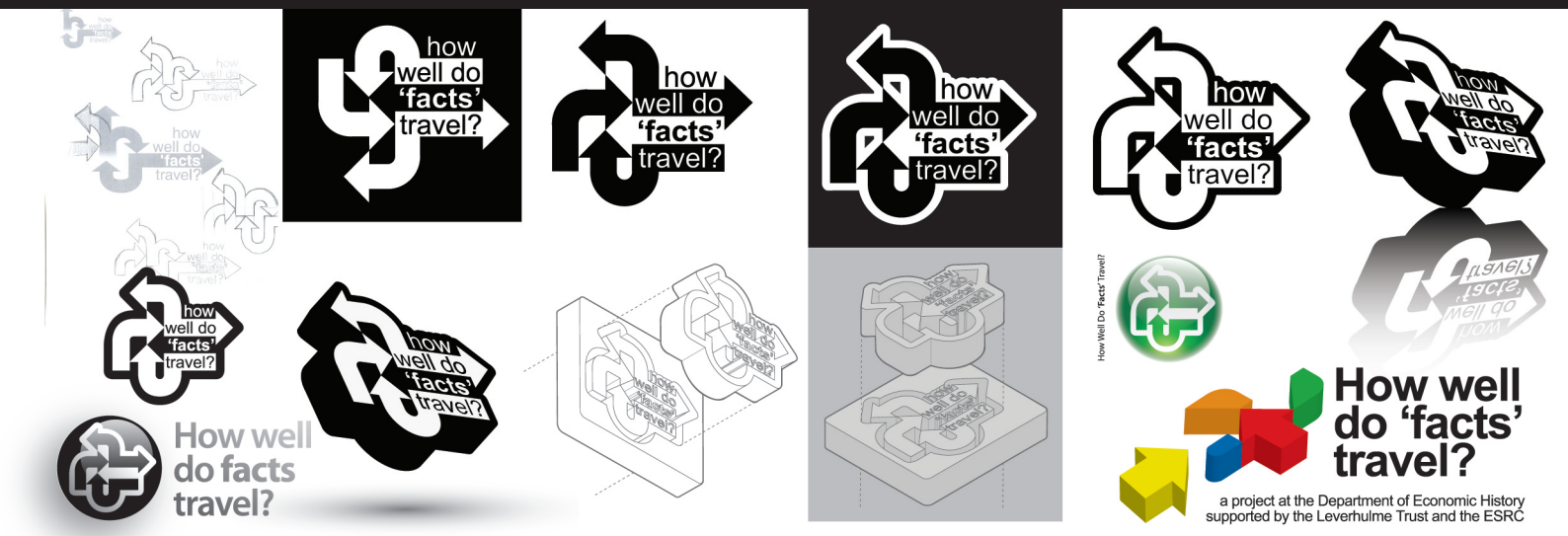
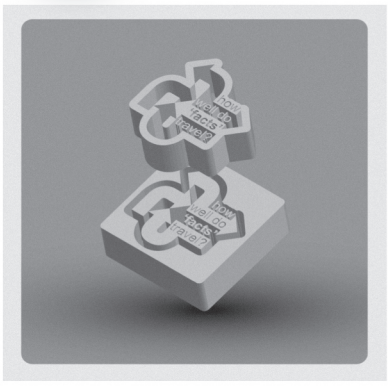
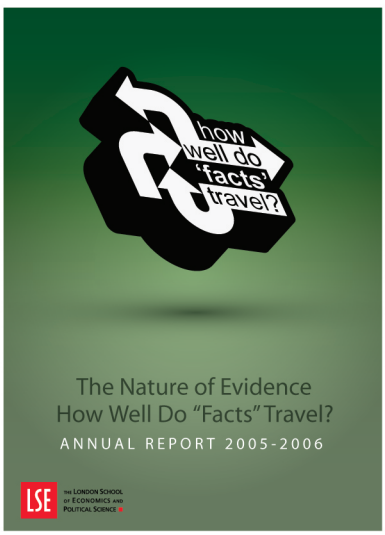
LSE

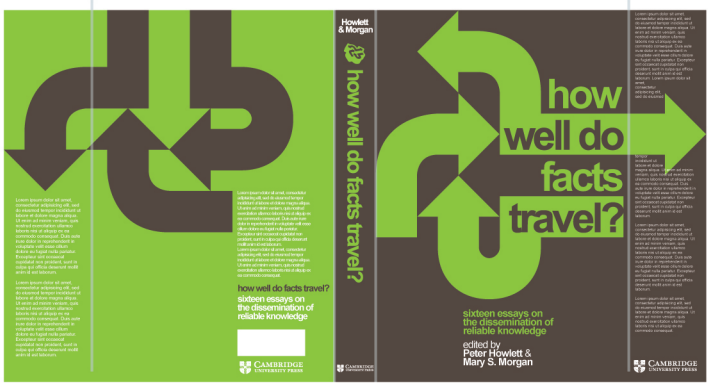
The Nature of Evidence: How well do ‘facts’ travel?

FINAL REPORT 2004-2009









How Well Do Facts Travel?

Leverhulme Trust - Grant F/07004Z
Summary report

Aims and Objectives

The aims were to establish a body of case work assessing "How Well Do Facts Travel?" and to develop a conceptual framework for answering this question which would hold for both humanities and sciences.

Findings and Conclusions

Our main conceptual challenge was to explicate what it means for facts, understood as "pieces of reliable knowledge", to travel well. We focussed on two senses: i) facts travel well when they travel with sufficient "integrity" to be acted upon as facts; and ii) facts travel well when their travels prove "fruitful", as evidenced by their being used again in other times, places, and domains, or for other purposes. Such travels depend on various kinds of "good company": labels, packages (such as cases), vehicles (such as the internet or scientific models) and chaperones (such as the name of a famous producing scientist). More surprisingly, our research found evidence of the importance of "character": those facts that travel well exhibit particular features that get them noticed in the first place or that are developed during their process of travel. Though conventional wisdom might suggest that facts are, like gossip, likely to be corrupted in their re-use, our research suggested the opposite, namely, that with the appropriate good company and character, facts will often travel remarkably well to serve as foundational objects beyond the place and community of their original field of production.

Types of Publications Resulting

The research team (consisting of post-doc fellows, PhD students, LSE faculty members and a number of senior visiting scholars) has produced (to date) two PhD thesis (with two more forthcoming), a considerable number of articles and book chapters, and a "book of the project". The sixteen essays in *How Well Do Facts Travel?* (Cambridge University Press, forthcoming) use the conceptual materials developed by the group as a whole in the context of the wide variety of case studies. These show how our ideas about facts, their qualities, and their travels are shared across the humanities, the natural, and the social sciences.

Strengths and Weaknesses of the Research

Strengths

* Brought together a wider group of scientists, both natural and social, together with humanists than was originally conceived.
* Ethos of home base (Department of Economic History) kept the project firmly grounded on facts understood as well-evidenced pieces of reliable knowledge.
* Tightly-focussed workshops brought in outsiders and created more general intersections within the research group.

* Succeeded in integrating the case work with the development of conceptual analysis.
* Made links between the research group and those responsible (inside and outside university domains) for getting facts to travel well.
* Wide participation in our activities, and the subsequent dispersal of junior group members, created many paths for dispersion of the project ideas and findings.

Weaknesses

* Unavoidable changes in the research team created hiccoughs in the first two years of the project and meant that the intended research strand on direct policy usage of facts was reduced (though the coverage of public usage of facts was increased).
* It proved difficult to get papers accepted in some journals early in the project, reflecting both the usual difficulty of cross-disciplinary work but also the innovative approach of the project.

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June 2010

How Well Do Facts Travel?

Leverhulme Trust - Grant F/07004Z
Main Report

The research project: How Well Do Facts Travel? was established under a broad programme call on "The Nature of Evidence" and supported by the Leverhulme Trust with additional support from the Economic and Social Research Council. Funding awarded was £751k, and the financial accounts have been separately reported to the Leverhulme Trust, along with a full list of publications associated with the grant. Many of the individual research outputs, and reports of our other activities (seminars, conferences, workshops and press coverage), are available on the web given at: http://www2.lse.ac.uk/economicHistory/Research/facts/AboutTheProject.aspx The main organisation of the project, its research activities and its outcomes are reported here.

Organisation of the Project
Project People

The project was designed to involve both senior and junior faculty in the Department of Economic History with a group of post-doctoral fellows appointed especially for this research. In the event, it proved quite difficult to find post-docs with the skills necessary to address the research question; and several personnel transitions occurred at different levels (reported in successive Annual Reports of the project). This had implications for the case-work undertaken on the project (which was designed to be dependent on the faculty involved and post-docs appointed) but did not interrupt the development of the conceptual framework.

The stable core group of faculty consisted of three members: Mary S. Morgan, Peter Howlett and Patrick Wallis. (Of the original faculty members: Paul Johnson moved to a position in Australia; Max Schulze moved to another grant-funded project quite early in the project; while Stephan Epstein died suddenly in 2006). Partly as a result of these changes, we were careful to maintain longer-term commitments from a small number of project "visiting fellows" who became attached to the project and visited several times, and/or attended all our workshops: Alison Wylie, Martina Merz, Rachel Ankeny, Marcel Boumans and Harro Maas.

The post-doctoral team (after the early loss of Demade, who returned to Paris) were rather more stable, but naturally followed their own paths as career opportunities became available to them. The post-docs were (in order of initial appointment):
Simona Valeriani (October 2004 - December 2009)
Jon Adams (November 2004 - March 2009)
Julien Demade (January 2005 - September 2005)
Erika Mansnerus (previously Mattila) (May 2006 - December 2008)

Edmund Ramsden (July 2006 - December 2007)
Sabina Leonelli (July 2006 - June 2008)
Another post-doc, David Haycock (funded by a Wellcome Trust grant), worked alongside the project for some of the period.

In addition, four PhD students became attached to the project. Their theses were intellectually aligned to the project, and they were supervised (in part) by faculty working on the project. Two of these, Aashish Velkar and Albane Forestier have already graduated, the other two are very close to graduation: Ashley Millar and Julia Mensink (the latter funded for three years by the project).

There are two significant points that are worth noting here about the research team. First is that the group was extremely cohesive in its research activities involving faculty, post-docs, PhD students and visiting fellows without making distinctions between them. There were no sub-group activities organised by interest, or by seniority: all research work meeting and workshops were open to all project members. All who were available at any one point participated actively and with great commitment to the research work, both in developing its shared conceptual framework and in discussions of the case-work of individual members.

Second, was the openness of the disciplinary space that the project created and occupied. The host Department of Economic History spans humanities and social sciences in its methods of approach and in its subject matters. It proved not just a congenial home for the project, but a natural base for the collaboration not only of those trained in the social sciences and the humanities, as well as - equally - those who had a background training also in one of the natural sciences. Our team included many who had training in two disciplines that crossed these major divides, and their multiple approaches and disciplinary interests meshed happily together.

Project Activities

Over the course of the project, the group ran a regular "Facts Seminar" hosted within the Department of Economic History at LSE with outside speakers discussing a huge range of topics, from Linnaeus's card filing system for plant names to the speed of 'news' circulation over the centuries, from systems designed to maintain facts in forensic science to the determination of the quality of cloth in seventeenth-century England, and so forth. We ran an irregular reading group for topics of general interest - such as literature on gossip and war-time rumour control, or on the nature of artefactual knowledge.

As in any academic project, the research group members disseminated their own, and the project ideas as a whole, at conferences, workshops, special panels, at many locations and within a number of different national and international academic networks. These included a couple of joint meetings with those working on the "History of Scientific Observation" project at the Max Planck Institute for History of Science in Berlin.) We reached a variety of audiences via publications in journals and

books (a list of these is attached to this report.) Of special mention, given the importance of our young scholars in the team was a special issue devoted to the project of the *Graduate Journal of the Social Sciences* (vol 6:2, June 2009). Our project also reached a public audience via press reports and our contacts were extended by the website of the project which recorded not only all our research activities, reports, and workshops (below) but some toolkits on ideas used in the project as well being a repository for our working papers, and a record of publications. We were short-listed and then "highly commended" in the category of best Research Project of the year at "THE Awards 2008" (the Times Higher Education Awards).

The most significant activities, from the point of view of developing the project content, were our workshops and a public congress sponsored by the British Academy. We ran an initial workshop which acted as a brainstorming meeting to get the project going, and a closing workshop which discussed the book chapters for the forthcoming "book of the project": *How Well Do Facts Travel?* (eds Peter Howlett and Mary S. Morgan, Cambridge University Press, forthcoming 2010. (The contents are attached at the end of this report: chapters are contributed by team members, visiting fellows, and others who had written papers especially for one of our workshops.) On these occasions we invited a number of outside commentators (including senior international academics such as Norton Wise, James Griesemer, etc) as well as our regular project visiting fellows. These scholars aided us in framing our project in the first place, and acted as referees and quality monitors for our proposed book chapters in the final meeting.

We helped to run a British Academy Congress: "Enquiry, Evidence and Facts: An Interdisciplinary Conference" which, coming in the middle of our project time (December 13-14th 2007), proved critical to the development of our thinking about our overall framework. This two-day congress was sponsored by the British Academy, our own project, and our sister Evidence project at UCL ("Evidence, Inference and Enquiry" led by Philip Dawid). Participants included the faculty and post-docs reporting both the LSE and UCL projects alongside a number of outside speakers who contributed to discussions about the broader questions of evidence.

This BA congress prompted the production of "posters" for each of the LSE group members, including our PhD students. We used these to exemplify the possibilities of getting facts to travel well - the facts of our research cases - in the most illuminating and effective way. They were exhibited at the British Academy during the conference and hang outside the project offices: many people have stopped to look at them and discuss them with us. They are also available on our website.

We ran five substantive workshops: each two-day event was associated with the work of one of the five post-docs. On these occasions, each hosting post-doc invited both senior and junior visitors who could speak to their own research questions: some of these came directly from their own field, others from related or complementary fields and interests. In addition, our regular visitors came to most or all of these workshops: they helped the local faculty to provide continuity and to join up related elements of the

research as it progressed. The workshops with their topics and post-doc hosts are listed here:

1) *The Fact/Fiction Ratio in Science Writing* led by Jon Adams, 12-13th April 2007
2) *Facts at the Frontier: Crossing Boundaries Between Natural and Social, Animal and Human* led by Edmund Ramsden, 16-17th April, 2007
3) *Facts and Artefacts: What Travels in Material Objects* led by Simona Valeriani, 17-18th December, 2007
4) *Making Small Facts Travel: Labels, Vehicles and Packages* led by Sabina Leonelli 27-28th March, 2008
5) *Life Histories of Facts, Biographies, Cycles and Metamorphoses* led by Erika Mansnerus 31st March-1st April, 2008.

Each of these workshops were described in the relevant annual reports for those years, and the programmes and participants at each workshop are recorded on our project website. Each played a significant role, not just in the development of each individual post-doc project, but in the life and work of the group as a whole. Our outside visitors often arrived sceptical about our project, challenging our starting points and ways of thinking about facts. But they usually ended up convinced that our question was important and our answers interesting. These workshops proved invaluable for the development of the broader ideas discussed in the project work below and they were wonderfully stimulating interdisciplinary meetings which live in the memory of those who took part.

The Research Framework for Understanding Travelling Facts: Analysis and Associated Case Work

The broad aims of the research project were to establish a body of case work on the question "How Well Do Facts Travel?" and to develop a conceptual framework, or frameworks, for answering this question.

At the opening of the project, we faced a number of challenges which - over the course of the project - we used as the status quo or benchmark against which we developed the general framework for our case studies and for answering our project question in positive and innovative ways. These challenges can be associated with the existing accounts given in the literatures of history, philosophy and sociology of science and while we sought to complement these, we also wanted to extend our ideas to the knowledge systems of the humanities.

First, we discovered we had to defend our interest in "facts" and explain why they were worthy of study. This was a surprise to us, for facts are by no means such obvious things as people think. While "evidence" is recognised as something that has to be studied and theorized, facts are seen as boring and straightforward. Yet facts and evidence are closely related: some fields suppose that facts are put together to form evidence for some claim; others that evidence is put together to form facts. This makes

"facts" just as important as "evidence" in studying "The Nature of Evidence", and potentially just as problematic.

Facts are of course everywhere: they litter the utterances of public life as much as the private conversations of individuals. They frequent the humanities and the sciences in equal measure. They may be tiny, and on their own seem quite trivial (as a piece of genetic information about a plant), or important and earth saving (as our temperature measures of climate change). And, of course, as we all know, individual facts may be strong and secure bits of knowledge, or sometimes hard to distinguish from fictions, or be shaky to the point of falsehood. But their very ubiquity, in conjunction with the many forms they take, and the different qualities they hold, tells us not only why it is difficult to form general but sensible answers in response to seemingly simple questions about facts, but why it is extremely important to do so.

The second set of challenges came from the existing ways that scholars had of thinking about facts. On the one hand, philosophers tend to think of facts as expressed in linguistic statements and define them in terms of truthfulness. On the other hand, sociologists of science have come to think about facts over the last two decades as socially constructed, but stabilized, bits of knowledge while historians of science typically think of them as discoveries hard won from scientific work. It was one of our early tasks to work out a usable sense of what we meant by the term "facts". It was important that we characterized facts in ways which would allow us to work across the terrains of knowledge and their disciplinary boundaries, particularly across the science-humanities divide because, of course, humanists are equally dealers in facts. Their ways of thinking about the facts of history, archaeology, architecture, literature, anthropology, law, and so forth proved equally relevant to the multi-disciplinary community we assembled as were the ways of defining facts used in the sciences and those who study them. In our experience, all communities have things that might be denoted as facts, though some might refer to them under different labels (such as calling little facts "data" or big ones "phenomena" or "findings").

Facts *can* be characterised in a way that crosses the domains of the sciences and the humanities as we found out when our project group thought about this problem carefully, and drew on the history of the notion as well as its current usages. We came to understand facts as shared pieces of knowledge that hold the qualities of being short, specific (non-abstract), and reliable. They are non-conjectural: they are not hypotheses, theories, fictions, etc.. Nor are they matters of mere belief or opinion. Rather, they are bits of shared knowledge established according to criteria of evidence existing in a community at a given time, and thus taken to be reliable enough to act upon (assuming that they are useful for some purpose). These are the qualities that make us say "a fact is a fact is a fact" wherever it is, for whatever purpose it is used. These are also the qualities that enable such settled pieces of knowledge to travel (assuming they are communicable or transportable in some way) beyond their place of origin to be used in new contexts.

A third aspect of facts, in which we had to work against standard views, was in the forms that facts took. It was quickly became evident that for our project participants, facts are not only expressed in verbal claims and counter claims, but in all sorts of things and in all sorts of ways: in the drawings of insects, in the maps of our globe, in the beams of buildings, or in the shards of our forebears. The notion that facts are events or deeds stems for their earliest usage in law: to establish matters of fact is to establish events and happenings. Facts then became the events of history to be recorded in books and reported in newspapers. But for many humanists, facts travel unashamedly in artefacts. For building historians and archaeologists, the timbers supporting a church roof or fallen through fire contain or carry facts about their construction, their purpose and their decoration. The presence of such humanities' specialists within our wider group - particularly Simona Valeriani and Alison Wylie - proved tremendously important to our ability to think generously about the nature of facts and the sites within which they were located and travelled. For example, Valeriani's workshop on facts carried in artefacts (our third workshop mentioned above), proved a wonderful opportunity to explore just how artefactual facts could be. The participation in that workshop by specialists who analyse, and restore, artefacts in museums and on ruined sites proved enormously stimulating and influential to our thinking about the ways that artefacts carry facts, and about the density of those facts. From these examples, we were able to see in a new light the many other ways that other kinds of facts are located in other kinds of objects and carried along by other kinds of non-verbal means: for example the data points of science located and carried along in computer images, the technical facts carried by agricultural technologies, and so forth.

Working with this shared notion of facts: as pieces of knowledge with specific characteristics, was only one step in resolving the puzzles posed in our research question. It is equally pertinent that facts are recognised to be separable bits of knowledge that can be extracted from their producing context and shared with others. Indeed we might say that facts are pieces of knowledge that, by definition, are separable from their original context. And because they are such independent pieces of knowledge, facts have the possibility to travel, and indeed some circulate freely, far and wide and gain a life of their own. Of course many facts do not circulate: supplied but never demanded, they may remain unnoticed unless perhaps picked up later, or by chance, for some new purpose.

Yet even if facts are bits of knowledge that can be easily separated from their producing contexts, it remained unclear what it means for facts to travel and to travel well? These questions jointly created much discussion at our earliest brain-storming workshop in which we sought to define and expand the notion of travelling and what it meant to "travel well".

We came to answer these puzzles in two ways. For those facts that do travel, that do gather a life history, the project asked how do such bits of knowledge - whatever their appearance and size - circulate while maintaining their integrity as facts? For of course it matters that facts do hold their knowledge: they are not just an essential category of

the way we talk in modern times, but provide one of the forms of knowledge upon which we act. This is one way we answered our question: 'How *Well* Do Facts Travel?' *Well enough* to act upon them: facts need to retain their integrity and reliability if we are to act upon them safely. At the same time, our recognising that facts have travelled well depends on us noticing how certain facts get used again and again, by other communities or for other purposes. This provided our second insight into the problem of understanding *travelling well.* Facts travel well if their travels prove fruitful. So these two senses of travelling well: with integrity and fruitfully, frame our answers to the question 'How *Well* Do Facts Travel?'.

With these resources, we had found a sufficient framework that worked for both the humanities and sciences, and for both the natural and the social sciences. The full extent of what can be understood as the fruitfulness of travel can be exemplified by one of our cases. Edmund Ramsden's research showed how the facts that came out of experiments on crowded rat populations travelled to be applied to human populations and thence affected the design of urban housing, college dorms and prisons via architects and urban planners. More unexpectedly, facts from those same sources travelled into children's science fiction in the "Rats of NIMH" a book and film (where NIMH stands for the National Institute of Mental Health in the USA). The travels of these facts is one of the most extraordinary stories amongst our case work, receiving press coverage and at least two documentary companies are considering making a film baaed on our case study about these well-travelled facts.

The integrity of travelling facts are evident in another case study of the Tamil Nadu Precision Farming Project that aimed to get fertigation technology transferred from the scientific to the practical farming domain. Here the challenge was to get the technical facts to travel intact, that is: "precisely", a challenge overcome by careful design of the project to ensure that farmers kept to the exact use of the fertigation equipment, but were free to experiment with other parts of the technology. This analysis and study by Peter Howlett and Aashish Velkar created a fruitful working relationship between the Facts project and the Tamil Nadu Agricultural University and its Director, Dr Vadivel. The facts from our analysis have been incorporated both by the Indian scientists into their evaluation process, and by Tata into their business model for rolling out the fertigation project elsewhere in India. Facts have travelled several ways here: to fertilise our project ideas, to feed back into these Indian developments, and in turn, these two way facts have travelled into a much-watched LSE video about the possibilities for a "Second Green Revolution" at: http://www2.lse.ac.uk/newsAndMedia/videoAndAudio/research/theSecondIndianGreenRevolution.aspx (This video made by another of our post-docs, Jon Adams, whose work now involves making LSE research facts travel.)

The problem of maintaining the integrity of travelling facts is revealed by those cases where such integrity is compromised or lost. Instructive here are two of the project's analyses of the fact-fiction ratio. Patrick Wallis shows how successive versions of the Eyam plague narrative has, over the decades, seriously altered the factual record. The Rector corralled his parishioners into their proto-industrial village in such a way that

probably increased their death rate. But both he, and the village, were romanticized by an early nineteenth century poet whose work turned the site into a tourist attraction from which it has been difficult to retrieve the integrity of the original facts - they travelled fruitfully, but without much integrity. Jon Adams in his study of science popularisations over the twentieth century analyses just how difficult it is to draw the lines between facts which travel with integrity and those where literary devices create some justifiable compromises and thence to those where facts are purposely altered for literary effect and finally to accounts put forward as facts when they are indeed fictions.

What then causes some facts to travel well and others not so well? Here we developed two ideas. One was concerned with "good company"; the elements that carry facts into new domains, new uses and new users. We have developed ideas about "travelling companions" to a much fuller extent than in the existing literatures on travelling knowledge by examining not only witnesses, but other kinds of chaperones, expert and lay; not only research papers and books, but many other kinds of vehicles such as cases and scientific models; not only citations, but attention to labels, addresses, and packaging in general. For example, while technical facts might seem to travel along very restricted channels because so much is tacit and experiential rather than articulated, the relative openness of such routes (geographically, socially, and institutionally) may be surprising, as exemplified both in a study of apprenticeship training in seventeenth-eighteenth century England by Patrick Wallis and in the science-farmer knowledge transfer found in twenty-first century India by Peter Howlett and Aashish Velkar. In another example, we found how the requirements for labels and appropriate packaging has become particularly important for "data intensive" sciences, as Sabina Leonelli's study of bio-informatics makes very clear. If small facts are well labelled, then this not only makes that scientific field more efficient in sharing data, but offers tremendous possibility for cross-fertilization at higher levels of knowledge based on those labels. Images offer a form of packaging critical, as Martina Merz's study shows, for getting the facts of nano-science to travel effectively and efficiently. While those working in science studies have been interested in the importance of visual communication, the extent to which facts can be only be fully seen and understood through such images speaks both to our earlier point about the various forms in which facts are found, and to the importance of various different kinds of vehicles for communicating facts so that they will travel well.

In other words, our conceptual work on "good company" involved both broadening the scope as implied in our terminology "travelling companions", and rethinking it as a notion to cover many elements previously treated as distinctly different. Placing them all - labels, packaging, vehicles, and chaperones - under this broad umbrella term, enabled us to see how these elements maybe substitutes as well as complements in the process of getting facts to travel well. Thus, in a study of the long-lived fact of the remarkable age of "Old Thomas Parr", attested to having died aged 152 in 1635, David Haycock shows how different kinds of chaperones or companions (expert witnesses, celebrities) combined with the authority of texts (such as the Bible) and vehicles of travel (such as pub signs and society portraits), to create a veritable "scaffolding" which

supported the fact of his age. This fact travelled across Europe and over two centuries. It only became understood as a "false fact" when an alternative way of understanding longevity developed with the rise of statistical and probability thinking. This new scaffolding made such a life-span so unlikely as to be seen as untrue, no longer a fact.

Our second finding about what causes some facts to travel well is concerned with their "character". Certain facts are surprising, awkward, or stand out for notice in a field: they have sufficient character to make them candidates for travel and re-use. For example, evidence which showed that firms did not exit from a declining industry according to their profit/loss rankings in that industry - as widely assumed by economists - established a fact that was sufficiently startling to spread far and wide in both academic and policy making circles. In another field, Rachel Ankeny found how the initial set of symptoms mentioned in the first reported cases of HIV-AIDS were not startling individually, but that they stood out as a set of facts taken together and this is what made them - packaged into a case note - travel. At that stage however, the personal facts of the patients were overlooked. It was only when both sets of facts were put together that they came to constitute the case materials that made the facts of the disease travel far and wide. Yet, travelling itself also develops the character of facts. As we found, facts may become logo facts for a particular result, key facts for a special way of doing something such as measuring the roughness of a river bed, or to denote the characteristic style of classical architecture. And, as Erika Mansnerus shows in her study of the ways that facts travel around the modelling communities of epidemiologists, some facts remain stubborn, some are chameleons adapting to new environments. Character is associated here with the functioning of facts, which then become an important consideration in tracing the life histories of facts and understanding why their travels are fruitful.

Whilst our group did not adopt any *one* theoretical, or disciplinary, approach to studying the nature of evidence, individuals in the project did use a variety of resources, from the history, philosophy and sociology of knowledge, for thinking about travelling facts. But we did share a common question, and we did come to share an analytical framework for answering questions about what it means for facts to travel well. This open approach to the study of knowledge enabled us to develop a substance-neutral, but not substance-weak, account of travelling facts that made sense of cases from the sciences, the humanities and the arts, some of which are found (below) in our forthcoming book of the project *How Well Do Facts Travel?*

Research Outcomes

Taken overall, our project has concentrated on rethinking the notion of facts as important elements in our knowledge set, and then on assessing what it meant for facts to travel well and what determines such travels. And while it might seem that much of our initial ground work in defining facts as bits of knowledge with certain characteristics was merely clearing away both the effects of recent postmodernism in science studies and the older, linguistics-dominated, analytical stance of philosophy towards knowledge, such views had proved remarkably resilient, and unduly restrictive. Getting ourselves, and our audiences, to think outside these boxes proved surprisingly difficult. When we recognised how restrictive those ideas were, we were able to liberate facts from those two boxes and recreate with the help of past notions and our many cases, a more informative - and more broadly applicable - account of the nature and characteristics of facts. This revision was necessary before we could think sensibly about the travels of facts, and give an account of what it meant for them to travel well. But this re-thinking in itself has epistemological consequences - it brings back facts as one of the important foundational elements, rather than as the less interesting outcomes, in our considerations of knowledge and its diffusion. Such reconsideration calls for attention to the kinds of structures that transport, support, and otherwise contain facts such as cases, artefacts, and so forth that have been somewhat neglected in mainstream history, sociology and philosophy of knowledge but which we found to be important. Our rethinking of facts opens up doors to the nature of evidence *and* suggests new rooms for study.

Of our four notions about travelling: *fruitfulness* and *travelling companions* are ideas that we have labelled in such a way that we could develop, extend and more fully analyse some notions that had already been only partly and separately conceived in the various literatures on knowledge. The notion of fruitfulness in particular was under-conceptualised, and working on this pointed us to the many different places and functions in which facts do get used beyond their sites of production. Developing ideas about good companions required less conceptual work and more an ordering of possibilities and broadening of roles. The analysis and ideas here have wide practicality for they suggest the means to get facts to travel well regardless of the terrain of travel, from academic to public, or within the sciences and humanities. Our development of fruitfulness and companionship has enabled us to fill in more exactly what is meant, and the means, for facts to travel well, but it is notable that these two notions are equally relevant for the circulation of other kinds of knowledge not just factual knowledge.

Our other two qualities: *integrity* and *character* depend very much on the way that we have posed and answered our question about travelling facts. Both are qualities that are integral to the notion and characteristics of facts as was evident in our re-thinking of what facts are, what form they take, and where they are found. But integrity and character are less obviously concepts that may be easily transposed to other forms of knowledge or to their circulation.

Integrity points us to the requirement we most prize in facts: that they remain honest

and so reliable, a quality that speaks directly to their definition and their purpose. This has potentially wider relevance for our thinking about factual knowledge and its usage in the public domain. For example, it seems that in various contexts, there is a call for transparency when integrity is really what is really required. So calls for "transparency" - for example over sources in climate science reports - are really calls for the integrity of the facts involved and so it is rather "traceability" that are the means to this end, traceability of those facts and their producers/sponsors that have travelled together to make up such reports. Character seems equally a quality to be prized in facts: facts that have character will travel, and facts that travel will gain character and the character of particular facts may well point to their functions and roles in particular contexts. This finding is less immediately useful to practical problems of getting facts to travel and more useful in understanding the life cycles and usages of travelling facts.

Our impact with all these ideas - our ability to make a difference to the fields that we work across - is difficult to assess. One indicator is when others start using our terminology, as Professor Susan Hunston did following our BA Congress in her own work on corpus linguistics. But, as we have learnt from studying the travels of facts, those facts that have travelled best are ones that cease to have any links with their producers, ones that no longer feel the need to reference their parents as a signal of their good character or authority. These are the facts that "everyone knows" to be so, they are taken for granted, and used without discrimination. We will know we have made a real difference to those studying the nature of evidence, or those responsible for getting facts to travel, when our terminology of travelling facts becomes so standard that it is no longer possible to find our project by tracing back through the resources of Google Scholar!

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June 2010