Are species modifiable?* (1865) and *The antiquity of Man* (1866). In the first thesis, he analysed all of the evidence supporting Darwin’s theory available at the time from fields such as geology, paleontology, biogeography, comparative anatomy, morphology and embryology. In the second thesis, Henriques applied the theory of evolution by natural selection to the human species, anticipating the procedure Darwin would adopt some years later in *The descent of man* ... (1871). Both theses indicate that he had clearly understood the Darwinian idea of evolution. Most significantly, Henriques did not intertwine Darwinism with the ideas of necessary and teleological progress or perceive natural selection as a deity with predetermined intentions. At the University of Coimbra, Henriques was professor of botany, director of the Botanical Garden and professor of the School of Pharmacy. He was one of Portugal’s most notorious botanists, having published many important works on different subjects and was a mentor to several young botanists. Henriques also published several works on botany applied to pharmacy and medicine. The value of these works earned him national and international recognition.

James Poskett  
University of Cambridge  
'The minds of men are on the move': phrenology in Bengali print culture, 1845-1850'

“Paper, ink, and pen... the press, the publisher, the steamer... such are the means and many motives which we possess, to enable and prompt us to widen the fields of human knowledge, and disseminate it among all ranks of men.” This celebration of the power of print would not seem out of place amidst the evangelical publishers of nineteenth-century Britain. But this paper explores a different context. As this quote from 1840s Calcutta indicates, certain sections of Bengali society also believed print would give them the power to disseminate science. As a case study, this paper takes the group of Bengali phrenologists who founded the Calcutta Phrenological Society in 1845. By 1850, they were publishing
their own periodical: The Pamphleteer. In the European context, the SciPer (science in the nineteenth-century periodical) project clearly demonstrated the merits of a close study of individual periodicals. This paper extends such an approach to South Asian history of science for the first time. Whilst there is a very well-developed literature on Bengali print culture, there are no detailed studies of individual scientific periodicals nor the communities which organised around them. By studying The Pamphleteer, this paper reveals how the Bengali phrenologists linked phrenology and print within their narratives of diffusion.

Constance E. Putnam
Independent scholar
'The apotheosis of Semmelweis and late nineteenth-century interest in public hygiene'

The story of Ignác Semmelweis's discovery (in the 1840s) of the actual cause of childbed fever and the best way to prevent it is reasonably well known. His life and career are typically presented as the sad tale of a tragic hero. Semmelweis's later 'rehabilitation' is sometimes explained as a self-serving attempt by Hungarians (a quarter century after his death) to establish that they had a major medical hero of their own. Tivadar Duka, an ex-patriot Hungarian physician, is on record as having stimulated interest in England in the idea of paying international tribute to Semmelweis. But two other physicians rarely included in the story need to be examined to show more accurately how the improved recognition of Semmelweis's contribution fits in the history of science. Alfred Hegar, a German, was one of the first after Semmelweis's death to undertake (in 1882) to explain both the importance of the Hungarian’s work and how the failure of a general acceptance of his approach was related to Virchow’s skepticism. Also critical to the story is the important work in the growing field of public health and hygiene undertaken by József Fodor, a Hungarian who, among other things, established in Budapest the world’s second chair in Public Health. The culmination of efforts to recognize Semmelweis anew took place at the 8th International Congress on Public Health and Demographics—which not so incidentally was held in Budapest in 1894. These individuals and events constitute an important point of coalescence in the history of science.

Jennifer Rampling
Princeton University
'The adaptive adept: Retooling medieval apparatus for early modern chymistry'

One obstacle to understanding medieval alchemical practice is the lack of material evidence from this period, with most surviving apparatus and drawings of laboratories dating from the sixteenth century or later. To reconstruct earlier practices, we must therefore rely to a large extent on written sources, including instructions for acquiring suitable chemical apparatus. Sometimes these instructions were accompanied by illustrations of furnaces and vessels: the essential ‘furniture’ of alchemy. Unlike many alchemical figures, these illustrations can often be explicitly linked to known chemical procedures. Yet their apparently pragmatic nature can mask the fact that, like the writings they accompanied, medieval diagrams of apparatus also came to acquire considerable authority in later periods. Copied and recopied, such images might become detached from their original contexts: illustrating new texts, or finding new homes in distillation handbooks or patronage suits. This paper will trace the repurposing of several late medieval alchemical illustrations in early modern manuscript and print. At the same time, I shall ask how medieval instructions and designs were actually read. Was their use primarily rhetorical, or did early modern practitioners also take them seriously as advice to be followed when acquiring their own furnaces and glassware? And how did practitioners reconcile earlier sources with new innovations in craft knowledge and chemical technology? Where possible, I shall refer to archaeological evidence to illustrate possible connections.

Georgina Rannard
University of Edinburgh
'Empire and “useful knowledge”: charting the British Atlantic world, 1660-1720'

British Atlantic trade expanded rapidly in both value and volume in the late seventeenth and early eighteenth centuries, incorporating new settlements and lucrative markets. Navigating the Atlantic Ocean and American coastlines demanded natural and navigational knowledge and skills. At the same time, a market for geographical information was developing in London, with institutions and individuals...
involved in this expanding Atlantic world creating demand for maps, charts and geographical texts. How did the priorities of these organisations affect the nature and form of geographical knowledge of the Atlantic? The British economy benefitted significantly from the growth of colonial trade, but how far was this supported by growing circulation ‘formalised’ geographical knowledge? Was the expertise required to navigate the Atlantic and American trade routes collated and translated into printed materials in London, or did it remain in the hands of mariners at sea? In addressing these two issues, this paper will further contextualise the charting of Atlantic trade routes by considering how growing commercial interests shaped the production of geographical knowledge. It will place this process in the context of diverging paths of European economic development.

Jessica Ratcliff
Yale-NUS College, Singapore
‘The East India Company and scientific practice in Imperial London, c. 1815-51’

It is well known that the East India Company was a major patron of the sciences throughout its colonial possessions. But the Company also played an important role in shaping the growth of science within the borders of Britain. This paper considers the East India Company’s place in London science in the first half of the nineteenth century. Focusing on the East India Company Museum at Leadenhall Street, I will explore the Company’s pursuit of an archive of natural knowledge. I will offer the Company museum as a case study of how European economic growth in this period also entailed a changing material landscape and consumer culture of science. Those changes would, in turn, give rise to new forms of scientific practice. I will also consider the question of whether or how the East India Company’s science should count as state science in nineteenth-century Britain.

Amanda Rees
University of York
‘Excavating ‘Deep History’: archaeological field practice and narratives of human identity’

The first aim of this paper is to examine key moments in the evolution of archaeological field practice. It will survey the different methodological practice of the founding UK archaeologists (Lubbock, Pitt Rivers, Flinders Petrie), the mid-twentieth-century quantitative revolutions in methodology, and the development of DNA based and cognitive archaeology in the 80s and 90s. It will show how disciplinary practice evolved in relation to three key digs in Europe, North America and Africa – again foregrounding the significance of place to scientific inquiry – and in the context of different political, economic and intellectual structures. The second aim is to show why it is important to interrogate these studies in this way. First, the immense public interest in origin stories mean that the results of archaeological field practice have an immediate public impact, whether they are focused on the origins of local communities, nation states or the human species. It is incumbent on us as historians of science – as public intellectuals – to be able to show how these narratives have evolved along with changing physical practice and political context. Second, the study of archaeological field practice also holds intriguing possibilities for a more inclusive, and potentially global, history of science. Archaeological studies represent one of the few means by which we can try to understand how cultures outside of the ‘Western’ trajectory interacted with and impacted on what we define as the ‘natural’ world. But to do so, we need to understand the methodological, theoretical and linguistic underpinnings of these studies.

Cameron Roberts
University of Manchester
‘Modernism and the motorways: public contestation of the future of transport (1945-1963)’

While the Beeching cuts are commonly thought to ushered in a road-dominated transport system at the expense of the railways, they were preceded by a series of government decisions favouring cars over trains. Postwar British governments spent considerable sums of money on new motorways, while a planned modernisation of British Rail was cut short in the late 1950s due to lack of funds. Similarly, motorway construction was seen as a valuable use of public resources while the railways were expected to pay for their infrastructure and turn a profit. The government’s preference for road transport can be partially accounted for by considering the popular understandings of road and rail transport in the 1950s.
and 1960s. British newspapers at the time were marvelling over new roads in foreign countries and using modernist language to aggressively promoting motorway construction at home. Railway periodicals’ attempts to develop similar modern associations with rail modernisation never caught on in the mainstream press. This paper will consider how motor transport came to be identified with modernity, thereby contributing to the scholarship on the role of public discourse during the coordination crisis, when rail transport gave way to road transport in the United Kingdom. It will be shown that the identification of cars with modernity played a major role in facilitating the transition to a road-dominated transport system. This implies that such transitions cannot be reduced to their financial, technical, or political elements, but must also be considered in light of larger ideological and cultural developments.

**Anna Marie Roos**  
*University of Lincoln*  
'Francis Willughby (1635-72): the chymical culture at Trinity College, Cambridge'

In 1645, under the aegis of Lord Manchester, the Major-General of the Eastern Association of the Parliamentary Army, the University of Cambridge saw the ejection of a large number of fellows thought to be of the religiously or politically incorrect persuasion. Many students subsequently abandoned a career in the church or in government, pursuing scientific studies and medicine instead. Trinity College saw the formation of a community of scholars interested in medicine and its allied fields of chymistry, anatomy, and botany, including the fellow and botanist John Ray and his protégé Francis Willughby (MA, 1659). Willughby’s commonplace book reveals that from 1658 to 1660, he and Ray were engaged in significant chymical experimentation at Trinity. Scholarly studies of Ray and Willughby have concentrated upon their contributions to ornithology and botany, but their work in chymistry has been little analysed. As chymistry was a basic analytical tool for seventeenth-century natural philosophers, an understanding of their chymical investigations sheds further light on their work in natural history. Furthermore, Ray and Willughby were also engaged in chrysopoeic investigations into the transmutation of matter, aided by foreign chymists paid by Trinity who tutored fellows in the subject. Although it is now well known that Newton performed extensive chymical work at Trinity College from 1669 until 1695, it seems there was a well-established chymical culture at Trinity decades earlier.

**Camilla Mørk Røstvik**  
*University of Manchester*  
'At the edge of their universe: art and science at CERN, 1954-2014’

In 2011 the European Laboratory for Particle Physics (CERN) in Geneva, Switzerland, announced a new competition that would give an artist the chance to collaborate with its staff and work. Since then five artists have been part of Collide@CERN, giving lectures, creating art and meeting scientists at the organisation. The programme has been met with enthusiasm from the Sci-Art environment, amused curiosity from art and science media, and little criticism. This paper seeks to critically examine the collaboration by asking what art can tell us about CERN. By analysing the artists and artworks that engage with CERN, before and after this new collaboration, the hope is to highlight the ways in which the organisation is seeking a certain type of representation and image today. As the Higgs boson was ‘discovered’ in 2012, quickly followed by a Nobel Prize in Physics to CERN-scientist Peter Higgs in 2014, the organisation has never enjoyed so much favourable limelight as now. However, the timing and aims of Collide@CERN point to a different reality of uncertainty about what will happen next to the employer of thousands of scientists and engineers, cleaning staff, librarians, security guards and, recently, artists. This paper argues that concerns about its future around 2010 led to the focus on reimagining CERN as a culturally relevant space. By exploring these questions as an art and science historian, this analysis will focus on what art can tell us about physics, and why it matters.
Richard Serjeantson  
*Trinity College, Cambridge*  
‘Natural philosophy in seventeenth-century Cambridge: a tale of three notebooks’

A flurry of recent historical research into sixteenth- and seventeenth-century notebooks has yet to impact the history of the sciences in the English universities as thoroughly as it deserves to. The goal of this paper is to offer an account of the nature, and also the trajectory, of natural philosophical education in the University of Cambridge between c. 1600 and c. 1670 from the perspective of three manuscripts in particular. The latest is well-known: it was kept by the young Isaac Newton across the 1660s (Cambridge University Library, Add. MS 3996). The other two, however, have scarcely been studied at all. One is the extensive commonplace-book kept by the future ornithologist and founding fellow of the Royal Society, Francis Willughby, during his time as a fellow-commoner in Cambridge between 1652 and 1662 (Nottingham University Library, MS Mi LM 15/1). The third and earliest manuscript was kept by one George Palfrey during his MA studies at Cambridge in the earlier 1620s (still in private ownership, this has recently been edited by C. J. Cook as *The Palfrey Notebook*, 2011). Taken together, this trio of documents (along with other evidence) will offer an opportunity to reassess the nature, status, and development of natural philosophy across a period of its transformation. In particular, this paper will use the perspective they offer to propose a fresh thesis about the dynamics of the impact of the ‘new philosophy’ in England.

Cornelis J. Schilt  
*University of Sussex/Newton Project*  
‘Corpus Newtonicum: reconstructing Isaac Newton’s working methods’

When Isaac Newton died in 1727 he left an enormous collection of draft manuscripts, mainly on alchemy, theology and ancient history. Because of their unorthodox nature none of these writings were deemed fit for publication. Similarly, when the fifth Earl of Portsmouth donated the manuscripts to Cambridge in the 1870s, the scientific materials were gladly accepted, but the rest were returned, to be finally sold at a virtually unnoticed Sotheby’s auction in 1936. It was not until the 1970s that scholars finally began to interact with these materials, who by then were dispersed all over the world. Today the web-based Newton Project provides access to the majority of Newton’s writings. For the first time in history we are able to ask and answer questions involving the whole of the Corpus Newtonicum. Previous generations of scholars focused on the coherency of Newton’s work in terms of a unified programme, or at least stemming from a single mind and therefore methodologically connected, without convincing results; but then they did not have access to the digital treasure we have today. Moreover, they had to deal with the manuscripts as they presented themselves in their disordered state. Throughout the centuries Newton’s drafts have been ordered and reordered, thereby destroying much of the original order Newton applied. But the combined manuscripts are a blueprint of his own ordering and working practices. In this paper, I will demonstrate how sophisticated digital techniques allow us to excavate these and provide a glimpse of Newton’s brain.

Scott Schorr  
*University of St Andrews*  
‘Why Europe won the Space Race: cooperative governance, the STEM-industrial complex, and the girth of the European Space Agency (1975)’

The Cold War is over. It has been over for a generation. The historical narrative for space science and its institutions needs a new narrative, one that properly places institutions of science, technology, engineering, and mathematics (STEM) within a new paradigm. Caught between the splendor of Sputnik and the allure of Apollo, Europe found itself wedged between a dual struggle for power and industrial mobilization between the United States and Soviet Union in what has popularly been referred to as the ‘Space Race’ of the Cold War. To the East, an Iron Curtain draped nation-states such as Poland, Hungary, and Czechoslovakia by means of control through coercion. To the West, nation-states such as Belgium, Norway, and Switzerland remained partially covered by a *North Atlantic Curtain* as a result of post-war geopolitics. It was the prerogative of Western European powers such as these to debate and decide whether their future would remain purely national under the *North Atlantic Curtain*, or to establish a new *Transnational Collaborative Curtain* to shield themselves from American influence, and with it a common
European identity in the West. On both sides of an East-West European dichotomy, these Iron and North Atlantic curtains were tugged and pulled by governments in Moscow and Washington DC, often without care of the consequences for the people and governments holding the other end. This paper is an adaptation of my M.Litt dissertation titled *A European Constellation: Transnational Identity Formation During The Founding Fusion of the European Space Agency.*

**Désirée Schauz**  
*Technische Universität München*  
'Science policy in search of new semantics: basic research in the era of the Second World War'

This presentation will focus on German science policy in the early twentieth century and the emergence of the new concept of ‘Grundlagenforschung’ (basic research). So far, the concept of basic research has not been associated with the era of the German Nazi Regime. After the Second World War, ‘basic research’ became a symbol for scientific autonomy, and this idea of autonomy could not be reconciled with the Nazi Party’s ideology of subordinating science under its political aims. In contrast, this presentation will demonstrate that the use of the relatively new concept of ‘Grundlagenforschung’ already became common in the Nazi period. After the government had established the Reich Research Council in 1937, the new distinction between ‘Grundlagenforschung’ and ‘Zweckforschung’ (goal-oriented research) emerged. Since the Nazi ideology denounced the old ideal of pure science as a liberal bourgeois ideal that had permanently estranged science and scholarship from the German people, science policy advisers had to find new concepts to mediate between scientific and societal needs, interests and ideals. Désirée Schauz argues that the concept of basic research worked as a discursive strategy to bridge the gap between the uncertainty of the scientific endeavour and the scientific promise of technological innovation.

**Elise Smith**  
*University of Oxford*  
'Physical deterioration, national efficiency, and the Royal Navy, 1880-1910'

By the end of the nineteenth century, fears that the British population were experiencing a widespread physical decline took hold in popular and medical discourse. Army recruitment statistics from the Boer War, showing that a high proportion of men had been rejected as physically unfit, helped to fuel anxieties about the strength of the military and the nation’s defensive capacities. Yet the state of naval recruits seldom featured in these warnings, and the sea service remained largely unscathed by the debates over physical efficiency at the turn-of-the-century. This paper argues that the Royal Navy had successfully implemented many of the principles of the Victorian health reform movement by the early 1900s, and that the spectre of degeneration which hung over Britain materialised only theoretically for the Navy, as commentators suggested that the force would be unable to renew itself in future years. Certain observers became particularly fixated on the number of foreigners serving aboard ships, arguing that non-British sailors were overwhelming traditionally robust English ones. Schemes to improve the physical standards of adolescents training for the Navy were proposed, and Greenwich Hospital School, the ‘cradle of the Navy’ became a testing ground for many new theories of healthy development, from diet to exercise. By the mid-Edwardian period, the Navy’s success at parrying physical decline through systemic lifestyle reforms were heralded as a counter-example to continued claims that the nation’s decline was inevitable and irreversible.

**Paul Smith**  
*University College London*  
'Engineering a chilly reception: experiments in prolonging the life of horticultural produce, 1917-1930'

Between 1910 and 1930 an array of experiments were carried out at UK horticultural research stations using glasshouses, laboratories, containers and the open ground. These experiments impacted significantly on horticultural scientists, commercial growers and consumers. Among them there were the investigations carried out to extend the life of horticultural produce. One aspect of this post-harvest research were the experiments on low temperature storage of horticultural crops conducted by Kidd and West, based at Cambridge University and funded by the Department of Scientific and Industrial Research. Their pioneering work, 1917-1930, is examined. They investigated different storage temperatures and
altered the composition of the atmosphere of the storage chambers. In 1922, Cambridge opened a state of the art Low Temperature Research Station and Kidd and West used this facility to control variables more effectively and extend the research on controlled atmospheres. It was hoped this work would enable growers to overcome sharp falls in prices caused by gluts, consumers to enjoy home grown horticultural produce for longer periods and Australian producers to feel confident their exported fruit would arrive in prime condition. By promoting the consideration of a wider range of variables, by stressing the importance of painstaking data accumulation and by developing innovative laboratory equipment, the ground-breaking work of Kidd and West set standards for the design and conduct of post-harvest experiments in horticulture. Their methods and equipment were adopted, then modified, by a number of research stations and commercial establishments in the UK and other countries.

Alistair Sponsel  
Vanderbilt University  
‘From description to theory: how coral reefs changed nineteenth-century hydrography’

From 1778 until about 1850, the charting of what became known as coral reefs posed a special problem for hydrographic surveyors. Low islands and reefs were already feared for the hazard they posed to navigation in the tropics; Captain Cook had run aground on New Holland’s ‘Great Barrier’ in 1770. It was in 1778 that J.R. Forster, who had been naturalist on Cook’s second Pacific voyage, became the first European to declare such reefs to be the product of organic growth. The possibility that living corals were capable of extending existing reefs or producing entire new ones in parts of the sea that had formerly been clear of obstruction called into question the entire enterprise of managing risk by the production of highly accurate charts. In this paper I argue that the peculiar threat posed by coral-reef growth forced a change in the practice of surveying, away from prioritizing the accurate description of specific locations toward seeing individual reefs as representative instances and emphasizing survey practices that might produce broadly-applicable theories of the coral reef formation.

James Sumner  
University of Manchester  
“‘Choose the one that makes the best noise’: selling computer technology in the age of mundanity”

Several historians and social theorists have charted the eruption of computers into everyday British home life, as promoters in industry, education and policy circles built up engagement with the new machines as a potential silver bullet for the country’s post-industrial woes. But what happened when the novelty wore off? The fervent enthusiast culture of the early 1980s certainly expanded the audience vastly, in size and cultural breadth, beyond its 1970s radio/electronics hobbyist precursors; yet it still had its limits. In 1983, the market hit saturation point, triggering an abrupt crash which wiped out most of Britain’s distinctive indigenous microcomputer manufacturers. In the new climate, only one UK firm bucked the trend by succeeding as a new entrant: Amstrad, the established hi-fi manufacturer headed by Alan Sugar, a charismatic entrepreneur who unapologetically ignored novelty and sophistication, selling cheap microcomputers configured as electronic word-processors to displace manual typewriters. As ‘box-shifting’ became the norm in retail, and as the crusade for ‘computer literacy’ became a natural victim of its own success, promoters had to respond to a world in which the notion of ‘the computer’ itself had less purchase on users’ minds. My paper looks at three responses: the notably unreliable approach of seeking to revive future-minded kudos by grafting on newer technologies; the short life of the ‘leisure software’ industry, conceived as a family-oriented alternative to ‘playing games’; and the games market itself, which, though a roaring long-term commercial success, ultimately frustrated many manufacturers’ ambitions.

Sarah Swenson  
University of Oxford  
‘The biology of altruism and the post-war social order: a reconsideration of the meaning behind inclusive fitness’

W.D. Hamilton’s theory of inclusive fitness, fully communicated in 1964, mathematically delineated the limits of altruistic behaviour that continue to be used today. Popularized as kin selection, it became a
major feature of two monumental, yet controversial, biological texts in the following decade: E.O. Wilson’s *Sociobiology* (1975) and Richard Dawkins’s *The Selfish Gene* (1976). Hamilton claimed that behaviours that appear altruistic are ultimately selfish since they tend to benefit close relatives and, therefore, the genes of the individual performing the behaviour. The socio-political ramifications of the theory, however, were profound. According to Hamilton, it made the goal of communism impossible to realise, and it questioned the ideas that world peace was attainable and racism eradicable. Using material from Hamilton’s archive—only recently made fully accessible—I will demonstrate the extent to which his interest in the social behaviour of animals was wound up in his concerns (often markedly conservative) for the future of human society. Marking the fiftieth anniversary of inclusive fitness, this paper reveals the impetus behind Hamilton’s choice of subjects. In so doing, it argues that Hamilton’s theory was derived not from a knowledge of social insects, as is commonly thought, but from an intuitive understanding, combined with anthropological data, about kinship and prosocial behaviours and their limitations within human populations. Through an understanding of the social and political world in which Hamilton developed the theory for which he became famous, I hope to shed light on the extent to which extrascientific factors influenced the field of genetics in the post-war world.

Tillmann Taape  
*University of Cambridge*  
‘A quintessential craft: Hieronymus Brunswig’s adaptation of learned alchemical concepts of distillation into artisanal medicine making’

Hieronymus Brunswig was a busy surgeon and apothecary, practising chiefly in and around the Alsatian town of Strasbourg. Despite his apparent lack of university education, he read widely and wrote prolifically on medical topics in his native dialect. In particular, his two manuals on distillation, published in 1500 and 1512, were highly popular and saw numerous reprints. While distillation had always been a key process in alchemists’ projects of transforming and purifying matter, the sixteenth century saw increasing interest in distillation as a means of producing powerful and reliable medicines. Written in the vernacular and with a technical focus, Brunswig’s manuals situate the project of distilling medical remedies at the intersection of alchemy, artisanal knowledge and charitable healing. This paper investigates how Brunswig’s assimilation of learned alchemical cosmology and matter theory shaped his artisanal understanding of distillation. More specifically, I show how John of Rupecissa’s fourteenth-century work on quintessence influenced Brunswig’s concept of distillation as a process which had the power to harness nature’s healing powers. By extracting and purifying medicinal properties from unstable natural matter, distillation helped to defy physical corruption and produced remedies with a predictable effect on the human body. Tracing this concept in Brunswig’s meticulous and highly technical instructions, I aim to show how Rupecissa’s notion of quintessence translates into concerns about artisanal skill, technical precision and reproducible practice in the production of both medicines and medical books.

Kostas Tampakis  
*National Hellenic Research Foundation*  
‘ Estranged bedfellows: borderland science, Eastern Orthodoxy and calendar reformation in twentieth-century Greece’

The modern Greek State was one of the last European states to affect a calendar reformation in 1923. Calendar reformations, as recent scholarship has taught us, are not trivial events. They involve not only the temporal ordering of events, but a host of social, intellectual and political processes, even the experience of history itself. In the Greek case, the persistence of the older Julian calendar until that date can be traced to Greece’s Ottoman past and to the ecclesiastical needs of the Greek Orthodox Church, a powerful national and cultural symbol. The reformation itself was the result of the modernistic aspirations of the state and did not meet any serious opposition from the official Church. However, a minority within the Church objected, resulting in a schism that persists even today. Thus, it was a case of science and religion working together under the aegis of the state, while meeting opposition from within the Church itself. This paper proposes to use the Greek calendar reformation as an opportunity to map the various ways scientific and religious practices met in the borderland of Europe that was Greece at the time. It will trace the various actors and agents that made the reformation possible and discuss how the public responded to the many changes involved. In the end, the study of Greek calendar reformation could
help us identify novel forms of interaction between science and religion, as well as ways of describing them.

Zuayta Tauqueer
University of Oxford
"The door to the Frontiersman’s heart": medical intervention on British India’s hostile Afghan border'

The northwestern frontier of British India bedevilled imperial policymakers for a hundred years. A gateway for invaders from Central Asia, the barren mountainous territory bordering Afghanistan was home to the Pathans, considered a fierce, warlike people. The British refused to formalise their rule over this population; nevertheless the Government of India (GOI) repeatedly acknowledged its failure to invest in the socioeconomic welfare of these ‘British protected persons.’ GOI officials cited local opposition as responsible for this failure. The tribesman, they claimed, “would rather remain free and undeveloped than developed and administered.” I use the history of medicine of the northwestern frontier to challenge this particular narrative of development in the region. The idea of the antagonistic, independent Pathan tribesman was largely a deliberate construction intended to excuse greater investment there at a time of significant upheaval elsewhere in India. In contrast to accusations of intransigence regarding development, I find evidence of proactive engagement between locals and British medical men. Tribesmen sought western medicines—for malaria, smallpox, TB—in mission clinics, distant provincial hospitals, even in British military forts. Medical officers meanwhile explicitly noted the great potential of British medicine in building influence in tribal territory. “There is one door which only the doctor can unlock and that is the door to the Frontiersman’s heart,” wrote one British frontier surgeon. Failure to heed this advice obstructed meaningful colonial intercession in this precarious region. Pathan anti-colonial activists cited lack of health services as evidence of the colonial government’s neglect of tribal welfare.

Mienieke te Hennepe
Museum Boerhaave, Leiden
‘Van Leeuwenhoek – The Movie: cinema as agent of national identity and scientific heritage’

Science cinema in the 1920s and 1930s transformed the heroes of the past and their scientific discoveries into a visual spectacle of commemoration and celebration. The 1924 movie about the life and work of the Dutch microscopist Antoni van Leeuwenhoek (1632-1723) allowed audiences all over the Netherlands to witness the wonders of the microscopic world as seen through the eyes of the scientist renowned scientist. The film, produced by avant-garde filmmaker Jan Cornelis Mol, depicts abstract objects and moving imagery of microscopic investigations. Turning the audience into a spectator of Van Leeuwenhoek’s investigations, this early example of experimental microcinematography functioned as a way to witness the history of science in a new manner. Moreover, the microscopes portrayed in the film would soon feature at the centre stage of the newly established Dutch National museum for the history of science, now Museum Boerhaave. Visual culture thus contributed not only to build up national identity, but also shaped a collective imagery of microscopy and the illusion of a glance into the past.

Anne M. Thell
National University of Singapore
‘The mind in motion: Margaret Cavendish, organic materialism, and the mobility of thought’

Many scholars have discussed the relationship between Margaret Cavendish’s fictional travelogue, Blazing World, and her treatise on natural philosophy, Observations upon Natural Philosophy, which she published together in both 1666 and 1668. Few scholars, however, have focused on Cavendish’s use of the travel genre and its connection to her natural philosophy. Cavendish might have chosen a travelogue as the companion piece to Observations for a whole variety of reasons. On one hand, travel writing was a primary vessel of the experimental program that she wished to critique, and therefore it makes sense that she would employ the genre to illustrate her competing theory of nature. Even more important, I argue here, are the theoretical links between travel and Cavendish’s natural philosophy. Both Cavendish’s ontology and her epistemology are predicated on motion: For Cavendish, to be is to know and to move. Moreover, in much of her writing, Cavendish considers the imagination a type of travel: like Hobbes, she
understood fancy as “a Celerity of Imagining” that liberates the mind from “patterning” external stimuli. On a variety of levels, then, Blazing World’s genre and its thematic focus on mobility work to dramatize a universe that Cavendish sees in constant, ever-changing motion. At the same time, Blazing World is a piece of travel fiction, and while it expounds many of her philosophical ideas, it also explores concepts that Cavendish found uncertain or untenable in philosophical contexts. In so doing, Cavendish shows an astute awareness of the conjectural nature of her philosophy, while at the same time demonstrating the value and the necessity of speculative, imaginative thought.

Anke Timmermann
Darwin College, Cambridge
‘Alchemy at Cambridge – a collective perspective’

While connections between Cambridge, alchemy and Newton have been researched extensively in recent years, alchemical manuscripts in Cambridge represent a much wider, older and more diverse tradition than hitherto acknowledged. This talk presents newly discovered aspects of alchemy in Cambridge collections, based on research dedicated to this topic in the past academic year. Cambridge holdings of alchemico are both diverse and often not captured adequately in catalogues: unidentified fragments of well-known works, digests of reading notes both scholarly and artisanal, short recipe texts, and a large number of anonymous compositions have been particularly invisible to scholars to date. These alchemical items arrived at Cambridge through bulk donations or individually, often at the end of now-untraceable journeys through the Latin speaking world, and in miscellanea of too varied an origin to be classified in any manner. Also, whether simple ink sketches or expertly executed decorations, alchemical images that do not form part of the recognised visual canon of alchemy have not been fully appreciated in scholarship. Considered in the context of Cambridge and as a group of collected knowledge, however, Cambridge manuscripts inform our understanding of the production, circulation and reception of alchemical knowledge in writing. It is the aim of this talk to suggest ways in which a fresh perspective on the material and cultural histories of these collections may contribute to the history of alchemy.

Simone Turchetti
University of Manchester
‘A very national Geophysical Year? The IGY in Italy’

The IGY has been portrayed it as one of the chief examples of scientific internationalism during the Cold War. Early works have emphasized how it helped to reduce tensions between Eastern and Western blocs using science as a way to overcome Cold War divisions. Later literature has revealed the underlying (and at times hidden) agendas of IGY programmes looking in particular at the collection of global data and their significance – also for military research organizations. Few works, however, have analyzed why nations that played a less relevant role in the Cold War conflict sought to be part of this event. Using archival materials from its national Institute of Geophysics I seek to explain why a national IGY committee was set up in Italy. I suggest that Italian promoters of geophysical research understood that the resonance of the IGY – nationally and internationally – could help them to put together the resources needed to complete an outstanding programme of national surveys. This was first elaborated at the end of WW2, but could not be completed because of lack of funding. Using the IGY as a lever, Italian scientists thus obtained the additional funds needed to advance this programme. I thus conclude that if for several other research groups the IGY was an opportunity to develop collaborative work internationally, the Italians looked much closer to home when setting their research agenda for this international event.

Karin Tybjerg
Medical Museion, University of Copenhagen
‘From Pathological Collections to Biobanks: Medicine as a Collection Science’

During the nineteenth-century the landscape of disease was categorized and ordered in medical museums. Collections of pathological organs and malformed embryos were presented in a similar fashion to stuffed animals and boxes of butterflies in natural historical collections and as the natural history collection ordered the field, the pathological collections ordered the clinic. The collections thus
created a material link between theoretical medical knowledge and the clinic. After the invention of the microscope and the development of cell culture, interest in disease shifted to the cellular and later molecular level. Disease is now understood and categorized on the basis of biopsies and blood samples. Collection of human material continues, but it now takes the form of tissue samples kept in freezers in biobanks for diagnostic or research purposes. Thus the physical samples still bridge research and clinical work, even though the two have moved further apart in modern biomedicine. My claim is that the practices and functions of contemporary biobanks are closely related to those of the pathological museum. The differences lie in the changes in methods of analysis and concept of disease. I shall draw on John Pickstone’s concept of “ways of knowing” as well as Bruno Strasser’s account of collection in biology to draw the parallels and demonstrate that collections play a central role both to medicine and biomedicine. Biobanks may be regarded as the medical museums of twenty-first-century biomedicine.

**Ruth Wainman**  
*University of Kent*  
‘Rebelling against the “System”: embarking on a scientific career in Britain from World War II to the early post-war period’

In a British Library interview for “An Oral History of British Science,” physicist and noted developer of flat-panel liquid crystal displays, Cyril Hilsum, remarked that his work with the civil service was sometimes like being in a ‘system’ of promotions and changing promises of senior personnel. Using this account and other life story interviews provided by “An Oral History of Science” which has captured the lives and careers of some of Britain’s most eminent scientists since 2009, this paper will provide an insight into the highs and lows of embarking on a career in science from WW2 to the early post-war period. With reference to scientists who went on to find careers across industry, academia and government, this paper will examine the factors affecting scientists’ recruitment and experiences of these different institutions as well as the opportunities provided by them to pursue a career in science. The interviews will also be complemented by governmental records and journals to further explore some of the methods that were used to publicize scientific careers in order to aid recruitment. In this respect, we can start to build up a more detailed picture of the organizational structures and personal experiences behind embarking on a scientific career.

**Michael Weatherburn**  
*Imperial College, London*  
‘Scientific management at work: Charles Bedaux, Liberal technocrats, and the triumph of scientific management in Britain, 1920–50’

There is a longstanding historiographical consensus that Britain, particularly its liberal manufacturers such as Edward Cadbury and Seebohm Rowntree, rejected F.W. Taylor’s system of scientific management in the period up to 1920. This literature also asserts that scientific management was actually far more influential as a theory than as a practice, and also that, when compared to all other major industrial nations, scientific management theory had minimal impact on Britain. Building on recent research by Edgerton and Scranton, this paper shifts the analytical focus from theory to practice. In doing so, it will tell a very different story from the one frequently presented. It will explore an industrial Britain in which the practice of scientific management peaked, not around Taylor’s death in 1915, but long afterwards, radically expanding through private and public sector manufacturing as a response to the production and labour supply crises of 1940-3. Influential liberals in British industry, especially Rowntree and his protégé Lyndall Urwick, will be examined. A key focus will be the professional embarrassment caused by the 1944 suicide of Charles Bedaux, a management consultant of some notoriety, specifically Bedaux’s wartime collaboration with the Nazis. As Urwick was also a historian, he soon erased Bedaux and his extensively-used ‘Bedaux system of human energy measurement’ from the historical record. From 1949 onwards, Urwick and other liberals replaced Bedaux and his system with a canonised version of F.W. Taylor, a controversial icon who subsequently fell under attack from both the left and right.
Simon Werrett  
*University College London*  
‘Making a home for science in early modern England’

Much of the focus on the spaces of early modern science has been on dedicated spaces – alchemical laboratories, observatories, cabinets of curiosities and academies. But it has long been known that most science in this period was done in scholars’ homes. Early modern houses underwent many transformations between the sixteenth and eighteenth centuries, and this included serving as locations for experimental inquiries. While scholars such as Deborah Harkness and Gadi Algazi have explored the social significance of the family for early modern science, little attention has been given to the home as a physical and material space for science. This paper will explore three rooms in the early modern home which were adapted to scientific ends – the kitchen, the bedroom, and the cellar. I will argue that these spaces constituted particular opportunities and constraints for adaptation to experimenting as each afforded different utensils, furnishings, and material conditions which could serve experimental programmes of inquiry. Furthermore, I suggest that the home was not used incidentally, just because more dedicated facilities were unavailable, but was part of a larger goal on the part of philosophers to adapt and exploit existing resources to learn more about nature. Finally, doing science in the home was always connected to the social relationships of family, servants, and external communities. Not just rooms but people needed to be adapted in order to recycle the home as a new space for science.

Alice White  
*University of Kent*  
‘De-militarising management science and “Settling down in Civvy Street” after World War II’

At the end of the Second World War, scientists who had developed psychological techniques for the British army were leaving military service. They were adapting their practices, such as personnel selection tests, for civilian use, and applying their theories to help soldiers adjust to civilian life through Civil Resettlement Units. This paper will consider how this science of managing men demobilised. It had been a ‘Big Science’ during the war: military, state sponsored, utilising large numbers of practitioners from different disciplines, with a broad geographical spread and in some respects impersonal for both practitioners and subjects of study. The transition to peace required a move towards practising on a small scale with funding from industry and charities. The processes by which theories and methods were legitimated will be explored using recently released archival documents. These processes were made more complex by state censorship that restricted publication on war work, and which resulted in a problematic status for the discipline on the edge of acceptable limits of ‘science.’ Informal networks will be highlighted as particularly important in enabling the science to survive without the support of the military, facilitating its “settling down in civvy street.”

Rosa Williams  
*University of the Free State*  
‘Colonial medical knowledge and its limits in Mozambique at the turn of the twentieth century’

This paper addresses ways in which practices of colonial medical knowledge-production in Mozambique at the turn of the twentieth century met with limits – pragmatic limits to what could be medically known and conceptual limits to what counted as medical knowledge – and the places where these limits met. I argue that *what could be medically known* in the colony was limited not only by the poor reach of state infrastructures for gathering knowledge about the health of populations, the inadequacies or indifference of some of those administrators charged with that task and the capacity of colonial subjects to evade medical interventions but also the slow dissemination of changing medical paradigms and the contested nature of the emerging field of tropical medicine. Recurring references to these limits in the archives of the medical services suggest a Portuguese self-consciousness of the shortcomings of colonial knowledge-making, amplified by Portugal’s position at the margins of trans-imperial scientific networks. This contributed to medical officials anxiously policing the boundaries of *what counted as medical knowledge* and of who was authorised to make claims to that knowledge while in certain instances threatening the commitment of the administration as a whole to maintaining those boundaries. So, while medical moral commitments to preserving life were invoked in prescriptions of the limits of state practices of codifying ‘custom,’ acknowledgement of a failure to meet the medical needs of all the colony’s inhabitants
authorised plans, themselves largely unrealised, to license non-biomedical healing practices or to supplant them with locally trained nurses: ‘official curandeiros.’

**Jessica Wright**  
*Princeton University*  
‘All in the mind: brain, soul, and mental disorder in the fourth century CE’

Localisation of the psychic faculties (for example, imagination, thought, and memory) in the cerebral ventricles is first attested within the Greco-Roman medical tradition in the late fourth century CE. It was to prove a highly durable model, lasting in Europe until the dismantling of the Aristotelian paradigm in the seventeenth century. This paper explores the rising interest in the material structure of the brain—and its relationship to mental illness, the intellect, and the soul—among doctors and theologians in the century during which Christianity became a dominant force within the Roman empire. Our case study will be the fourth-century bishop Nemesius of Emesa (Homs, Syria), whose anthropological treatise *On the Nature of the Human Being* exhibits close familiarity with medical texts, and offers the earliest witness to the ventricular model. Our focal point will be the relationship between localisation in diagnosis of mental disorder (for example, damage to the brain, versus damage to the heart or stomach) and perceptions of the relationship between body and soul. As we shall see, the central question of whether the soul could be damaged in mental illness was treated chiefly with reference to the brain (even if to dismiss it). The problems associated with localising psychic faculties in the brain were to trouble theologians for centuries to come. The fourth century marks the beginning of these discussions, offering a rich, if neglected vantage point onto the engagement of religion with science over questions of psychic function and dysfunction central to both.

**Rebecca K. Wright**  
*Birkbeck, University of London*  
‘Economies of limitation: Jacques Loeb’s mechanistic conception of energy’

In 1926, the British radiochemist Frederick Soddy recommended energy as an objective standard to fix the arithmetical blunder endemic to the entire “hells brew of scientific civilization.” Energy, Soddy explained, was an intrinsic value standard to escape the fallacy of perpetual motion upholshing the monetary price system. Soddy was not alone in this determination. As energy became a central paradigm in the life sciences in the early decades of the twentieth century, it was privileged as an absolute standard to correct the ‘blunder’ of surplus value. As predatory culture relied on the specious logic of endogenous excess, energy was hailed as a standard to correct an unbalanced society founded on the chimera of value. In this way whilst pecuniary culture extended onto the infinite, energy provided a political discourse centered on limitation. Energy, I will argue, became as much a social arbiter as a biological modulator. To do this, I will explore how Jacques Loeb, a German-born American physiologist, proposed a ‘mechanistic conception of energy’ as both a critique of biological (vitalist) and pecuniary excess. I will suggest that Loeb’s energy conception can be viewed within an expanded context, in which energy became central to a social and economic critique of culture. I will look at how Loeb engaged with these emerging discourses, in dialogue with his friend and colleague Thorstein Veblen, and at how his formulation became a social epistle for subsequent intellectuals like Upton Sinclair, Theodore Dreiser, and the later technocracy movement. By tracing these different articulations, I will argue that a socio-political-economic agenda was hidden behind the neutral façade of energy. I will ask how energy, despite the cultural and ideological work it performed, maintained its stubborn claim to objectivity?

**Yang Haiyan**  
*Peking University*  
‘Min Chueh Chang: a transnational reproductive biologist’

The role of Chinese-American scientists in the formation of international scientific networks after World War II has recently attracted increasing interest from historians of science. This paper aims to examine a unique figure, Min Chueh Chang (1908-1991), who not only himself had a transnational educational background, but also contributed to the transnationalization of the American scientific community. With a
BSc from Tsinghua University (1933), Diploma of Agriculture from the University of Edinburgh (1939), and PhD from the University of Cambridge (1941), he eventually joined in the Worcester Foundation for Experimental Biology (WFEB) in Shrewsbury, Massachusetts in 1945 and spent the rest of his life in the US. Chang’s major achievements included the discovery of sperm capacitation, in vitro fertilisation of mammalian eggs, and transplantation of oocytes and embryos. He also made an essential contribution to the creation of a steroid contraceptive pill. Throughout his scientific career, as a scientist who crossed borders and maintained connections afterwards, he helped to make the WFEB a mecca, attracting students and young scholars from Europe (especially the UK), Japan, and in due course from mainland China. Examination of Chang’s career provides an illustration of how the American scientific community was transnationalized, and helps our understanding of the development of international scientific networks following World War II, revealing political and cultural threads embedded in them.
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The next BSHS Annual Conference will take place at Swansea University from 2-5 July 2015. Currently nestled in the southwest corner of the expansive Singleton Park, with views overlooking Swansea Bay, the University is expanding on to a second campus later in 2015. History of science, technology, and medicine occurs at Swansea in many places and forms. The College of Science hosts ‘Scientists, Science, and Society’, a seminar series in the history of science and technology. Collaboration between members of the College of Arts & Humanities and the College of Human & Health Sciences has generated a Research Group for Health, History, and Culture, and has led to the university becoming a major centre for disability history, with projects such as the Wellcome-funded programme ‘Disability and Industrial Society’. Meanwhile, the Cu @ Swansea project, a collaboration between the University and the City and County of Swansea, is pursuing the investigation, preservation, and regeneration of the Lower Swansea Valley copperworks, centre of the nineteenth-century global copper trade. The attention of Swansea historians is also turning to the untold histories of the Welsh steel industry. The University commemorates South Wales’ connections with nineteenth-century scientists in the names of many of its buildings and lecture theatres, among them Faraday, Wallace, and Grove.

Thought to have been founded c. 1014, Swansea is located just to the east of the Gower Peninsula, the first site in Britain to be designated an Area of Outstanding Natural Beauty, and about an hour by road or rail west of the Welsh capital, Cardiff. The Brecon Beacons National Park lies a short distance to the north. The region is known for its glorious countryside and beaches, rich medieval and industrial heritage, and vibrant sporting and musical traditions. In the nineteenth century, Swansea’s philosophical and literary society became the Royal Institution of South Wales, a major centre of scholarly activity; its extant collections and building survive as the Swansea Museum. The nearby Waterfront Museum, a branch of the National Museum Wales opened in 2005, is devoted to the history of Welsh industry and innovation. The city also hosts the West Glamorgan Archives Service, whose holdings date back to the twelfth century; both it and the University’s Richard Burton Archives, preserve many documents relating to the region’s industrial past.

A call for papers with more information will be published in the autumn on the BSHS website: http://www.bshs.org.uk/
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- Officers of the US Army Venture into Research, 1840–60, Gordon
- The Bélidor Bascule Bridge Design, Barpi et al.
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University of California Press
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Yale
http://yalepress.yale.edu
Credits and Acknowledgments

Local Organisation
Aileen Fyfe (lead), Isobel Falconer, Sarah Easterby-Smith, John Clark, Julie McDougall-Waters and Noah Moxham

Academic Programme
Jenny Rampling

Administration
Lucy Santos and Malcolm Noble

Postgraduate Helpers
Arik Clausner (lead), Hannah Grenham, Dawn Jackson Williams, Sebastián Kroupa, Sam Robinson

Our Thanks to
Hasok Chang, Simon Chaplin, Sally Horrocks, Jeff Hughes, Richard Noakes, James Sumner (BSHS)

The School of History, University of St Andrews; the Institute of Intellectual History; Ann Martin and Audrey Bruce (Conference Office); Maia Sheridan (Library); Martin Milner (Bell-Pettigrew Museum); Claire Robinson, Matt Sheard, Arianna Carlini (MUSA); Alex Reid (Print Unit); and the staff at Luvians Bottle Shop (St Andrews)

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Information in this handbook is based on that available on 27 June 2014. Whilst every effort will be made to achieve the advertised programme, the Society reserves the right to change any aspect of the programme and other arrangements where good reason calls for this to be done.

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