Knowledge Management Symposium, 6th February 2006

Knowledge Optimization in Research Funding

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Wellcome Trust

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The Wellcome Trust Headquarters, London

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The Wellcome Trust

The Wellcome Trust is an independent research-funding charity, established under the will of Sir Henry Wellcome in 1936.

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Wellcome Trust mission

"To foster and promote research with the aim of improving human and animal health"

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The Wellcome Trust

Our current annual spend is approximately $800 million…

We support more than 5,000 researchers at 400 locations in 42 different countries…

We fund major initiatives in public engagement with science and SciArt projects…

We are the UK's leading supporter of research into the History of Medicine

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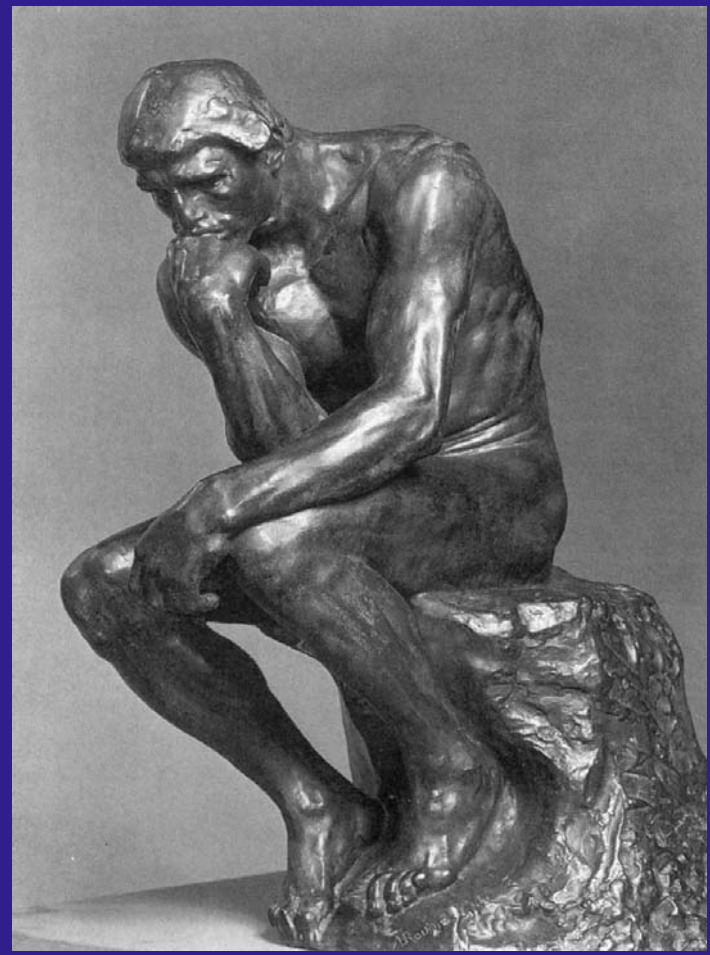
Agenda

Part 1 – wearing my Wellcome Trust 'hat'
Evaluation
Wellcome Trust Grant System project

Part 2 – a personal view
Opportunities for the future



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Evaluation

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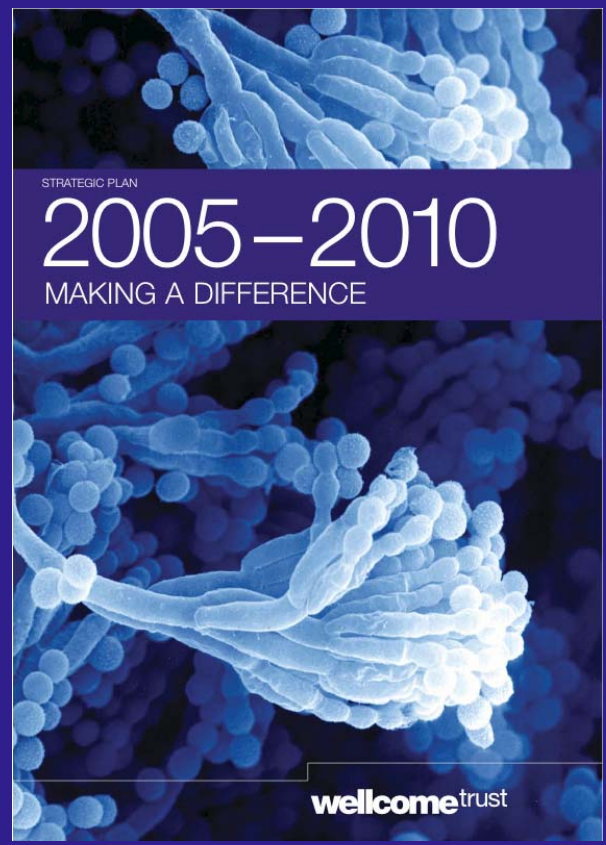
Evaluation

Evaluation: rationale

To enable the Trust to report on progress towards the key indicators set out in the Strategic Plan (2005-2010)



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Evaluation

doing evaluation: three key challenges

capturing outputs & outcomes: in a systematic and comprehensive way

evaluating the 'impact': outputs & outcomes

bringing it all together: synthesing & reporting the information at the required levels

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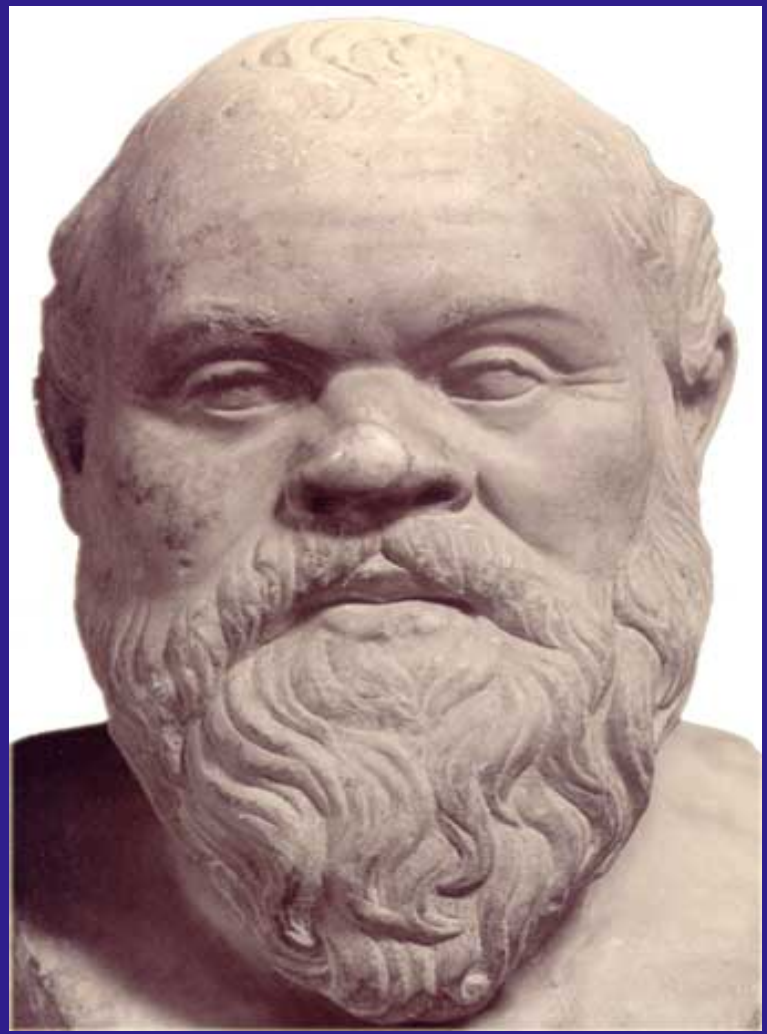
Evaluation

Changing the Philosophy



Should we fund the best science, or the best scientists?

Move towards ‘Continuous Assessment’

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Grant System Project

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Wellcome Trust Grant System Project

Key Drivers

Comprehensive Management Information
Improved Systems and Infrastructure
More Efficient Business Processes
Better Experience for the External Community

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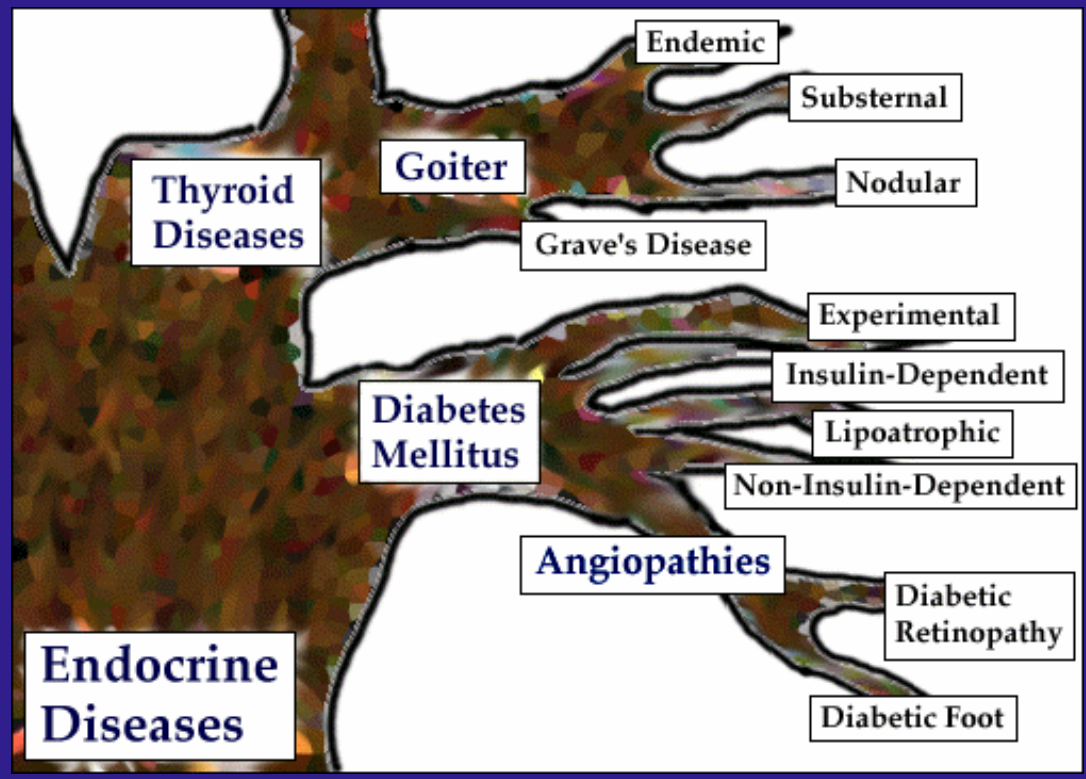
Classification and Reporting Issues

Problems with existing science classification system

The Trust wants to MeSH (Medical Subject Headings)

Peer Review Issues

We will introduce software that classifies automatically, and provides excellent management information



KM Software

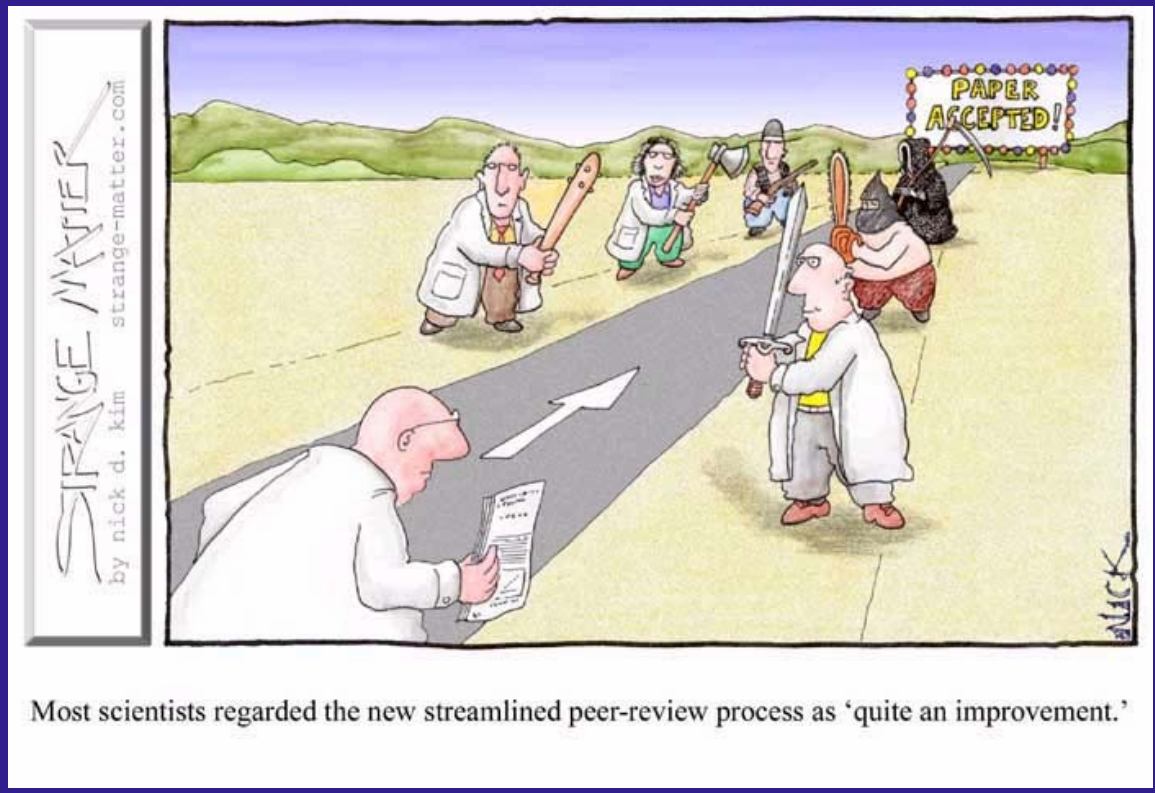
How does the software work for referee selection?

Uses text in application (parts of the proposal) as search

That gets broken into a number of concepts and is weighted

Matched against similar concept profiles in Medline

Concepts can be added/taken away and weighting altered and it will re-search



Most scientists regarded the new streamlined peer-review process as 'quite an improvement.'

Wellcome Trust use of KM Software

A ‘searching vector’, or ‘Disease Category’ is a weighted string of MeSH terms that best represents a concept.

‘Searching vectors’ will be created and updated to provide re-usable and consistent report searches

That Searching vector/Disease category is then the ‘Disease Code Fingerprint’ of that disease.

We will ‘borrow’ NIH’s searching vectors if they let us!

Concept Name	Weight
alpha-Dystroglycan	100
beta-Dystroglycan	100
CDC42BPA protein, human	100
CDC42BPB protein, human	100
DUX4 protein, human	100
Dystroglycans	100
Dystrophin	100
Muscular Dystrophies	100
Congenital hereditary muscular dystropy	95
Distal Myopathies	95
Muscular Dystrophies	95
Muscular Dystrophy, Becker	95
Muscular Dystrophy, Duchenne	95
Muscular Dystrophy, Emery-Dreifuss	95
Muscular Dystrophy, Facioscapulohumeral	95
Muscular Dystrophy, Oculopharyngeal	95
Myotonic Dystrophy	95
White Muscle Disease	95
Myopathy	51
Cardiomyopathies	19
Glycogen Storage Disease Type VII	2

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KM Software - Issues

How do we ‘cut the pie’?

‘Double counting’ cost issues.

How do we know if a classification is a good classification?

Will the text create a good fingerprint?

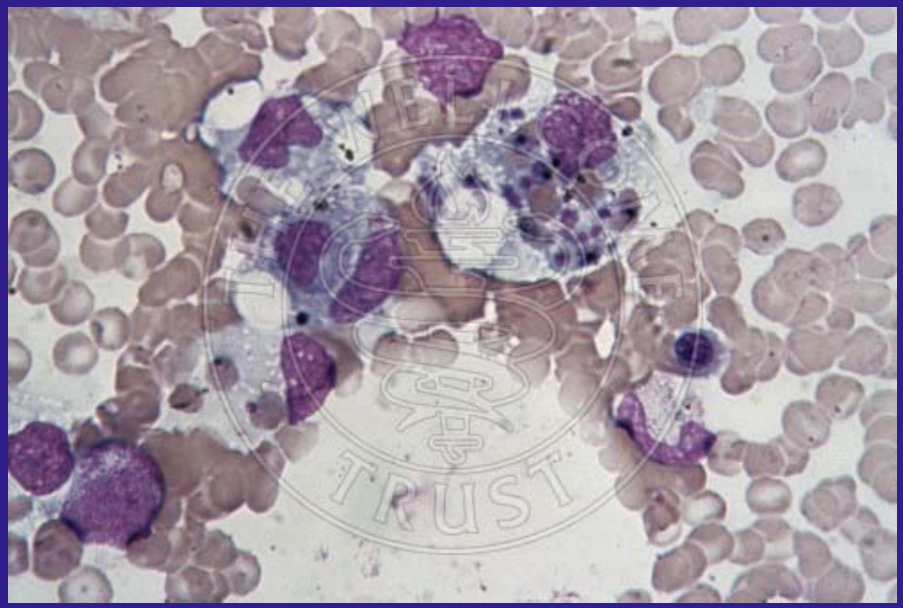
KM Software – use as comparative tool

Comparative analysis of like-for-like funding with other Research Funders is problematic.

Different classification systems will create different answers

And so are our ideas of what constitutes ‘malaria’..

We will never get all Funders to use the same classification system



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KM Software – use as comparative tool

A Possible Solution?

Take another funders' raw data and filter it through our classification system software

This would allow for accurate 'funder-to-funder' portfolio analysis

It would quantify the difference in interpretation between any two respective systems

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Part 2 - Opportunities for the Future

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Counterfactual History

The idea of ‘what if…?’

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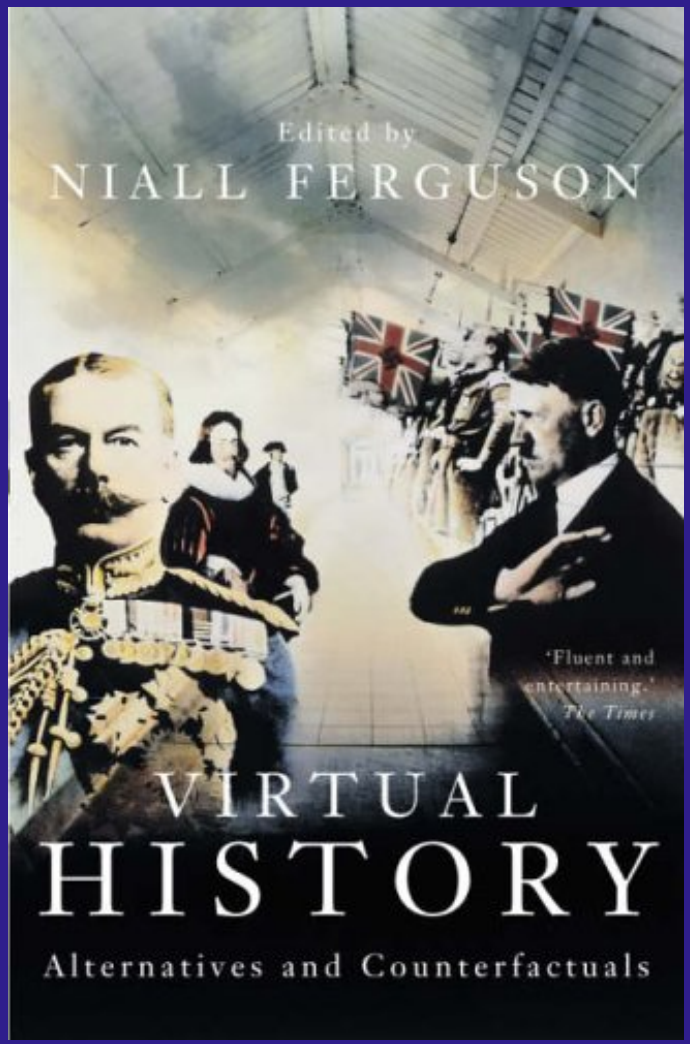

Common idea in History and Fiction – What if Hitler had won?

Common argument in Philosophy – Determinism and free will

Common in Science Fiction

Not common in Science..

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Each human ejaculation contains approximately 500,000,000 sperm

The chances of ‘me’ being ‘me’, or ‘you’ being ‘you’ are miniscule.

Humans are very susceptible to counterfactual history

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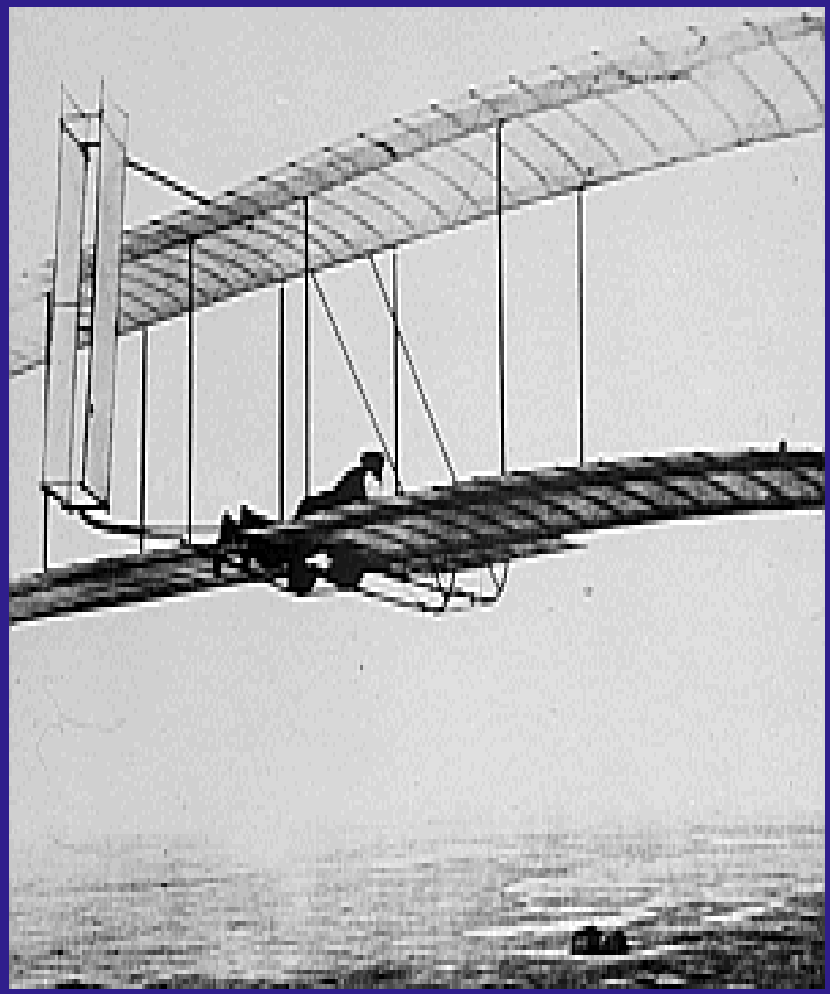

But what of science? Is it susceptible to counterfactual history?

Could the first heavier than air flight have taken place in 1600? 1700? 2000?

Science is very unsusceptible, or intolerant, to counterfactual history possibilities

Therefore, science is susceptible to predictive analysis

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So - Scientific and technological discoveries are far less susceptible to counterfactual history.

They happen when conditions are right

Scientific and technological discoveries are naturally iterative, building upon and using earlier discoveries.

Advancements are made in generally small, discrete steps. Eureka moments

It is easy to imagine a ray gun, but not possible to build one

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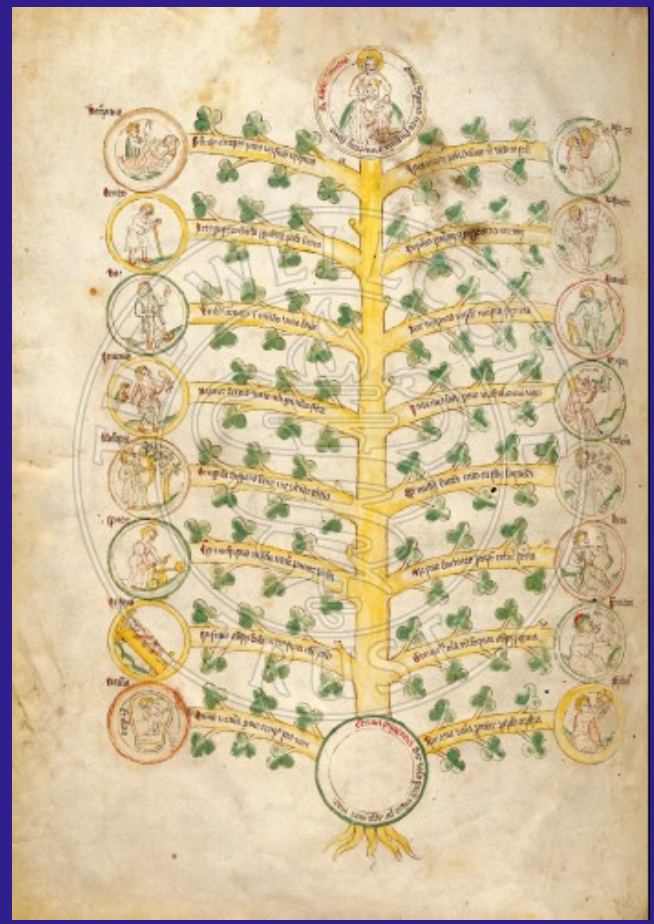
Why does this matter? Why have I talked about this?

What if we could predict where, and in what discipline, the next step might take place?

What if we used predictive technology to inform where funding should be concentrated to maximize the chance of new discovery?



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Is what is already ‘discoverable’ far greater than we imagine if only we could analyse existing data?

Why do I think this might be possible?

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Because of the explosive power of exponential growth, the 21st century will be equivalent to 20,000 years of progress at today's rate of progress

The whole 20th century is equivalent to 20 years of progress at today’s rate of progress

Organizations have to be able to redefine themselves at a faster and faster pace

Research Funders are no exception.

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Bench science is expensive, but produces enormous quantities of information.

There's a new Medline publication every minute – that's 1,500 new publications a day.

Average Wellcome Trust new project grant cost = $375,000

A single project grant might produce about 3 papers. That's $125,000 a paper (one piece of information)

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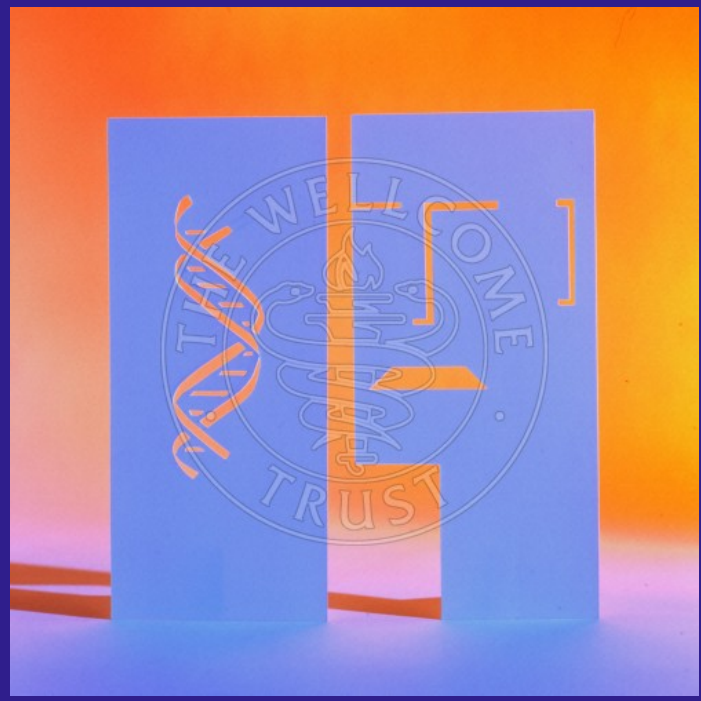
The resulting information is not generally fully optimised

We only just at the stage of an open repository - ('open access')

Simply getting the right people to read the right information is not enough to maximise the benefits of the information



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The potential of intelligent software

- **Information Repository**
- **Information Management**
- **Knowledge Management**
- **Knowledge Optimization**

Open Access

Intelligent Software

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Over the next 5 years I believe technology will take a leading role is science advancement. Software will be able to:-

- identify areas of research that should be pursued (hypothesis generator)
- provide relevant material for researchers to read, Provide meta analysis of research activity/proving vastly improved management information
- generate new knowledge directly

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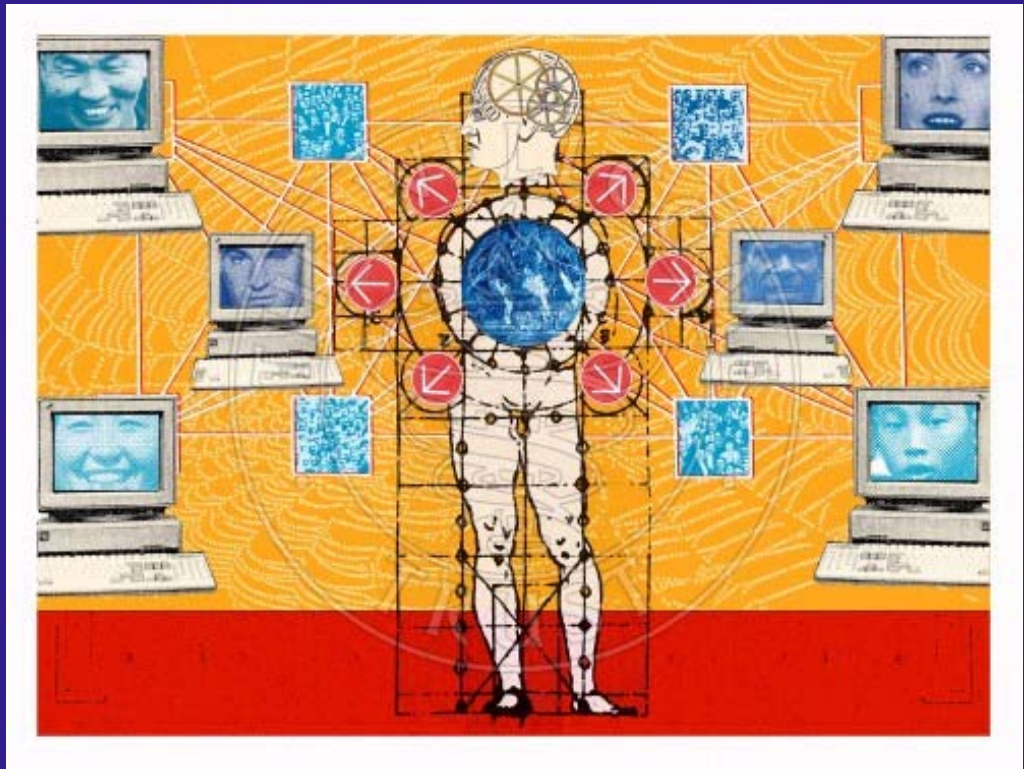
Over the next 15 years I believe technology will:-

- become a mainstream way of ‘doing’ scientific work

- it will provide the primary mechanism for policy and strategic setting

- and it will be able to predict when and where certain types of discovery will happen



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6 opportunities for Research Funders over the next 5 years

1) Research Funders must start re-considering what ‘funders’ do.

2) Funders’ System Development should encompass knowledge management systems

3) As part of ‘Evaluation’ we need to consider what kind of funding creates the most knowledge

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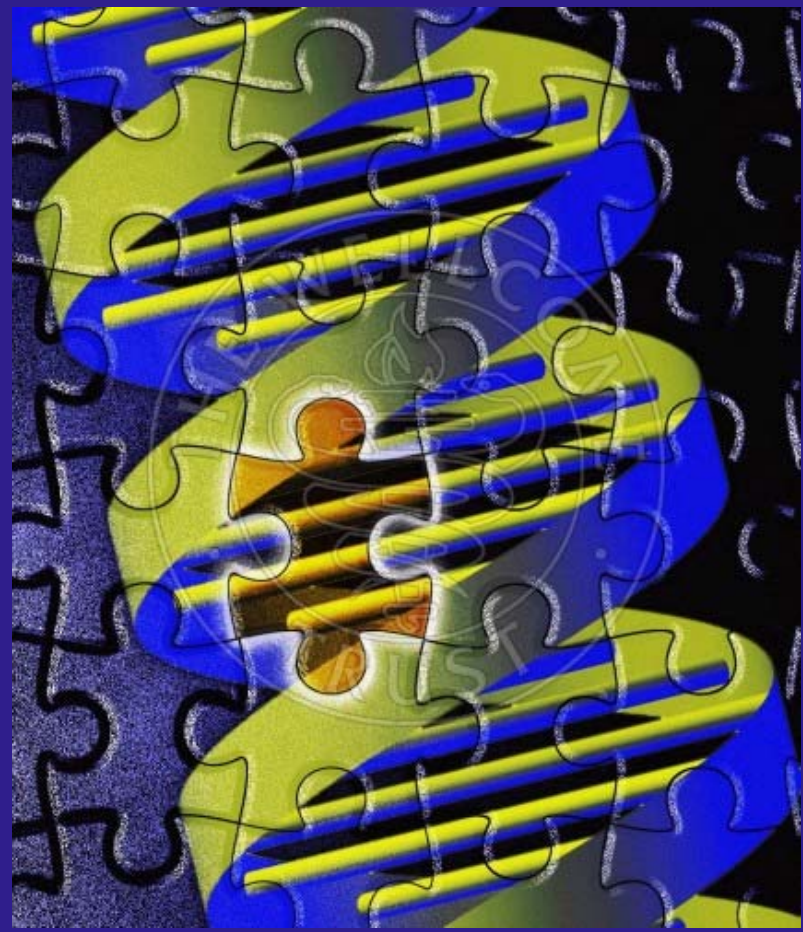
6 opportunities for research Funders for the next 5 years

4) Data. If technology can derive knowledge from information then we need as much information as possible.

5) Ethics – technology advances faster than human ideas of what is and is not ethical.

6) These are the ‘milk and honey’ years – imperative that we squeeze as much knowledge out of existing information as possible



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www.nactem.ac.uk - National Centre for Text Mining
www.biomint.org - BioMinT Biological Text Mining
www.media-style.com -Company in Information Management
www.collexis.com - Collexis Website
www.sciencecommons.org - goal is to encourage stakeholders to create areas of free access and inquiry using standardized licenses and other means
www.connectingforhealth.nhs.uk - Example of a new data source. Electronic Prescription Service
www.ukbiobank.ac.uk/ - Biobank
www.alspac.bris.ac.uk/welcome/index.shtml - Avon Longitudinal Study of Parents and Children (ALSPAC)
http://www.teranode.com/ -software company used by research commons
www.kurzweilai.net – Ray Kurzweil